Predicting Personality and Mapping its Impacts in Rapidly Evolving Business Environments: A Behavioral Process Perspective

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1. Introduction

1.1 Aims and Scope

Individuals carry inherent personality traits not directly accessible to others. However, these traits play a significant role in shaping how individuals feel, make decisions, and behave in daily interactions. This leads to powerful cumulative personality effects on fundamental life outcomes, such as the probability of divorce, salary levels (see also Ng et al., 2005), and even the timing of death (Roberts et al., 2007). The effect size of personality is substantial, comparable to established medical effects (Meyer et al., 2001). Whereas most people are aware that chemotherapy increases the probability of surviving breast cancer (r = .03), ibuprofen relieves pain (r = -.14), and alcohol induces aggressive behavior (r = .23), it is also reasonable to acknowledge personality traits' impacts on vocational outcomes. For instance, personality predicts job performance (e.g., $r_{\text{Conscientiousness, job performance}}$ = .13; e.g., Barrick & Mount, 1991), counterproductive work behavior (e.g., $r_{\text{Narcissism, counterproductive work behavior}}$ = .35; e.g., O'Boyle et al., 2012), job satisfaction (e.g., $r_{\text{Emotional stability, job satisfaction}}$ = .24; e.g., Judge et al., 2002), occupational stress (e.g., $r_{\text{Emotional stability, emotional exhaustion}}$ = -.42; e.g., Alarcon et al., 2009), and leadership outcomes (e.g., $r_{\text{Extraversion, leadership emergence}}$ = .33; e.g., Judge, Bono, et al., 2002).

Accordingly, there is ongoing interest in (a) predicting applicants' personality traits for personnel selection and development purposes (e.g., Sackett et al., 2022; Schmidt & Hunter, 1998; Schmitt et al., 1984), and (b) mapping their multifaceted vocational impacts (e.g., Bell, 2007; Hogan et al., 1994; Judge, Bono, et al., 2002; Lord et al., 1986; Mann, 1959). These interests (c) do not operate in a vacuum but in the context of constantly changing business environments characterized by digital transformation (e.g., Hanelt et al., 2021; Verhoef et al., 2021). This dissertation's three-fold goal is to advance research in these areas (a-c) by addressing exemplary focal, yet under-explored, questions taking a (personality-evoked) behavior-centered perspective sensitive to changes in the business environment.

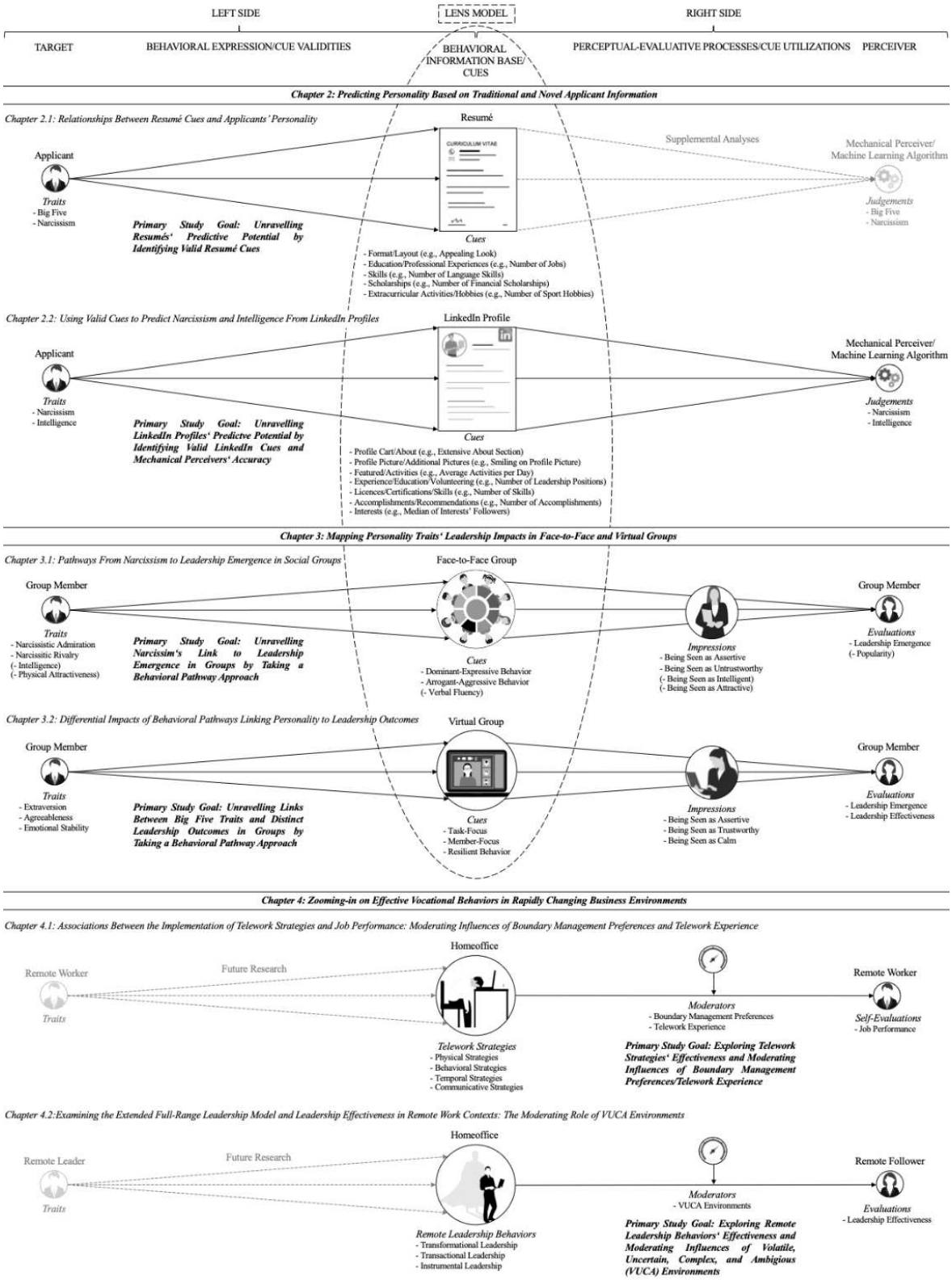
The lens model (Brunswik, 1956) offers a framework for understanding complex links between personality traits and interpersonal judgments (see also Back et al., 2011; Grosz et al., 2020; Nestler & Back, 2013), making it a suitable framing theory for this dissertation: As personality traits are latent constructs, the key to understanding their effects on interpersonal judgments lies in personality-evoked behaviors. These behaviors or "cues" are more accessible to interpersonal observation and play the central mediating role. Thus, behavioral processes (or residues thereof) represent the common ground for (a) predicting applicants' personality traits, (b) mapping their vocational impacts, and (c) embedding these processes in the context of rapidly evolving business environments (see Figure 1).

The critical behavioral cues vary depending on the link between personality traits and interpersonal judgments to be understood. Concerning (a) predicting applicants' personality traits, interpersonal personality judgments are the relevant outcome. Key questions cover personality judgments' accuracy based on different information bases (e.g., resumés, LinkedIn profiles) and how this accuracy (or lack thereof) arises. Here, personality-evoked behaviors used to infer personality may represent traces of past behavior, such as job-relevant experiences listed in resumés. Concerning (b) mapping personality traits' vocational impacts, interpersonal judgments related to evaluations of leadership outcomes are extensively studied (e.g., Judge, Bono, et al., 2002; Judge et al., 2009). Unanswered questions revolve around explaining the link between distal personality traits and evaluations of leadership outcomes through proximal mediating behavioral mechanisms (e.g., Antonakis et al., 2012; Zaccaro et al., 2018). Here, personality-evoked behaviors may represent expressed behaviors in interpersonal interactions, such as task-focused behavior in work groups.

However, digital transformation-driven changes to the business environment present (c) altered boundary conditions and new opportunities for (a) predicting personality and (b) mapping its vocational impacts. For example, whereas recruiters have traditionally inferred applicants' personality from resumés (e.g., Brown & Campion, 1994; Burns et al., 2014), these may eventually be replaced (Zide et al., 2014) by digital profiles on online networks such as LinkedIn ("cybervetting"; e.g., Cubrich et al., 2021; Hartwell & Campion, 2020). Such changes may also affect the nature of perceivers, with human recruiters being complemented by mechanical perceivers (machine learning algorithms). In Chapter 2 "Predicting Personality Based on Traditional and Novel Applicant Information", we investigate (i) resumés' and (ii) LinkedIn profiles' potential to accurately infer personality. Also, there is a shift from stationary face-to-face groups to virtual groups and hybrids of both (e.g., Hertel et al., 2005; Rudolph et al., 2021). In Chapter 3 "Mapping Personality Traits' Leadership Impacts in Face-to-Face and Virtual Groups", we examine the behavioral-perceptual processes that explain (i) narcissists' leadership emergence in face-to-face groups and (ii) links of big five traits with distinct leadership outcomes in virtual groups.

Figure 1

Behavioral Processes as Common Ground for Predicting Personality and Mapping its Impacts in Rapidly Evolving Business Environments



Note. Chapter 4 does not present lens model studies in the proper sense due to the lack of multi-source data (objectively coded behaviors, *inter*personal judgments). Thus, the depicted lens only covers Chapter 2 and 3. However, future research may conduct full-featured lens model studies by building on effective vocational behaviors in remote contexts as mediating processes between personality and interpersonal judgments.

In Chapter 4 “Zooming-in on Effective Vocational Behaviors in Rapidly Changing Business Environments”, we shift our spotlight from personality effects framed in the lens model to more general effective vocational behaviors (telework strategies, remote leadership behaviors) instrumental for key outcomes in novel business environments (remote job performance and leadership effectiveness). Specifically, the COVID-19 pandemic has accelerated changes in the work mode, moving away from on-site work to remote work, in a business environment characterized by uncertainty (Kniffin et al., 2021; Kramer & Kramer, 2020; Rudolph et al., 2021). This “zoomed-in” perspective allows us to draw a nuanced picture of effective vocational behaviors considering additional moderating influences (individual teleworker characteristics, perceptions of the organizational environment as uncertain). The identified effective vocational behaviors may serve as a foundation to better understand the mediating mechanisms between personality traits and vocational outcomes in these under-explored circumstances in the future (see Avolio et al., 2014; O’Neill et al., 2009).

1.2 Detailed Outline

Table 1 presents the assignment of research articles included in this dissertation to their respective chapters, along with basic information on the publication status, authors’ contributions, aim, method, analysis, and results. The main text outlines how our research extends the current state of knowledge and highlights central contributions.

Table 1

Overview of Research Articles Included in This Dissertation

Publication Status	Authors' Contributions	Aim	Method	Analysis	Results
Chapter 2: Predicting Personality Based on Traditional and Novel Applicant Information					
Chapter 2.1: Relationships Between Resumé Cues and Applicants' Personality					
Härtel, T. M., Breil, S. M., Grunenberg, E., & Back, M. D. (2023). Relationships between resumé cues and applicants' personality. Submitted to *Journal of Business and Psychology*. [The data, codebook, R-script, and supplementary results are made transparent on the open science framework: https://bit.ly/3al6vv1.]	TH conceived the idea for this article, reviewed by SB and MB. SB organized the resumé collection and personality assessment. TH derived the resumé cues and organized their coding. TH prepared the data and ran the statistical analyses. EG checked the computation of machine learning models. TH wrote the manuscript. All authors provided feedback to shape the final manuscript. TH prepared the supplemental material.	We illuminate resumés' predictive potential to accurately infer personality by identifying valid resumé cues signaling personality.	We collected self-reported personality traits (big five, narcissism) and resumés of 141 business students. Eleven trained coders coded 160 resumé cues, from which we selected 70 cues for the main analysis based on their theoretical underpinnings to signal personality.	We identified valid resumé cues based on bivariate correlations to ensure the comparability with previous research. We computed hierarchical multiple linear regressions to identify the explained personality variance by resumés. As a robustness check, we computed nested cross-validated elastic nets.	We found valid resumé cues for each personality trait, and resumé cues explained substantial personality variance. However, only 16 of the 70 resumé cues appeared to be valid, and resumé cues' explanation of personality variance beyond demographics was not significant for agreeableness and neuroticism, suggesting a mediocre upper limit to the potential of accurately inferring personality from resumés.
Chapter 2.2: Using Valid Cues to Predict Narcissism and Intelligence From LinkedIn Profiles					
Härtel, T. M., Schuler, B. A., & Back, M. D. (2023). Using valid cues to predict narcissism and intelligence from LinkedIn profiles. Submitted to *The 83rd Annual Meeting of the Academy of Management*. [The data, codebook, R-script, and supplementary results are made transparent on the open science framework: https://bit.ly/3pTHr2M.]	TH and BS conceived the idea for this article, reviewed by MB. TH organized the collection of LinkedIn profiles and personality assessment. TH derived the LinkedIn cues and organized their coding. TH prepared the data and ran the statistical analyses. BS computed the machine learning models. TH wrote the manuscript except from the description of the machine learning models in the Method and Results, which was written by BS. TH prepared the supplemental material.	We illuminate LinkedIn profiles' predictive potential to accurately infer personality by identifying valid LinkedIn cues signaling personality that are used by mechanical perceivers to make personality inferences.	We collected personality traits (self-reported narcissism, aptitude tests of intelligence) and LinkedIn profiles in a mixed sample of 406 students/professionals. Three trained coders coded 64 deductively derived LinkedIn cues based on their theoretical underpinnings to signal narcissism and intelligence.	We identified valid LinkedIn cues based on bivariate correlations and their feature importance in nested cross-validated elastic nets. We identified mechanical perceivers' accuracy based on the correlations between the predicted personality values from the nested cross-validated elastic nets and the observed personality values.	We found ten/eleven valid LinkedIn cues signaling narcissism/ intelligence that showed significant bivariate correlations and appeared to be robust in the nested cross-validated elastic nets. The mechanical perceiver achieved substantial accuracy (r = .28/.32 for narcissism/intelligence), suggesting that personality traits can be accurately inferred from LinkedIn profiles if the contained valid cues are used consistently.
Chapter 3: Mapping Personality Traits' Leadership Impacts in Face-to-Face and Virtual Groups					
Chapter 3.1: Pathways From Narcissism to Leadership Emergence in Social Groups					
Härtel, T. M., Leckelt, M., Grosz, M. P., Küfner, A. C. P., Nestler, S., Geukes, K., & Back, M. D. (2019, September 16-18). *Narcissists' pathways to leadership in naturally emerging social groups* [Conference presentation]. The 15th Biennial Conference of the German Psychological Society - Personality	TH and MB conceived the idea for this article. AK, KG, and MB organized the data collection and preparation of the personality interaction laboratoy study (PILS; Geukes et al., 2019). TH prepared the data required for this article. TH ran the statistical analyses, supervised by ML and SN. TH	We illuminate the behavioral-perceptual processes that explain the narcissism-leadership emergence link in social groups.	We applied data from a multi-methodological laboratory group interaction study (PILS) comprising four types of variables assessed in a predominantly student sample of 311 participants: Personality traits (narcissistic admiration and rivalry, intelligence, physical attractiveness), video-recorded	We computed multiple mediator models with group-mean-centered data to control for the nesting of participants in groups. We applied a non-parametric bootstrapping approach to test for significant	The results suggest that narcissists' emergence as group leaders is due to agentic narcissism components. More specifically, we found narcissistic admiration to be expressed in dominant-expressive behaviors, evoking interpersonal impressions of assertiveness, which were positively evaluated by

Publication Status	Authors' Contributions	Aim	Method	Analysis	Results
Psychology and Psychological Diagnostics (DPPD) Section, Dresden, Germany. **Härtel, T. M.**, Leckelt, M., Grosz, M. P., Küfner, A. C. P., Geukes, K., & Back, M. D. (2021). Pathways from narcissism to leadership emergence in social groups. *European Journal of Personality*, *35*(5), 1-23. https://doi.org/10.1177/0890207021-1046266. [The data, codebook, R-script, Mplus-scripts and supplementary results are made transparent on the open science framework: https://osf.io/4hpuf/.]	wrote the manuscript. All authors provided feedback to shape the final manuscript. TH prepared the supplemental material, except from the PILS-Codebook, which was prepared by AK, KG, and MB.		behaviors coded by six trained coders (dominant-expressive, arrogant-aggressive, verbal fluency), interpersonal impressions (assertive, untrustworthy, intelligent, attractive), and interpersonal evaluations (leadership emergence, popularity).	(differences in) indirect effects. As a robustness check, we computed multilevel structural equation models.	interaction partners in terms of leadership emergence. These effects were distinct from effects of narcissism on popularity and remained robust when the intelligence and physical attractiveness pathways were also considered.
Chapter 3.2: Differential Impacts of Behavioral Pathways Linking Personality to Leadership Outcomes					
Härtel, T. M., Hoch, F., & Back, M. D. (2023). Differential impacts of behavioral pathways linking personality to leadership outcomes. Accepted at *The 23rd Annual Meeting of the European Academy of Management* and submitted to *The 83rd Annual Meeting of the Academy of Management*.	TH and FH devised the idea for the online group interaction study (OGIS), reviewed by MB. TH conceived the idea for this article, supported by FH. TH and FH organized the data collection and the data preparation of OGIS. TH ran the statistical analyses. TH took the lead in writing the manuscript, supported by FH.	We illuminate the behavioral-perceptual processes that explain links between big five personality traits and distinct leadership outcomes in social groups.	We collected multi-methodological data in an online group interacting study comprising four types of variables assessed in a predominantly student sample of 364 participants: Self-reported personality traits (extraversion, agreeableness, emotional stability), video-recorded behaviors coded by six trained coders (task-focus, member-focus, resilient), interpersonal impressions (assertive, trustworthy, calm), and interpersonal evaluations (leadership emergence, leadership effectiveness).	We computed multiple mediator models with group-mean-centered data to control for the nesting of participants in groups. We applied a non-parametric bootstrapping approach to test for significant (differences in) indirect effects.	We found big five personality traits to differently relate to distinct leadership outcomes via the examined behavioral-perceptual pathways: Extraversion was more important to leadership emergence due to impressions of assertiveness evoked by task-focused behavior being stronger valued. Agreeableness/emotional stability were more important to leadership effectiveness due to impressions of trustworthiness/calmness evoked by member-focused/resilient behavior being stronger valued.
Chapter 4: Zooming-in on Effective Vocational Behaviors in Rapidly Changing Business Environments					
Chapter 4.1: Associations Between the Implementation of Telework Strategies and Job Performance: Moderating Influences of Boundary Management Preferences and Telework Experience					
Härtel, T. M., Hüttemann, D., & Müller, J. (2023). Associations between the implementation of telework strategies and job performance: Moderating influences of boundary management preferences and telework experience. *Frontiers in Psychology*, *14*, 1099138. https://doi.org/1-0.3389/fpsyg.2023.1099138. [The data, codebook, R-script, and supplementary results are made transparent on the open science framework: https://osf.io/gqpdf/.]	JM devised the initial idea for the home office project (HOC). TH conceived the idea for this article, supported by DH and JM. TH and DH organized the data collection, supervised by JM. TH and DH prepared the data and ran the statistical analyses. TH took the lead in writing the manuscript, supported by DH. TH and DH prepared the supplemental material.	We illuminate the effectiveness of the individual ways in which teleworkers organize their work processes by exploring telework strategies' associations with job performance and moderating influences of boundary management preferences and telework experience.	We assessed the self-reported implementation of 85 telework strategies derived from previous research and popular media, job performance, boundary management preferences, and telework experience in a sample of 548 teleworkers.	We computed multiple linear regression analyses to identify telework strategies' associations with job performance and moderating effects of boundary management preferences and telework experience.	We found the most implemented telework strategies to be the ones most positively associated with job performance. These serve less the purpose of drawing boundaries between work- and private-life, but rather purposes of working task-oriented and productively as well as keeping social contact. We also found telework strategies' effectiveness to depend on teleworkers' boundary management preferences and telework experience.

Publication Status	Authors' Contributions	Aim	Method	Analysis	Results
Chapter 4.2: Examining the Extended Full-Range Leadership Model and Leadership Effectiveness in Remote Work Contexts: The Moderating Role of VUCA Environments					
Hüttemann, D., **Härtel, T. M.**, & Müller, J. (2023). Examining the extended full-range leadership model and leadership effectiveness in remote work contexts: The moderating role of VUCA environments. Submitted to *European Management Review*. [The data, codebook, R-script, and supplementary results are made transparent on the open science framework: https://bit.ly/3EzKmou.]	DH conceived the idea for this article, supported by TH and JM. DH organized the data collection and data preparation. DH ran the statistical analyses, supported by TH. DH took the lead in writing the manuscript, supported by TH. DH prepared the supplemental material, supported by TH.	We illuminate the effectiveness of leadership behaviors from the extended full-range leadership model (eFLRM) in remote work contexts and moderating influences of volatile, uncertain, complex, and ambiguous (VUCA) organizational environments.	We assessed self-reported follower perceptions of their leaders' manifestation of eFRLM behaviors and leadership effectiveness as well as follower evaluations of their organizational environment as VUCA-like in a sample of 529 remote workers.	We computed hierarchical linear regression analyses to examine associations of eFLRM behaviors with leadership effectiveness in remote contexts and moderating effects of VUCA environments.	Instrumental leadership was perceived as highly effective in remote work contexts, explaining unique variance beyond transformational-transactional leadership. The effectiveness of remote leadership behaviors appears to depend on follower perceptions of the organizational environment as VUCA-like, with instrumental leadership behaviors gaining effectiveness in VUCA environments, while transformational-transactional leadership losing effectiveness.

1.2.1 Predicting Personality Based on Traditional and Novel Applicant Information (Chapter 2)

Personality self-reports are established personnel selection tools predicting occupational outcomes (e.g., Barrick & Mount, 1991). However, they are suspect to suffer from invasiveness, faking, and limited introspection (Morgeson et al., 2007). Also, recruiters often take alternative routes to assess applicants' personality. For example, recruiters draw from resumés to make personality inferences (e.g., Brown & Campion, 1994; Burns et al., 2014), and also from their digital incarnation providing additional cues, LinkedIn profiles (e.g., Roulin & Levashina, 2019; Van de Ven et al., 2017). Yet, little is known about whether these information bases allow accurate personality inferences and what specific information can be used to do so. Our research builds on the lens model (Brunswik, 1956) and underlines its status as a framework to understand the processes involved in making personality inferences based on applicant information in recruitment contexts. Specifically, we add valid resumé/LinkedIn cues to the information bases recruiters may draw on to infer personality (e.g., job interviews, applicant photographs, online social network profiles; e.g., DeGroot & Gooty, 2009; Fernandez et al., 2017; Stopfer et al., 2014). The lens model appeared useful for unraveling why human recruiters lack accuracy when making resumé (Burns et al., 2014; Cole et al., 2009)/LinkedIn based (Roulin & Levashina, 2019; Roulin & Stronach, 2022; Van de Ven et al., 2017) personality inferences: There are valid cues signaling personality contained in resumés/LinkedIn profiles, suggesting that recruiters' lack of accuracy is (at least to some extent) due to a lack of consistently using this valid information. Even more so, the lens model may be extended to mechanical perceivers, recently attracting attention in accurately predicting personality from online social network profiles like Facebook (e.g., Azucar et al., 2018; Settanni et al., 2018). We show that machine learning algorithms achieve remarkable accuracy when predicting personality based on resumés and particularly based on LinkedIn profiles by consistently using the contained valid information. This automated approach emerged as a suitable vehicle to unravel predictive potentials.

1.2.1.1 Relationships Between Resumé Cues and Applicants' Personality (Chapter 2.1). The aim of this research article is to identify resumés' predictive potential for accurate personality inferences. We focus on the lens model's necessary prerequisite for accurate personality inferences (left side), the identification of valid resumé cues signaling personality (see Figure 1). We expand previous explorative research by examining an extensive set of resumé cues (70 compared to 20/26 cues in Cole et al., 2003/Burns et al., 2014) in a larger resumé sample (141 compared to 122/37 resumés in Cole et al., 2003/Burns et al., 2014). We

establish robust findings on valid resumé cues by (a) deductively deriving the cues based on personality theory and empirical findings, and (b) applying nested cross-validated elastic nets (Stachl et al., 2020; Zou & Hastie, 2005) as supplemental analysis, addressing previous research' power and replicability limitations (Burns et al., 2014; Cole et al., 2003). Further, we broaden the focus from big five traits to narcissism, complementing the big five when predicting vocational outcomes (Grijalva & Newman, 2015; Judge et al., 2006). We found resumé cues to explain substantial personality variance, but only 16 of 70 resumé cues actually signaled personality traits. We contribute to the literature by unraveling that resumés seem to hold mediocre predictive potential with a clear upper limit to accurately infer personality. This suggests that human perceivers' lack of accuracy (Burns et al., 2014; Cole et al., 2009) might be to some extent due to resumés' inherent limited capacity to signal personality, but also due to recruiters using the contained valid information inconsistently. Our supplemental analyses based on mechanical perceivers consistently using valid cues point in the direction that machine learning algorithms are a promising approach to derive personality traits from resumés, at least for prescreening purposes.

1.2.1.2 Using Valid Cues to Predict Narcissism and Intelligence From LinkedIn Profiles (Chapter 2.2). The aim of this research article is to identify LinkedIn profiles' predictive potential for accurate personality inferences, focusing on narcissism and intelligence, two key traits in online network (e.g., Gnambs & Appel, 2018; Hartwell & Campion, 2020) and organizational contexts (e.g., Campbell et al., 2011; Salgado et al., 2003). We again shed light on the lens model's necessary prerequisite for accurate personality inferences (left side), the identification of valid LinkedIn cues signaling personality. We augment this one-sided perspective by examining the accuracy of mechanical perceivers consistently using valid LinkedIn cues, representing the lens model's sufficient prerequisite for accurate personality inferences (right side, see Figure 1). We follow calls to illuminate LinkedIn based applicant assessments (Roth et al., 2016; Van Iddekinge et al., 2016) and add to previous research by examining an extensive set of LinkedIn cues (64 cues compared to $9 \leq N_{\text{Cues}} \leq 33$ in Fernandez et al., 2021; Roulin & Levashina, 2019; Roulin & Stronach, 2022; Van de Ven et al., 2017) in a larger LinkedIn profile sample than most previous studies (406 profiles compared to $97 \leq N_{\text{Profiles}} \leq 154$ in Roulin & Levashina, 2019; Roulin & Stronach, 2022; Van de Ven et al., 2017; cf. Fernandez et al., 2021). We address calls to add robustness to exploratory findings on valid LinkedIn cues (Roulin & Levashina, 2019; Roulin & Stronach, 2022; Van de Ven et al., 2017) by (a) deductively deriving the cue set based on personality theory and empirical findings (see Fernandez et al., 2021), and (b) applying nested cross-validated elastic nets. Further, we

extend an initial attempt to transfer the automated approach on online social network based personality assessments (e.g., Bleidorn & Hopwood, 2019; Tay et al., 2020) to more restricted online professional networks like LinkedIn. Specifically, we go beyond training machine learning algorithms based on textual cues (Roulin & Stronach, 2022) by using an extensive cue set reflecting LinkedIn's broad information spectrum. Deductively deriving cues ensured the conceptual connection to the inferred personality traits, addressing lacks of content validity. Overall, we unravel LinkedIn's predictive potential: LinkedIn profiles contain a rich set of valid cues that appeared as robust predictors in nested cross-validated elastic nets. Accordingly, mechanical perceivers achieved substantial prediction accuracy for narcissism (r = .28) and intelligence (r = .32). This suggests that recruiters' lack of accuracy (Roulin & Levashina, 2019; Roulin & Stronach, 2022; Van de Ven et al., 2017) is due to their lack of consistency in using valid LinkedIn cues. We thereby introduce a novel methodological approach for lens model studies, that is, identifying robust valid cues based on feature importance in nested cross-validated machine learning models consistently using valid cues to predict personality.[1] This automated approach provides solid metrics to quantify predictive potentials.

1.2.2 Mapping Personality Traits' Leadership Impacts in Face-to-Face and Virtual Groups (Chapter 3)

Leaders play a crucial role in managing work group performance and satisfaction. As such, identifying who becomes an (effective) group leader is a long-standing question in the trait perspective of leadership. The establishment of personality taxonomies has advanced the detection of robust personality-leadership links, some of which diverging between conceptually distinct leadership outcomes. For example, whereas extraversion is considered the most important big five predictor of leadership emergence, it seems to be comparatively less important for leadership effectiveness. Conversely, agreeableness may not be decisive for rising as a leader, but for leading effectively (Judge, Bono, et al., 2002). Yet, the underlying reasons why these effects hold are poorly understood, leading to calls for process-oriented approaches to unravel the mediating mechanisms behind personality-leadership links (e.g., Antonakis et al., 2012; Zaccaro et al., 2018). We develop a behavioral-perceptual pathway approach to explain (a) how narcissists emerge as leaders in stationary face-to-face groups, and (b) how big five traits relate to leadership outcomes in virtual groups. We base this approach on the rationale of the lens model adapted in modern process models of personality (e.g., Back et al., 2011;

[1] Applying *nested* cross-validated machine learning algorithms in itself represents a methodological advancement that is often overlooked in research on automated personality assessments leading to optimistically biased accuracy estimates (Stachl et al., 2020).

Grosz et al., 2020; Nestler & Back, 2013): Personality effects are mediated by expressed behaviors and evoked impressions, which are in turn evaluated by interaction partners in terms of leadership outcomes. Whereas we build on the narcissistic admiration and rivalry concept (NARC; Back et al., 2013) and the dual-pathway approach (Küfner et al., 2013) to explain narcissists' leadership emergence, we marry process models of personality with leadership process models (e.g., Antonakis et al., 2012; Zaccaro et al., 2018) and behavioral personality science (e.g., Leising & Bleidorn, 2011) to explain big five-leadership links. In doing so, we demonstrate the benefits of collecting multi-source and multi-methodological data in a behavioral-perceptual pathway framework.

1.2.2.1 Pathways From Narcissism to Leadership Emergence in Social Groups (Chapter 3.1).

The aim of this research article is to explain the narcissism-leadership emergence link in social groups based on a well-powered sample of 311 predominantly student participants.[2] We address calls to (a) examine how narcissists emerge as leaders (Brunell et al., 2008) by zooming-in on the underlying behavioral-perceptual mechanisms, and (b) investigate this link by differentiating between distinct effects of narcissism's agentic and antagonistic subdimensions (Braun, 2017; Grijalva et al., 2015; Zeigler-Hill et al., 2018). We establish robust findings by analyzing whether narcissism effects on leadership emergence are distinct from effects on popularity and remain meaningful when considering intelligence and physical attractiveness as additional prototypical leader attributes. We contribute to the literature demonstrating that building on the NARC (Back et al., 2013) and the dual-pathway approach (Küfner et al., 2013) represents a powerful process-oriented framework to illuminate the "how" of narcissists' group leadership emergence by disentangling effects of agentic and antagonistic behavioral-perceptual pathways: Whereas narcissists' agentic aspects fostered leadership emergence via dominant-expressive behaviors yielding impressions of being seen as assertive, narcissists' antagonistic side reduced their popularity via arrogant-aggressive behaviors yielding impressions of being seen as untrustworthy. These effects held when considering intelligence and physical attractiveness pathways. The findings go well with conceptualizations

[2] This research article was originally based on the idea of the first author's master's thesis, which underwent rigorous changes before publication. First, feedback was incorporated based on a presentation at *The 15th Biennial Conference of the German Psychological Society - Personality Psychology and Psychological Diagnostics (DPPD) Section*. The manuscript's structure was fundamentally altered. A new literature search was conducted. The statistical models were adapted and updated. A project was created on the open science framework to provide supplementary materials. Due to a rejection by the *Journal of Personality and Social Psychology*, the manuscript underwent rigorous revisions, before being submitted to the *European Journal of Personality*, where it was accepted after yet another revision. Overall, the manuscript underwent multiple revisions to improve its scientific rigor and clarity.

of narcissism as a multidimensional construct with its subdimensions arousing distinct interpersonal consequences (e.g., Back, 2018; Brown et al., 2009; Krizan & Herlache, 2018) and point to the potential of employing multi-methodological process-oriented behavioral-perceptual pathway approaches to explain a wide range of personality impacts on group leadership outcomes.

1.2.2.2 Differential Impacts of Behavioral Pathways Linking Personality to Leadership Outcomes (Chapter 3.2).

This research article sheds light on the behavioral-perceptual processes unraveling the causal mediating mechanisms linking big five traits to group leadership outcomes. We show that opening this "black box" explains differential main effects of big five traits on leadership emergence versus effectiveness. This way, we address broader calls (e.g., Antonakis et al., 2012; DeRue et al., 2011; Judge, Bono, et al., 2002; Zaccaro et al., 2018) to take a process-driven approach on the "how" of personality-leadership links and specific calls (Banks et al., 2021; Blake et al., 2022; Hu et al., 2019; Judge et al., 2009) to put the spotlight on personality-evoked truly behavioral constructs (third-party coded video-recorded behaviors). We do so collecting multi-source and multi-methodological online group data in an unprecedented sample size of 364 predominantly student participants. We found big five traits to differently relate to distinct leadership outcomes via the behavioral-perceptual pathways: Extraversion was more important to leadership emergence due to impressions of assertiveness evoked by task-focused behavior being stronger valued. Agreeableness/emotional stability were more important to leadership effectiveness due to impressions of trustworthiness/calmness evoked by member-focused/resilient behavior being stronger valued. We contribute to the literature on leadership process models (e.g., Antonakis et al., 2012; Zaccaro et al., 2018) by demonstrating that integrating these with process models of personality (e.g., Back et al., 2011; Grosz et al., 2020; Nestler & Back, 2013) and behavioral personality science (e.g., Leising & Bleidorn, 2011) offers a powerful framework to decrypt puzzling personality-leadership links.

1.2.3 Zooming-in on Effective Vocational Behaviors in Rapidly Changing Business Environments (Chapter 4)

The COVID-19 pandemic brought significant changes to the business world, including the enduring shift from on-site work to remote work (e.g., Athanasiadou & Theriou, 2021; Kniffin et al., 2021) and the amplification of organizational environment characteristics of volatility, uncertainty, complexity, and ambiguity (VUCA; Bennett & Lemoine, 2014; see also Jacquart et al., 2020; Mumford et al., 2000). These sudden changes posed challenges to maintaining workforce productivity and made research on best-practice vocational behaviors

related to (a) the individual ways in which teleworkers organize effective work processes and (b) effective remote leadership an urgent necessity (see Rudolph et al., 2021, calling for research on both aspects). Meanwhile, the pandemic served as a door opener to collect large teleworker samples (our combined sample comprises more than 1000 teleworkers). Also, the pandemic created opportunities to investigate moderating influences on effective remote working behaviors by mitigating self-selection effects and range restrictions concerning individual teleworker characteristics (e.g., teleworkers preferring to separate work- and private-life; Shockley & Allen, 2010; unexperienced teleworkers; Kramer & Kramer, 2020), and by functioning as a salient VUCA context (see Stoker et al., 2022). Our research represents an initial approach to identifying remote workers' effective vocational behaviors as well as illustrating that these depend on individual and environmental factors. The findings highlight the benefits of building on established theories (e.g., boundary theory; Ashforth et al., 2000; Nippert-Eng, 1996; person-environment fit theory, P-E fit; Kristof, 1996; Edwards, 2008; full-range leadership model, FLRM; Bass, 1985) when illuminating effective vocational behaviors in remote settings, but also stress the need to refine these theories (e.g., adding telework strategies related to adopting a conducive work attitude/keeping social contact; Greer & Payne, 2014; Kowalski & Swanson, 2005; boundary congruence/fit theory; Ammons, 2013; Kreiner, 2006; extended full-range leadership model, eFLRM; Antonakis & House, 2014).

1.2.3.1 Associations Between the Implementation of Telework Strategies and Job Performance: Moderating Influences of Boundary Management Preferences and Telework Experience (Chapter 4.1). The aim of this research article is to illuminate the individual ways in which teleworkers organize work processes, a nascent research area not yet well-anchored in the scientific literature. We answer calls (Allen et al., 2021; Rudolph et al., 2021; see also Binnewies et al., 2020) to examine the effectiveness (i.e. associations with job performance) of telework strategies and to explore moderating factors, that is, individual boundary management preferences and telework experience. We collected survey data of 548 teleworkers and add to the literature by (a) taking a quantitative approach on (b) a broad set of 85 telework strategies from different theoretical streams pursuing different goals. We (c) conduct our analyses on an aggregated level focusing on telework strategy categories as well as on an individual strategy level to draw nuanced inferences. While the scientific literature lags behind in providing evidence on telework strategies' effectiveness, there is a wide range of recommendations in the popular media. We (d) aim to close this gap by complementing telework strategies from the popular media. We found that teleworkers tend to implement and may profit from telework strategies that help them work task-oriented and productively (e.g.,

Greer & Payne, 2014) by adopting a conducive work-attitude as well as maintain social contact (e.g., Kowalski & Swanson, 2005) by using modern communication technology. The findings underline the merits of broadening a narrow scope on boundary related telework strategies (e.g., Basile & Beauregard, 2016; Fonner & Stache, 2012). Also, we found telework strategies' effectiveness to depend on teleworkers' individual boundary management preferences and telework experience, illustrating the benefits of marrying the literature streams of P-E fit (Edwards, 2008; Kristof, 1996), in particular, boundary congruence/fit (Ammons, 2013; Kreiner, 2006), and telework strategies.

1.2.3.2 Examining the Extended Full-Range Leadership Model and Leadership Effectiveness in Remote Work Contexts: The Moderating Role of VUCA Environments (Chapter 4.2). The aim of this research article is to shed light on the effectiveness of established (transformational-transactional leadership, FLRM; Bass, 1985) and aspiring (instrumental leadership, eFLRM; Antonakis & House, 2014) leadership behaviors in rarely addressed remote work contexts, as well as on the moderating role of VUCA-like organizational environments. Thereby, we answer (a) broad calls to examine how contextual factors influence leadership behaviors' effectiveness (e.g., Liden & Antonakis, 2009; Oc, 2018; Porter & McLaughlin, 2006), and (b) specific calls to examine how the COVID-19 pandemic (necessity of remote leadership, uncertain business environment) has affected effective leadership (e.g., Rudolph et al., 2021). Even more so, we lack understanding of instrumental leadership's effectiveness, a conglomerate of leadership behaviors potentially striving under challenging conditions (Antonakis & House, 2014). We collected survey data of 529 remote followers and add to the literature by (a) capturing the follower perspective, and (b) examining eFRLM leadership behaviors' effectiveness at dimensional and factor levels. This allows us to draw high-level conclusions while also delving deeper into the nuanced behaviors driving effectiveness. We show that instrumental leadership is perceived as highly effective in remote work contexts, explaining unique variance beyond transformational-transactional leadership. This underlines the theoretical and methodological (omitted variable bias) need for an extension of the FLRM (Antonakis & House, 2014; Rowold, 2014). Also, we found remote leadership behaviors' effectiveness depending on follower perceptions of the organizational environment as VUCA-like, with instrumental leadership behaviors becoming more effective in VUCA environments and transformational-transactional leadership decreasing in effectiveness. Thus, augmenting FRLM leadership behaviors with instrumental leadership seems to be a fertile ground to illuminate effective leadership in rapidly changing business environments.

1.3 Concluding Remarks and Outlook

This dissertation presents research progress on predicting personality and mapping its impacts in dynamic business environments. The common core marks a set of (personality-evoked) behavioral processes, which are subject to change in rapidly evolving business environments. We draw on established theories, apply them to current issues in nascent research areas, and combine them in novel ways. This way, we contribute to theory refinement. Specifically, we underline the lens model's (Brunswik, 1956) status as a framework for understanding processes involved in accurately predicting applicant personality. By extending the lens model to mechanical perceivers along with the methodological advancements of nested cross-validated machine learning algorithms, we can complement future lens model studies (see also Bleidorn & Hopwood, 2019; Tay et al., 2020). Further, the lens model adapted to modern process models of personality (e.g., Back et al., 2011; Grosz et al., 2020; Nestler & Back, 2013; see also Back et al., 2013; Küfner et al., 2013) served as a fruitful framework to track personality traits' vocational impacts, particularly when combined with leadership process models (e.g., Antonakis et al., 2012; Zaccaro et al., 2018) and behavioral personality science (e.g., Leising & Bleidorn, 2011). We also build on recent theoretical extensions (e.g., boundary congruence/fit theory; Ammons, 2013; Kreiner, 2006; eFLRM; Antonakis & House, 2014) of established theories (e.g., P-E fit theory; Kristof, 1996; Edwards, 2008; FLRM; Bass, 1985) and demonstrate how these help illuminate effective vocational behaviors in remote settings.

Our research shares strengths and weaknesses, and combining insights can pave the way for future research. First, the methodological foundation for advancing research on personality prediction from applicant information was increasing the numbers of resumés/LinkedIn profiles and deductively derived cues. This unprecedented data base, combined with the theoretical framing of the lens model and analytical advancements of nested cross-validated machine learning algorithms, enabled us to uncover resumés'/LinkedIn profiles' predictive potential: There may lurk a somewhat higher predictive potential in LinkedIn profiles due to additional valid cues unavailable on resumés. Future research could collect a participant sample providing both their resumés and LinkedIn profiles. This may contribute to a context-dependent understanding of the comparative predictive potentials, enabling to track how the validity of cues may differ across traditional non-public, non-digital applicant information like resumés and novel public, digital information like LinkedIn profiles. In a similar vein, future research may present resumés and LinkedIn profiles to both human and mechanical perceivers and compare their accuracy while tracing differences to deviations in valid cue use. Yet, coding cues constitutes a resource-intensive process (our research involved 14 human coders). Future

research may overcome this bottleneck by employing automated cue scraping techniques (e.g., Landers et al., 2016), but legal constraints may arise (e.g., Goldfein & Keyte, 2017).

Second, concerning mapping personality traits' vocational impacts, we achieved methodological advancements by collecting multi-source and multi-methodological data (self-reported personality traits, third-party coded video-recorded behaviors, interpersonal impressions and evaluations by group members) in unprecedented sample sizes (see Cheng et al., 2013, Küfner et al., 2013, Witkower et al., 2020, for comparable designs). We analyzed this data in sophisticated statistical models, that is, multiple mediator models (Preacher & Hayes, 2008) and multilevel structural equation models (Preacher et al., 2010), determining indirect effects based on non-parametric bootstrapping. Focusing on behavioral constructs (Banks et al., 2021) is rare due to the costs of objectively coding behaviors, thus putting our work in a favorable position to advance research on personality-leadership links (e.g., Blake et al., 2022; Hu et al., 2019; Judge et al., 2004, 2009). The enhanced process understanding offers targeted starting points to investigate moderating factors that can intervene at any stage of the mediation chain (e.g., Grosz et al., 2020; Tett & Burnett, 2003). One such moderating factor could be processes taking place in face-to-face groups as in our research on narcissists' leadership emergence versus in virtual groups as in our research on big five-leadership links. This online versus offline context might have impacted our results. For example, personality-evoked impressions of trustworthiness may be more valued in virtual groups (e.g., Breuer et al., 2016).[3] Future research may introduce the online work mode as a moderating factor to track how specific pathways may change. Overall, however, our results suggest that established personality-leadership links and underlying behavioral-perceptual mechanisms can be detected not only in face-to-face but also in virtual groups, serving as preliminary evidence in cautious favor of the generalizability of personality-leadership processes to online contexts.

Finally, our research on effective telework strategies and remote leadership behaviors is more exploratory, accompanied by streamlined methodological and analytical approaches (e.g., focusing on single-source information). To add robustness and causal elements, future research could collect multi-source data at multiple time points, and test the identified behaviors' effectiveness in pre-post control group training studies (e.g., Binnewies et al., 2020; Rexroth et

[3] Indeed, whereas we found a significant indirect effect of the communal pathway (agreeableness, member-focused behavior, being seen as trustworthy) on leadership emergence in the online context, we did not find such an effect of the communal pathway (narcissistic rivalry, arrogant-aggressive behavior, being seen as untrustworthy) in the offline context. However, caution should be exercised in attributing these differences to the online/offline context, as there were further factors that differed between the studies, such as differences in instructions, differently composed pathways, and controlling for other factors in the statistical models.

al., 2016). Research may then build on the identified effective behaviors by developing comprehensive personality-behavior-outcome chains in up-and-rising remote settings.

Our research offers practical implications for corporate human resources best practices following the spirit of evidence-based management (Rousseau, 2006; Rynes et al., 2007), which we hope may contribute to bridging the scientist-practitioner gap (e.g., Anderson et al., 2001; Deadrick & Gibson, 2007; Rynes et al., 2002).[4] To maximize societal and organizational impact, we favor open access publishing (see Härtel et al., 2021, 2023). We also created open science framework (Foster & Deardorff, 2017) projects providing the public with the raw data sets, analysis scripts, codebooks (including an overview of the study design, instructions, and collected variables), and supplemental results supporting our conclusions.[5] By taking these measures, we aim to increase transparency and confidence in our findings hopefully helping to put our research into action.

First, organizations may rather rely on self-report personality tests for selection purposes than inferring personality from resumés/LinkedIn profiles due to the early stage of research and resumés' mediocre predictive potential. However, our findings foreshadow merits of automated resumé and particularly LinkedIn based personality inferences as a non-invasive prescreening tool when facing large applicant numbers. Yet, as recruiters still routinely make resumé/LinkedIn based personality inferences, our findings may also inspire evidence-based training putting such inferences on an empirical foundation (e.g., Cole et al., 2005; Karelaia & Hogarth, 2008).

Second, organizations may align their leader selection, promotion, and development procedures towards the proximal, directly observable behaviors and impressions fostering leading effectively rather than taking the lead. Specifically, our findings suggest placing a stronger emphasis on personality-evoked behaviors and impressions related to interpersonal warmth and calmness, and less on agentic assertiveness. This may also serve as a measure for preventing narcissists from entering group leadership positions where they could potentially do harm (e.g., Grijalva & Newman, 2015; Judge et al., 2006; O'Boyle et al., 2012).

Finally, our research provides a preliminary understanding of effective vocational behaviors in novel business environments. Yet, restrictions centered around missing causality limit the potential for practical implications. Our findings cautiously point in the direction that

[4] We are glad our work on narcissists' leadership emergence has been featured in the popular media ("Gehirn und Geist"; Hartmann, 2022), as the inclusion of research in practitioner readings is a key measure to overcome the scientist-practitioner gap (Rynes et al., 2002).

[5] The project page for the in-progress research project "Differential Impacts of Behavioral Pathways Linking Personality to Leadership Outcomes" (Chapter 3.2) is still in construction and thus not linked in this dissertation.

remote workers have an intuitive understanding of effective telework strategies, but they could profit from adopting a conducive work attitude and refraining from telework strategies related to temporal flexibility. Remote leaders may benefit from implementing instrumental, that is, strategic and work-facilitating, leadership behaviors. However, we did not find a one-fits-all solution. Organizations may tailor training contents to individual characteristics and broader environmental factors as well as take measures to raise awareness of the context-dependent nature of effective vocational behaviors.

Bringing it all together, this dissertation underlines the benefits of a flexible (personality-evoked) behavior-centered perspective in addressing key questions related to predicting personality and mapping its impacts in rapidly evolving business environments. It is my sincere hope that this work will inspire research progress in these areas as well as inform corporate human resources practices.

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2. Predicting Personality Based on Traditional and Novel Applicant Information

2.1 Relationships Between Resumé Cues and Applicants' Personality

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Abstract. HR professionals frequently draw inferences on applicants' personality based on resumés. Building on the lens model, this study's goal is to shed light on resumés' potential for accurately inferring personality by providing empirical evidence on valid resumé cues signaling applicants' personality. We assessed self-reported big five personality traits and narcissism of 141 business students at career start who applied with resumés for a fictional business entry level position. Drawing on personality theory and previous empirical findings, 70 resumé cues (e.g., appealing look, number of internships/jobs, creative hobbies) were post hoc selected from a larger cue set comprising 160 resumé cues coded by 11 trained coders. Computing bivariate correlations and multiple linear regressions, we identified easy-to-interpret valid resumé cues explaining substantial variance of the big five traits and narcissism. Even though all considered personality traits were expressed in resumés, only a fraction of the deductively derived resumé cues (16 out of 70) actually signaled personality traits. This suggests that there is a definite and rather mediocre upper limit to the potential of accurately inferring personality based on resumés. We contribute to the literature on personality inferences at zero-acquaintance by adding valid resumé cues to information bases allowing to make (somewhat) accurate personality inferences in recruitment contexts (e.g., job interviews, LinkedIn profiles). The results have practical implications for identifying appropriate application purposes of resumé based personality inferences in recruitment contexts and for improving HR professionals' accuracy when inferring personality based on resumés.

Keywords. Resumé screening, personality expression, big five, narcissism, lens model.

Open Science Statement. The data, codebook, R-script, and supplementary results are made transparent on the open science framework: https://bit.ly/3al6vv1.

2.1.1 Introduction

Resumé screening is cost-effective and highly accepted by applicants (e.g., Marcus, 2003; Moscoso & Salgado, 2004; Steiner & Gilliland, 1996) making it the most applied personnel selection procedure (e.g., König et al., 2010; Schuler et al., 2007; Zibarras & Woods, 2010). HR professionals place great importance on applicants' personality when making hiring decisions (e.g., Dunn et al., 1995; Lievens et al., 2005; Ones & Viswesvaran, 1999; Tews et al., 2011) and frequently draw inferences on applicants' personality based on resumés (e.g., Brown & Campion, 1994; Burns et al., 2014; Cole et al., 2004, 2009). For instance, HR professionals tend to use a neat presentation of information as a cue for an applicant's conscientiousness and the presence of a leadership position as a cue for an applicant's extraversion (Burns et al., 2014).

Following the lens model (Brunswik, 1956), the necessary prerequisite for accurate resumé based personality inferences is the presence of valid cues, that is, information in resumés that is actually associated with applicants' personality. Building on that, this study's goal is to shed light on resumés' potential to accurately infer personality by enlarging our understanding of valid resumé cues signaling applicants' personality. Only two studies (Burns et al., 2014; Cole et al., 2003b)[6] have examined cue validities for the big five personality traits based on small explorative sets of resumé cues. Here, we complement these important initial findings by (a) examining cue validities for an extensive set of cues ($N_{Cues} = 70$) that were deductively selected based on personality theory and previous empirical findings, and by (b) including grandiose narcissism (Back et al., 2013) as an additional, impactful personality trait in work contexts (e.g., Campbell et al., 2011; Grijalva et al., 2015; Grijalva & Newman, 2015) complementing the big five traits.

For this purpose, we assessed the self-reported personality of 141 business students at career start who applied with resumés for a fictional position. Eleven trained coders coded the resumé cues. Based on (a) bivariate correlations between cues and personality, and (b) multiple linear regressions using cues to predict personality we identify (a) valid cues for each personality trait, and (b) the amount of personality variance explained by resumé cues.

The present study can contribute to our understanding of how personality is expressed in resumés and could add valid resumé cues to the literature on personality inferences in recruitment related zero-acquaintance contexts such as application photographs (e.g., Fernandez et al., 2017), online professional networks (LinkedIn; e.g., Van de Ven et al., 2017), and job interviews (e.g., DeGroot & Gooty, 2009). The lens model serves as a framework to

[6] Cole et al. (2003a) is based on a subsample of Cole et al. (2003b) and, thus, is not considered here.

examine the extent to which resumés contain valid information signaling applicants' personality and thereby identifying resumés' upper limit for accurate personality inferences. This should help to clarify whether the previously found lack of accuracy of HR professionals' resumé based personality inferences (Burns et al, 2014; Cole et al., 2009) might be rather due to resumés' potential inherent limited capacity to signal personality or due to HR' professionals potentially not consistently using the cues signaling valid personality information in resumés.

This study can help to derive practical implications on how to appropriately use resumé based personality assessments for recruitment purposes. Depending on resumés' potential for accurately inferring personality, organizations could be advised to (a) replace or supplement established personnel selection tools such as self-report personality tests (e.g., Barrick & Mount, 1991), that might suffer from faking (Morgeson et al., 2007), or (b) rather refrain from using resumé based personality assessments for recruitment purposes other than maybe prescreening high numbers of applicants. Either way, resumé based personality assessments are common practice in many organizations and HR professionals' lack of accuracy might lead to costly erroneous selection decisions such as rejecting competent applicants due to their apparent non-suitable personality. Identifying valid and non-valid resumé cues is thus important to improve HR professionals' accuracy when inferring personality based on resumés by conducting training sessions educating about these valid and non-valid resumé cues (Cole et al., 2005).

2.1.2 Theoretical Background

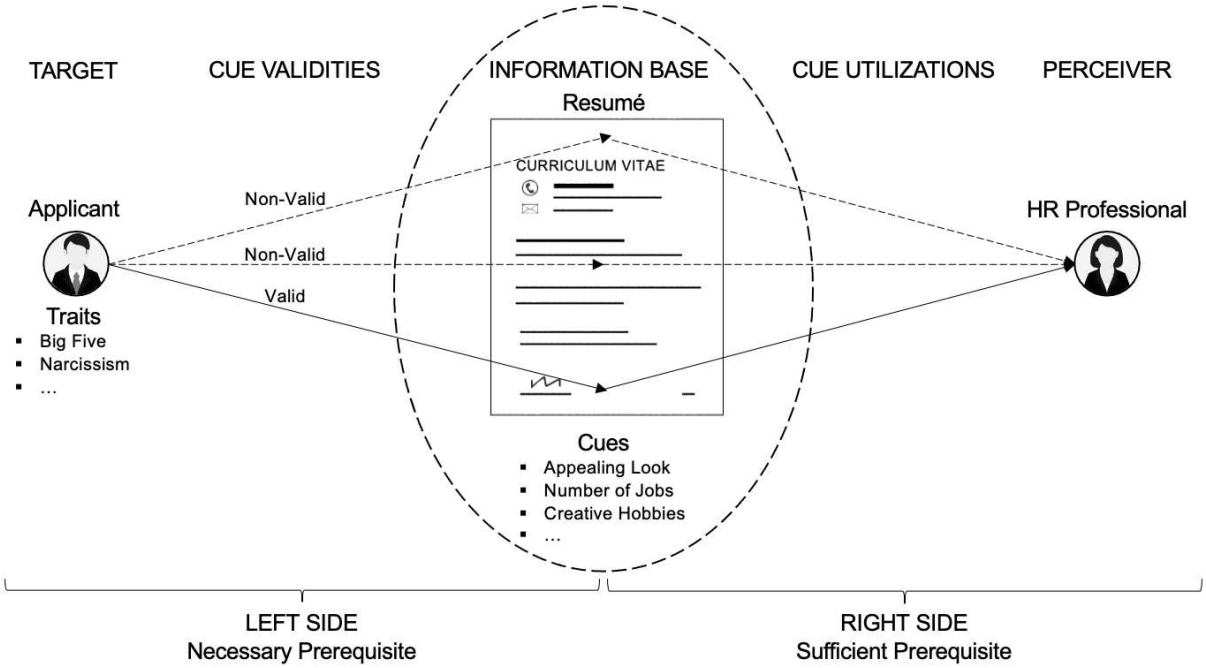
2.1.2.1 Applying the Lens Model to Resumé Based Personality Inferences. The lens model (Brunswik, 1956; see also Back & Nestler, 2016; Karelaia & Hogarth, 2008; Nestler & Back, 2013; Osterholz et al., 2021) is a theoretical framework that enables to unravel the processes involved in perceivers making accurate personality inferences based on targets' observable information (cues) at zero-acquaintance. Thereby, the presence of valid cues, that is, the presence of information which is actually associated with the targets' personality, constitutes the necessary prerequisite for accurate personality inferences (left side of the lens model). Perceivers using cues consistently according to their validity constitutes the sufficient prerequisite for accurate personality inferences (right side of the lens model).

Figure 2.1.1 illustrates the application of the lens model to drawing resumé based personality inferences. Previous research indicates that HR professionals lack accuracy when making resumé based personality inferences (Burns et al., 2014; Cole et al., 2009). According to the lens model, this might be due to (a) the lack of valid cues signaling personality in resumés, that is, cues that are actually related to the applicants' personality traits (left side of the lens

model), or (b) HR professionals using resumé cues inconsistently and not according to their validity when making resumé based personality inferences (right side of the lens model).

Figure 2.1.1

Application of the Lens Model to Resumé Based Personality Inferences



The present study aims to shed light on the left side of the lens model, the identification of valid resumé cues, constituting the necessary condition for accurate personality inferences. If a lack of valid cues signaling personality traits in resumés was identified, this would likely be the reason for HR professionals' lack of accuracy of resumé based personality inferences. From this, one could conclude that resumés should not be used for making personality inferences. However, if a valid cue base signaling personality traits in resumés was identified, this would suggest that HR professionals' lack of consistent use of resumé cues according to their validity might rather be the reason for the lack of accuracy of resumé based personality inferences. Information on valid cues might then be applied in recruitment contexts to enhance HR professionals' accuracy of personality inferences by conducting training interventions clarifying (non-) valid resumé cues (Karelaia & Hogarth, 2008; see also Cole et al., 2005; Powell & Bourdage, 2016).

2.1.2.2 Previous Research on Personality Related Cue Validities in Resumés. Cole et al. (2003b) report cue validities of 20 resumé cues (see Brown & Campion, 1994) for the big five traits of 122 upper-division management students. Due to the preliminary nature of their

findings, Cole et al. (2003b) emphasize the need to confirm their results before they might provide practical guidance. Burns et al. (2014) report cue validities of 26 resumé cues for the big five traits. However, because the sample consisted of only 37 master of business administration students, power and replicability are limited. Both Burns et al. (2014) and Cole et al. (2003b) examined cues in an explorative manner, that is, they did not derive their cues deductively based on theory and empirical findings on personality traits (see Burns et al., 2014, for a call for deductive approaches to examining relationships between personality and resumé cues). These important first steps towards a more detailed understanding of valid resumé cues led to several preliminary insights that make intuitive sense. For instance, Burns et al. (2014) found extraversion to be associated with leadership positions on resumés, which fits well with extraverts' assertiveness (Costa & McCrae, 1995) and tendency to emerge as leaders (e.g., Judge, Bono, et al., 2002). Cole et al. (2003b) found conscientiousness to be associated with a better grade point average on resumés, which fits well with conscientious individuals' striving for academic success (e.g., Poropat, 2009). Other findings, however, are difficult to interpret. For example, extraverts were found to use a different format for name and address (Burns et al., 2014) and conscientious individuals were found to be less likely to have supervised others (Cole et al., 2003b). Thus, to date, there are only few robust and very explorative findings on valid resumé cues signaling personality. In this study, we want to enhance our understanding of valid resumé cues by exploiting a comprehensive set of cues that are theoretically related to personality (see also Fernandez et al., 2021, for a similar approach in the context of LinkedIn profiles). We do so by selecting an extensive set of resumé cues (N_{Cues} = 70) from a larger cue set based on their theoretical underpinnings and empirical findings to signal the big five traits and narcissism.

2.1.2.3 Valid Resumé Cues Signaling Personality

2.1.2.3.1 Cues of Conscientiousness. Conscientious individuals are characterized by competence, order, dutifulness, achievement-striving, self-discipline, and deliberation (Costa & McCrae, 1995). Just like conscientious individuals value a tidy, neat, and organized physical appearance (Breil et al., 2021; Naumann et al., 2009) and rooms (Gosling et al., 2002) they may aim for a tidy, neat, and organized resumé. For instance, they could (1) use page numbers and (2) present information in a tidy manner. Conscientious individuals' preference for order along with their diligence might also lead them to omit less information and provide complete resumés (see also Fernandez et al., 2021, for a similar reasoning in the context of LinkedIn profiles). Thus, conscientious individuals may (3) fill out more resumé sections and distinguish more differentiated, nuanced sections, for example, (4) using separate sections for professional

experiences through internships and jobs. They might also describe relevant experiences in detail, for example, (5) listing study focuses (see also Burns et al., 2014) and (6) providing descriptions with internships and jobs. In a similar vein, they may list rather irrelevant, supplemental information such as their (7) primary school, (8) high school subjects, and (9) hobbies. Their tendency to work thoroughly could lead conscientious individuals to (10) make fewer spelling and grammar errors. However, the presence of spelling mistakes was not related to conscientiousness in LinkedIn profiles (Fernandez et al., 2021). Nevertheless, HR professionals tend to use spelling and grammar errors as a cue for low conscientiousness (Martin-Lacroux, 2017, see also Vignovic & Thompson, 2010). Conscientious individuals are competent, disciplined, and successfully strive for academic and professional success (e.g., Barrick et al., 2001; Judge et al., 1999; Kanfer et al., 2001; O'Connor & Paunonen, 2007; Poropat, 2009), so they may (11) spent fewer time on secondary school, (12) be less likely to study above the standard study period, (13) achieve better marks (see also Cole et al., 2003b), gain more professional experiences, that is, (14) more internships and jobs, (15) receive more scholarships, and (16) have a higher share of extracurricular activities in academic contexts (see also Cole et al., 2003b).

2.1.2.3.2 Cues of Extraversion. Extraverts are characterized by warmth, gregariousness, assertiveness, activity, excitement seeking, and positive emotions (Costa & McCrae, 1995). Extraverts seek social attention (Ashton et al., 2002) and extensively use online social networks (Azucar et al., 2018; Liu & Campbell, 2017), which is why they may (1) link their online profiles on resumés. Just like extraverts have a stylish and attractive physical appearance (e.g., Albright et al., 1988; Breil et al., 2021; Meier et al., 2010; Naumann et al., 2009; Vazire et al., 2008), they might (2) put effort in an appealing look of their resumé (see Burns et al., 2014). Extraverts highlight their expressive-dominant verbal communication with frequent broad, energetic gestures and a strong, full voice (e.g., Breil et al., 2021; Lippa, 1998) which may translate to (3) highlighting their written communication on resumés using bolded words. Extraverts prefer high-intensity sensory stimuli (Eysenck, 1967) and high-croma colors (Pazda & Thorstenson, 2018). Thus, they use diverse colors on their Instagram photos (Kim & Kim, 2019) and could (4) use more colors on resumés. Matching their assertiveness, extraverts emerge as leaders (e.g., Judge, Bono, et al., 2002), and thus, might (5) set a study focus on management that is geared to the preparation for leadership positions, and (6) occupy leadership positions in extracurricular activities (see also Burns et al., 2014, who found extraversion to be associated with leadership positions on resumés, and Fernandez et al., 2021, who found

extraversion to be associated with leadership roles and skills on LinkedIn). Due to their activity and sociability, extraverts could also (7) list team sports hobbies (see Allen et al., 2021).

2.1.2.3.3 Cues of Openness. Open individuals are characterized by openness to phantasy, aesthetics, feelings, actions, ideas, and values (Costa & McCrae, 1995). Just like open individuals feature a unique physical appearance (e.g., Naumann et al., 2009) and rooms (Gosling et al., 2002), their resumés may (1) look distinctive. For instance, they might (2) use various types of bullets, (3) mix fonts with and without serifs, and (4) include flow text. Their tendency to take new, alternative paths could make them early adopters changing the order of resumé sections, for example, (5) presenting professional before educational experiences. They might also (6) attend an unconventional school form (vocational high school), and (7) list extraordinary hobbies. Open individuals are creative (e.g., Feist, 1998; Larson et al., 2002), and thus, may (8) set a study focus on marketing, matching their creative mindset, rather than on (9) conventional business specializations such as accounting and taxation. They might also (10) list creative software skills (e.g., graphic design), and (11) hobbies (e.g., arts, music; Wolfradt & Pretz, 2001). Due to their curiousness to take on new challenges, open individuals are prone to frequently change jobs (e.g., Ng et al., 2005; Wille et al., 2010) and thus, could (12) display lower mean durations of internships and jobs on resumés. Open individuals also learn new, cutting-edge things, which could translate to (13) more software skills on resumés in a digitalized world (see also Saadé et al., 2006). Also, they may (14) list more languages on resumés (see also Fernandez et al., 2021), (15) except for Latin, an antiquated language no longer actively spoken. In a similar vein, characteristics such as broad-mindedness, intellectuality, and the desire for learning opportunities could make open individuals (16) list trainings (e.g., Barrick & Mount, 1991; Salgado, 1997) and (17) financial scholarships (Heist et al., 1961).

2.1.2.3.4 Cues of Agreeableness. Agreeable individuals are characterized by trust, straightforwardness, altruism, compliance, modesty, and tender-mindedness (Costa & McCrae, 1995). They are competent in cooperating (e.g., Bartram, 2005) and most valuable when interpersonal interaction is needed (Mount et al., 1998). Thus, agreeable individuals might (1) list interpersonal skills on resumés. Agreeable individuals contribute to team performance (e.g., Bell, 2007; Peeters, Van Tuijl, et al., 2006) and are satisfied when working in teams (e.g., Peeters, Rutte, et al., 2006), and thus, could (2) mention teams on resumés (see also Fernandez et al., 2021, who found agreeable individuals to list teamwork skills on LinkedIn). Due to their prosocial behavior (e.g., Habashi et al., 2016) and valuing of universalism and benevolence (Parks-Leduc et al., 2015), they may engage in (3) more and (4) longer extracurricular activities

(see also Fernandez, 2021, who found agreeable individuals to list volunteering on LinkedIn). In particular, their desire to support others could (5) predispose agreeable individuals to tutoring (see also Fernandez et al., 2021, who found a positive, non-significant, association between agreeableness and tutoring on LinkedIn). Agreeableness is associated with studying abroad (e.g., Greischel et al., 2016; Niehoff et al., 2017; Zimmermann & Neyer, 2013), travel curiosity (Andresen & Bergdolt, 2021; Jani, 2014), and cultural adjustment (e.g., Li et al., 2016; Zhang et al., 2010). Thus, agreeable individuals might display (6) more and (7) longer stays abroad, (8) an international study orientation, (9) a higher share of travel hobbies, and (10) intercultural skills.

2.1.2.3.5 Cues of Neuroticism. Neurotic individuals are characterized by anxiety, angry hostility, depression, self-consciousness, impulsiveness, and vulnerability (Costa & McCrae, 1995). Neuroticism is associated with academic dissatisfaction (e.g., Trapmann et al., 2007), academic stress (e.g., Shokri et al., 2007), and coping with withdrawal (e.g., Connor-Smith & Flachsbart, 2007). Thus, neurotic individuals may (1) show discontinued studies on resumés (see also Lounsbury et al., 2004). In a similar vein, they could show resumé gaps (Frank & Kanning, 2014). In particular, in a student sample at career start, neurotic individuals might (2) display academic gaps (gaps between and/or within high school, bachelor, and master). Due to their avoidance motivation (e.g., Elliot & Thrash, 2002), tendency to procrastinate (e.g., Schouwenburg & Lay, 1995; Steel, 2007; Watson, 2001), and less successful job search (Kanfer et al., 2001), they may (3) make less constructive use of academic gaps (e.g., simple side jobs rather than business-related internships). Neuroticism is associated with low self-esteem (e.g., Judge, Erez, et al., 2002), fear of failure (e.g., Watson, 2001), and self-handicapping (e.g., Ross et al., 2002), which could lead neurotic individuals to (4) opt for less prestigious universities and (5) employers. Neuroticism is negatively associated with physical activity (e.g., Sutin et al., 2016; Wilson & Dishman, 2015), and thus, neurotic individuals might (6) display a low share of sport related extracurricular activities and (7) hobbies. In particular, they tend to avoid group-oriented, competitive, and risky sports (e.g., Kajtna et al., 2004; Kirkcaldy & Furnham, 1991), so that they may rather (8) display recreational sports (e.g., walking).

2.1.2.3.6 Cues of Narcissism. Narcissists[7] are characterized by entitled self-importance (Krizan & Herlache, 2018) going along with agentic (e.g., charmingness, assertiveness) and antagonistic aspects (e.g., arrogance, manipulativeness; Back, 2018; Back et al., 2013). Narcissism complements the big five (Paulhus & Williams, 2002) and explains unique variance

[7] With the term *narcissists*, we refer to individuals relatively higher than most people on the continuous dimension of grandiose narcissism as a personality trait in the general population (Morf & Rhodewalt, 2001).

when predicting occupational outcomes (Grijalva & Newman, 2015; Judge et al., 2006). Due to narcissists' self-importance and vanity, research on CEO narcissism argues that narcissistic CEOs draw attention to their names in public documents (Cragun et al., 2020). Accordingly, cues such as the number of mentions of the CEO's name in company press releases (e.g., Chatterjee & Hambrick, 2007) and the CEO's signature size (e.g., Ham et al., 2018) are used as CEO narcissism indicators. Applying this reasoning to resumés, narcissists might (1) grant their name a prominent position and (2) mention it often. Narcissists strive for supremacy and brag about academic accomplishments (e.g., Buss & Chiodo, 1991) so that they may (3) list percentage ranks and test scores with academic achievements. In a similar vein, narcissists could list (4) more accomplishments with professional experiences and (5) more (even irrelevant) awards. Narcissists long for power (e.g., Carroll, 1987; Rogoza et al., 2016), status (e.g., Zeigler-Hill et al., 2018), and public admiration (e.g., Wallace & Baumeister, 2002), and might fulfill these desires by (6) decorating their resumé with prestigious internships and jobs at top tier business consultancies/auditing firms. Narcissists are rather self-focused than caring (e.g., Campbell & Foster, 2007), and thus, could be expected to display fewer extracurricular activities. However, narcissists might engage in volunteering for egoistic purposes such as advancing the career (e.g., Brunell et al., 2014; Kauten & Barry, 2016; Konrath et al., 2016). Thus, narcissists could (7) display fewer extracurricular activities with a focus on altruistically helping, but (8) more career-oriented extracurricular activities. Narcissism is associated with impression management (e.g., Hart et al., 2016; Paulhus et al., 2013; Sedikides & Nevicka, 2021) which may lead narcissists to strategically list hobbies that emphasize desirable applicant characteristics, for example, (9) cognitive (e.g., chess) and (10) business-related (e.g., reading business news) hobbies. At the same time, narcissists might list fewer hobbies typically not contributing to a positive impression, for instance, (11) hobbies primarily serving personal pleasures and relaxation (e.g., gaming). Due to their self-focus, narcissists could also (12) list fewer hobbies serving primarily social needs (e.g., meeting friends).

2.1.2.4 Present Study. Building on the lens model (Brunswik, 1956), we aimed to shed light on resumés' potential to allow accurate personality inferences by providing empirical evidence on valid resumé cues signaling applicants' personality in a sample of 141 business students. Specifically, we extended previous research (Burns et al., 2014; Cole et al., 2003b) by (a) examining an extensive set of cues ($N_{Cues} = 70$) that were tailored to each respective personality trait based on personality theory and previous empirical evidence, and (b) supplementing self-reported big five traits with narcissism. Drawing from a larger cue set ($N_{Cues} = 160$), we identified 16 cues potentially signaling conscientiousness, seven cues

potentially signaling extraversion, 17 cues potentially signaling openness, ten cues potentially signaling agreeableness, eight cues potentially signaling neuroticism, and twelve cues potentially signaling narcissism. Based on bivariate correlations, we provide evidence on valid resumé cues signaling personality. Based on multiple linear regressions, we examine whether whole sets of available cues explain (a) a substantial amount of variance in personality traits and (b) substantial incremental variance beyond basic applicant demographics (gender and age). This study was not preregistered as the resumé cues used in this study had been originally collected for a different research project. It is important to note that the deductive selection of cues took place at a stage when the data had already been collected. To address potential concerns of selecting cues after data collection, we (a) computed cue validities based on bivariate correlations for all 90 remaining cues (see Appendix 2.1.A) and (b) applied an alternative analytical approach, that is nested cross-validated elastic nets (Zou & Hastie, 2005), to check whether the identified valid cues signaling personality traits based on bivariate correlations remain robust when using resampling methods (see Appendix 2.1.B).

2.1.3 Method

2.1.3.1 Participants. The final sample consisted of 141 German-speaking business students (62 female) at the start of their professional careers. The prerequisite for participation was that participants (a) hold (or were just about to finish) a bachelor's degree in a subject related to business and economics (i.e., business and economics, industrial engineering, business informatics, and comparable courses of study) for a maximum of one year, and/or (b) were currently studying for a master's degree in a subject related to business and economics, or (c) were holding a master's degree in a subject related to business and economics for less than one year. We recruited participants via online channels, in particular, posting in Facebook and Xing (an online professional network) groups for business students, posting in online forums for business students, and e-mailing business student councils and lecturers for study distribution. In return for participation, we offered a €10 Amazon voucher, customized resumé feedback, and feedback on how the resumé's hireability was evaluated. We removed five participants from the initial sample, four participants because they did not give consent and one participant because they submitted their resumé twice. The average age was 24.48 (SD = 2.00), ranging from 20 to 32. Because the data collection was not specifically designed to test the research questions of the present study, no a priori power analysis was conducted. However, we computed a post hoc power analysis with G*Power (Version 3.1.9.6; Faul et al., 2007) for the difference of a correlation from a constant ($\rho_0 = 0$) using the bivariate normal model to get an impression of the power to identify significant cue validities. Testing two-tailed with an

α-error of .05 the power was .95 for a large correlation of ρ = .30, .67 for a medium correlation of ρ = .20, and .22 for a small correlation of ρ = .10 (Gignac & Szodorai, 2016).

2.1.3.2 Procedure. All procedures were in line with the recommendations of the German Research Foundation (DFG) and the German Psychological Society (DGPs). First, we asked participants to e-mail their completely anonymized two-page, tabular resumé in German as a PDF-file, with which they applied for a fictitious position in the "Trainee Program of the SELECT Group". We presented a corresponding job advertisement with the study advertisement. The entry-level trainee position was designed to appeal equally to students of business and economics related subjects at career start. We asked participants to include their high school graduation grades and university grades in their resumés, representing a common request of real-life organizations. Once we had received a resumé, we sent a confirmation e-mail including a link to a 15-minute online questionnaire. The self-report questionnaire assessed demographics, personality traits (big five, narcissism, self-esteem, self-concept), interest in the trainee position and the corresponding business units, previous professional and application success, and quality of and attitudes towards the own resumé. Participant collection took place between November 2017 and July 2018. For an overview of the survey and detailed information on all assessed variables see the Codebook at https://bit.ly/3al6vv1.

2.1.3.3 Measures.

2.1.3.3.1 Personality. The big five traits conscientiousness (α = .69, *M* = 4.00, *SD* = 0.55), extraversion (α = .75, *M* = 3.64, *SD* = 0.63), openness (α = .75, *M* = 3.52, *SD* = 0.70), agreeableness (α = .72, *M* = 3.75, *SD* = 0.60), and neuroticism (α = .77, *M* = 2.53, *SD* = 0.68) were measured with the 30-item short form of the Big Five Inventory-2 (BFI2-S; Soto & John, 2017; German version Rammstedt et al., 2018) using 5-point scales ranging from 1 (*do not agree at all*) to 5 (*agree completely*). Narcissism (α = .74, *M* = 2.54, *SD* = 0.80) was measured with the 6-item Narcissistic Admiration and Rivalry Questionnaire Short Scale (NARQ-S; Leckelt et al., 2018) using 6-point scales ranging from 1 (*do not agree at all*) to 6 (*agree completely*).

2.1.3.3.2 Resumé Cues. The full cue set originally collected for a different research project contained 160 resumé cues that were chosen based on a combination of a top-down (incorporating resumé cues from previous research; Burns et al., 2014; Cole et al., 2003b) and bottom-up approach (incorporating resumé cues that should vary between individuals). Thereby, we aimed to reflect the broad bandwidth of information contained in resumés by assessing resumé cues related to (a) format and layout (e.g., appealing look), (b) education (e.g., average marks), (c) professional experiences (e.g., number of internships/jobs), (d) language

skills (e.g., number of listed languages), (e) software skills (e.g., number of graphic design software skills), (f) scholarships (e.g., number of financial scholarships), and (g) extracurricular activities and hobbies (e.g., sport related extracurricular activities and hobbies; see Table 2.1.1 and Appendix 2.1.A).

We assessed two types of cues. Objective cues ($n_{Cues} = 139$) could be unambiguously coded by a single coder (e.g., counting the links to online networks). However, if a coder was still unsure, the specific coding was discussed with the first author who established objective decision rules which resolved the ambiguity. Subjective cues ($n_{Cues} = 21$[8]) had substantial decision latitude (e.g., rating the tidy presentation of information) and were rated on scales from 1 (*not at all*) to 6 (*completely*) by multiple coders. In total, eleven coders (nine female) were involved who studied psychology or business administration and were employed as research interns or student assistants. The coders of the subjective cues got extensive training[9] to ensure reliable and valid ratings. All subjective cues were initially rated by two coders. If the interrater agreement was good ($ICC_{3,k} \geq .60$; Cicchetti, 1994), the rating of the subjective cue was completed and the single ratings were averaged to a composite score. If not, an additional coder rated the cue until interrater agreement was good, leading to one subjective cue rated by three/four coders, respectively.

We selected resumé cues for this study from the full cue set based on their theoretical underpinnings to signal personality traits (see the deductive derivation of resumé cues in the chapter "2.1.2.3 Valid Resumé Cues Signaling Personality"). We thereby aimed for a broad selection of divergent cues assessing qualitatively different types of information and comprehensively reflecting the wide information spectrum in resumés ("good information"; Back & Nestler, 2016). Resumé cues on higher aggregation levels (e.g., total number of stays abroad) were preferred over cues on lower aggregation levels (e.g., number of stays abroad at school, semesters abroad, work and travel stays) to ensure reliable and comprehensive measurements and to reduce overlap. This led to a final set of 70 deductively derived resumé cues used for the main analysis (64 objective cues, 6 subjective cues; see Table 2.1.1 for details on measurement and descriptives). The 90 remaining cues from the full cue set along with their

[8] Three of the 21 subjective cues were originally assessed with two separate subjective cues, respectively, and then aggregated to a single cue due to strong similarity in content (i.e., serious, usual fonts, detailed descriptions internships/jobs, reputation of employers).

[9] We conducted two training sessions that included (a) input on the cues to be rated, including definitions of what exactly is meant by the cue and going through example resumés to exemplify the scale anchors, (b) information on what to be aware of when rating (e.g., exploiting the scale width) and which rating errors (e.g., halo effect) should be avoided, and (c) individually rating sample resumés and discussing disagreements to establish a shared understanding of cues and scale anchors.

measurement, descriptives, and correlations with personality traits can be found in the Appendix 2.1.A.

2.1.3.4 Analytical Approach. Before analyses, winsorizing was applied to the objective cues to reduce disproportionate influences of extreme values ($z > |4.47|$; see Chebyshev's inequality in Saw et al., 1984). We set extreme values to the next less extreme observed value below the threshold *z* to keep valuable information in the data set. To identify cue validities for each personality trait we computed bivariate correlations with the respective theoretically derived cues. Even though we derived one-sided expectations for the relationships between resumé cues and personality, we computed two-sided *p*-values. We also explored bivariate correlations of the cues derived for a specific personality trait with all remaining personality traits. In addition, we computed nested cross-validated elastic nets (Zou & Hastie, 2005) as an alternative analytical approach to check whether the identified valid cues signaling personality based on the bivariate correlations remain robust when using resampling. To identify whether cues explain a substantial amount of variance in personality traits, we computed six hierarchical linear regression analyses to predict conscientiousness, extraversion, openness, agreeableness, neuroticism, and narcissism, respectively. We inputted gender (0/1 = female/male) and age as controls in the first step (baseline model), and added the specific theoretically derived cues in the second step (full model). We *z*-standardized all cues and personality traits in the regression analyses. Some cues had missing values and we used pairwise complete observations to compute bivariate correlations and mean imputation for the regression analyses in these cases.[10] We used the statistical program R (version 4.1.0; R Core Team, 2018) and the interface RStudio (version 1.4.1106; RStudio Team, 2016) for all analyses. The data and statistical code for all main and supplemental analyses can be found at https://bit.ly/3al6vv1.

2.1.4 Results

2.1.4.1 Cue Validities. Descriptive statistics and bivariate correlations of the resumé cues with the personality traits they were expected to signal and with the remaining personality traits are displayed in Table 2.1.1 (an extensive correlation table showing all intercorrelations between personality traits, gender, age, and all cues of the main and supplemental analyses can be found in the Appendix 2.1.C). Four of 16 cues expected to be associated with conscientiousness were indeed associated with conscientiousness (fewer years on secondary school, better average marks, more internships and jobs, higher share of academic

[10] Five cues had missing values (years on secondary school, 39 missing; reputation of universities, one missing; constructive use of academic gaps, 47 missing; reputation of employers, two missing; extraordinary hobbies, 53 missing) because the respective information was not contained in some resumés.

extracurricular activities). Two of seven cues expected to be associated with extraversion were indeed associated with extraversion (more links to online networks, appealing look). Three of 17 cues expected to be associated with openness were indeed associated with openness (presence of flow text, having attended a vocational high school, higher share of creative hobbies). Three of ten cues expected to be associated with agreeableness were indeed associated with agreeableness (higher average duration of extracurricular activities, more stays abroad, higher average duration of stays abroad). One of eight cues expected to be associated with neuroticism was indeed associated with neuroticism (lower reputation of universities). Three of twelve cues expected to be associated with narcissism were indeed associated with narcissism (more top tier business consultancies/auditing firms, higher share of career-oriented extracurricular activities, lower share of pleasure hobbies). Overall, we found significant effects for about 23% of all examined associations, which is a higher value than expected by chance (i.e., 5%).

Table 2.1.1

Measurement and Descriptive Statistics of the Resumé Cues and Correlations With Personality Traits

Cue	Measurement	ICC	*M*	*SD*	r_C	r_E	r_O	r_A	r_N	r_{Nar}
	Resumé cues derived for conscientiousness									
1. Page numbers	0 = not present; 1 = present		.24	.43	.08	-.03	-.01	.03	.07	-.01
2. Tidy information presentation	1 = *not at all* to 6 = *completely* (i.e., presentation of information is neat, structured, and facilitates information acquisition)	.60	3.95	0.85	.13	-.14	-.13	-.13	.14	.03
3. Subordinate sections	Numerically counted (i.e., number of sections separated by formatting, e.g., headers, lines)		6.01	1.58	.10	.02	.06	.18*	.00	-.12
4. Internships/jobs separated	0 = internships/jobs mixed; 1 = internships/jobs in separate sections		.12	.33	.16	-.03	-.13	.03	-.04	-.06
5. Study focusses	Numerically counted (i.e., number of study focusses presented with study programs)		2.43	1.96	.08	.11	-.08	-.13	.08	.01
6. Descriptions internships/jobs	0 = not present; 1 = present (i.e., tasks associated with internships/jobs are listed)		.78	.42	.02	.01	.02	-.09	.06	-.02
7. Primary school	0 = not present; 1 = present		.11	.31	.12	.06	.01	.15	-.06	-.02
8. School subjects	Numerically counted (i.e., number of school subjects presented with high school)		0.64	1.32	.09	-.08	.00	-.11	-.04	.03
9. Hobbies	Numerically counted (i.e., number of activities/interests that concern personal pleasures)		2.65	2.69	.15	.09	.10	.15	.03	.04
10. Grammar/spelling errors	Number of grammar/spelling errors divided by total number of characters		.00	.00	.00	.02	.12	.06	-.02	.11
11. Years on secondary school	Numerically counted in school years		8.53	0.71	-.21*	.08	.10	-.04	.00	-.02
12. Studies above standard period	Numerically counted (standard study period was defined as six/four semesters for bachelor/master)		0.73	0.51	-.12	.12	.04	.07	-.02	-.08
13. Average marks	Average of marks of high school/college degrees in European grading system (1.0-4.0)		-0.03	0.84	-.21*	.22**	.08	.13	-.01	.01
14. Internships/jobs	Numerically counted (i.e., number of experiences closely related to internships (e.g., no theses in cooperation with companies, no project work) or jobs (activities that earn money, e.g., no volunteering)		4.77	2.17	.20*	-.01	-.10	.12	.13	-.18*
15. Scholarships	Numerically counted (e.g., financial scholarships, online scholarships, university funding initiatives, talent networks of renowned companies)		0.81	.15	.02	.05	.05	-.05	-.07	.05
16. Academic extracurricular activities	Number of academic extracurricular activities (e.g., student council, university mentoring, school/class/scholarship representative) divided by total number of extracurricular activities		.31	.36	.21*	.03	-.04	.04	.00	.04
	Resumé cues derived for extraversion									
1. Links to online networks	Numerically counted (e.g., LinkedIn, Twitter)		0.07	0.26	.08	.20*	.09	.08	-.16	.03
2. Appealing look	1 = *not at all* to 6 = *completely* (i.e., resumé appears appealing at first glance)	.61	3.52	0.91	.12	.17*	.08	-.06	-.01	-.01
3. Bold words	Number of bold words divided by total number of words		.15	.09	.08	.14	.07	-.03	-.13	.08
4. Colors	Numerically counted (i.e., number of distinct colors; shades of grey not included)		0.80	1.55	.10	.16	.09	-.07	.00	.11
5. Study focusses on management	Numerically counted (i.e., number of study focusses on management related subjects)		0.37	0.60	.01	.10	.01	.11	.00	-.15

Cue	Measurement	ICC	*M*	*SD*	r_C	r_E	r_O	r_A	r_N	r_{Nar}
6. Leadership positions in extracurricular activities	Number of leadership positions in extracurricular activities (e.g., chair/board member of student associations/university groups/student councils, group leader) divided by total number of extracurricular activities		.40	.43	.00	.12	-.04	.05	-.06	-.02
7. Team sport hobbies	Number of team sport hobbies (i.e., sports requiring collaboratively working together towards shared goals, e.g., soccer) divided by total number of sport hobbies		.15	.29	-.04	-.14	-.06	.01	.05	-.04
	Resumé cues derived for openness									
1. Distinctive look	1 = *not at all* to 6 = *completely* (i.e., resumé looks unique, stands out)	.85	3.67	1.09	-.02	.05	.14	.04	-.07	-.11
2. Types of bullets	Numerically counted (i.e., number of divergent bullets, e.g., circles, dots)		0.70	0.53	.05	-.12	.04	-.14	.12	.16
3. Fonts with and without serifs	0 = not present; 1 = present		.09	.29	-.16	.12	.04	.05	.02	-.05
4. Flow text	0 = not present; 1 = present (i.e., grammatically complete sentences ending with a period)		.08	.27	-.11	.10	.17*	-.08	-.17*	.05
5. Experience before education section	0 = not present; 1 = present		.11	.32	-.10	.08	.15	-.09	.04	.13
6. Vocational high school	0 = not present; 1 = present		.11	.32	-.01	-.05	.19*	-.03	-.04	-.01
7. Extraordinary hobbies	1 = *not at all* to 6 = *completely* (i.e., hobbies/interests are unique, special, rare, e.g., visiting medieval festivals, mountain climbing, parasailing)	.80	3.26	1.16	-.05	.10	.12	.14	-.18	.13
8. Study focusses on marketing	Numerically counted (i.e., number of study focusses on marketing related subjects)		0.23	0.53	-.02	.03	.07	.12	.03	.15
9. Study focusses on accounting/taxation	Numerically counted (i.e., number of study focusses on accounting/taxation related subjects)		0.44	0.81	.07	-.05	-.13	-.01	.05	-.01
10. Graphic design software skills	Number of graphic design software skills (i.e., software for image/video editing, visualization) divided by total number of software skills		.04	.11	-.10	-.03	.13	-.04	-.02	.02
11. Creative hobbies	Number of creative hobbies (e.g., playing an instrument, painting, photographing) divided by total number of hobbies		.07	.15	.03	.03	.19*	.17*	-.02	-.04
12. Mean duration internships/jobs	Total duration of internships/jobs in days divided by total number of internships/jobs		249	174	.07	.08	-.12	-.10	.03	-.04
13. Software skills	Numerically counted		4.96	3.08	-.12	-.13	.15	-.09	.15	-.02
14. Languages	Numerically counted (i.e., number of foreign languages; Latin not included)		2.39	0.95	-.08	.11	.16	.16	.18*	-.01
15. Latin	0 = not present; 1 = present		.21	.41	.04	-.01	-.16	.14	-.02	-.13
16. Trainings	Numerically counted (e.g., workshops, seminars, language and IT courses)		0.74	1.30	-.03	.07	.15	.10	.03	-.02
17. Financial scholarships	Number of financial scholarships (i.e., scholarships that involve an elaborated application process and substantial financial benefits) divided by total number of scholarships		0.14	0.31	.01	-.04	.13	-.11	-.11	.03
	Resumé cues derived for agreeableness									
1. Interpersonal skills	Numerically counted (e.g., communication, conflict management, empathy)		0.16	0.42	.05	.00	.08	.04	.03	.01
2. Teams	Numerically counted (i.e., number of mentions of teams, teamwork, groups, etc.)		0.62	0.82	-.01	-.06	.03	-.11	.00	-.04
3. Extracurricular activities	Numerically counted (i.e., number of voluntary activities outside the academic curriculum often serving social goals, e.g., engagement in university groups, athletic coach, mentor)		2.27	1.78	.01	-.01	.06	.01	-.09	-.02
4. Mean duration extracurricular activities	Toral duration of extracurricular activities in days divided by total number of extracurricular activities		607	676	-.02	-.04	-.05	.17*	-.07	-.09
5. Tutoring	Numerically counted (i.e., number of activities related to providing academic lessons)		0.15	0.36	.13	.02	.15	.11	-.13	.01

Cue	Measurement	ICC	*M*	*SD*	r_C	r_E	r_O	r_A	r_N	r_{Nar}
6. Stays abroad	Numerically counted (i.e., number of all stays abroad, e.g., school exchange, semester abroad, language courses abroad, internships/jobs abroad, travel stays)		2.06	1.78	.00	.07	.11	.21*	-.04	-.08
7. Mean duration stays abroad	Total duration of stays abroad in days divided by total number of stays abroad		123	89	-.12	.05	.05	.18*	-.08	-.09
8. International orientation of studies	Numerically counted (i.e., number of study programs that focus on international topics, e.g., international business administration/management/economics)		0.18	0.42	.06	-.07	-.10	.10	-.11	-.01
9. Travel hobbies	Number of travel hobbies (e.g., backpacking, discovering foreign countries and cultures) divided by total number of hobbies		.09	.16	.02	.12	.05	.10	-.01	-.03
10. Intercultural skills	Numerically counted (e.g., intercultural communication/knowledge)		0.18	0.41	-.13	.01	-.03	.12	-.02	-.06
	Resumé cues derived for neuroticism									
1. Discontinued studies	Numerically counted (i.e., number of discontinued studies without degree)		0.11	0.32	-.07	-.06	-.12	-.08	.14	-.12
2. Academic gaps	Numerically counted (i.e., number of gaps (at least one semester) between/within high school, bachelor, and master)		0.83	0.69	-.03	-.05	.03	-.01	.04	-.04
3. Constructive use of gaps	1 = *not at all* to 6 = *completely* (i.e., constructive use of academic gaps, e.g., business-related internship rather than simple side job)	.85	3.67	1.33	.02	.00	-.03	.06	-.05	.08
4. Reputation of universities	Aggregation of the *z*-scaled ranks of universities (bachelor, master, semesters abroad) in the Times Higher Education (THE; *World University Rankings 2020*, 2019)-ranking and Quacquarelli Symonds (QS; *QS World University Rankings*, 2020)-ranking		0.01	0.72	.13	.05	.11	.02	-.23**	.16
5. Reputation of employers	Reputation of employers (i.e., internships/jobs at renowned organisations; 1 = *not at all* to 6 = *completely*) was assessed separately for internships and jobs. The two subjective cues (r = .33 [.15; .49], $t(108) = 3.64$, $p < .001$) were *z*-scaled and aggregated.	.84/.81	0.03	0.85	-.01	.04	.06	-.07	-.15	.08
6. Sport extracurricular activities	Number of extracurricular activities in sport contexts (e.g., athletic coach, organizing sport events) divided by total number of extracurricular activities		.11	.28	.06	. 04	-.16	.07	-.12	-.10
7. Sport hobbies	Number of sport hobbies (i.e., hobbies that require physical exertion) divided by total number of hobbies		.34	.35	.08	-.06	-.10	-.05	.07	-.04
8. Recreational sport hobbies	Number of sport hobbies that primarily serve the personal recreation and relaxation (e.g., walking, cycling) divided by total number of sport hobbies		.16	.28	.13	.08	-.11	-.08	.16	.06
	Resumé cues derived for narcissism									
1. Prominent name position	Numerically counted how many of the following aspects are fulfilled: 1. Name top-centred, 2. Name as header, 3. Name (with headings) larger than rest of the resumé		0.90	0.80	-.01	.05	.08	-.04	-.04	.05
2. Own name	Numerically counted		1.40	0.73	.09	.11	-.07	-.11	.00	-.07
3. Academic comparison	0 = not present; 1 = present (i.e., bachelor's final mark presented with a percentage rank and/or categorized within the European Credit Transfer System (ECTS) and/or Graduate Management Admission Test (GMAT)-score presented)		.10	.30	-.07	-.03	.11	-.08	.00	.16
4. Accomplishments with professional experiences	Numerically counted (i.e., number of accomplishments listed with internships/jobs, e.g., having successfully completed a project, having increased sales)		0.06	0.25	.04	-.04	.13	.01	-.10	.08
5. Awards	Numerically counted (i.e., number of awards in various contexts, e.g., high school graduation awards, awards for university achievements, athletic competition titles)		0.53	1.05	.00	-.06	.04	-.10	-.11	.10

Cue	Measurement	ICC	*M*	*SD*	r_C	r_E	r_O	r_A	r_N	r_{Nar}
6. Top tier business consultancies/auditing firms	Numerically counted (i.e., number of professional experiences at top tier business consultancies/auditing firms, e.g., McKinsey, BCG, Bain, PWC, EY)		0.06	0.16	.03	.01	-.02	-.18*	-.08	.29***
7. Altruistic extracurricular activities	Number of altruistic extracurricular activities (i.e., strong focus on altruistically helping, e.g., food bank, geriatric caregiver) divided by total number of extracurricular activities		.17	.29	.05	-.14	-.05	.00	-.07	-.15
8. Career-oriented extracurricular activities	Number of career-oriented extracurricular activities (i.e., student business consultancies) divided by total number of extracurricular activities		.04	.13	.00	-.05	.00	-.11	-.07	.23**
9. Cognitive hobbies	Number of hobbies requiring considerable cognitive effort (e.g., playing chess, learning a language, reading) divided by total number of hobbies		.04	.10	.10	-.05	.08	.06	.07	.14
10. Business hobbies	Number of business-related hobbies (e.g., following business news, tracking developments of the stock market) divided by total number of hobbies		.02	.07	.02	.11	.10	.00	-.17*	-.01
11. Pleasure hobbies	Number of hobbies primarily serving pleasure/relaxation (e.g., listening to music, playing video games) divided by total number of hobbies		.03	.08	.07	.07	.08	-.04	.05	-.19*
12. Social hobbies	Number of hobbies primarily serving social needs (e.g., spending time with family/friends) divided by total number of hobbies		.01	.05	.02	.04	-.02	.11	.05	-.13

Note. ICC = ICC (3, k). C = conscientiousness; E = extraversion; O = openness; A = agreeableness; N = neuroticism; Nar = narcissism.
*$p < .05$. **$p < .01$. ***$p < .001$.

The valid resumé cues identified based on the significant bivariate correlations appeared to be robust when applying resampling in nested cross-validated elastic nets (see Appendix 2.1.B). More specifically, the valid resumé cues based on the bivariate correlations represented the most important elastic net predictors (strongest absolute values of regression coefficients averaged across the ten outer folds) for all examined personality traits except for conscientiousness. Concerning conscientiousness, the four valid resumé cues based on the bivariate correlations were among the five most important predictors of the elastic net. Thus, the machine learning approach backs up the pattern of results on valid resumé cues based on the bivariate correlations. We focus on the results of the bivariate correlations because this is the commonly applied analysis to identify cue validities (Back & Nestler, 2016; see for instance Gosling et al., 2002; Küfner et al., 2010; Naumann et al., 2009; Vazire et al., 2008) and thus facilitates the comparability with previous findings on cue validities based on resumés (Burns et al., 2014; Cole et al., 2003b). Also, because both analytical approaches yielded similar results, focusing on the less complex analysis is preferable.

2.1.4.2 Explanation of Variance in Personality Traits by Resumé Cues. The results of the hierarchical linear regressions are displayed in Table 2.1.2. For each personality trait, the multiple linear regressions using demographics (gender and age) and the respective theoretically derived resumé cues as predictors (step 2, full model) explained significant variance. More specifically, the full model accounted for 26% of the variance in openness, 26% of the variance in narcissism, 22% of the variance in conscientiousness, 19% of the variance in agreeableness, 18% of the variance in neuroticism, and 13% of the variance in extraversion. Comparing the multiple linear regressions of the baseline model (step 1; gender and age) and the full model (step 2; gender, age, and resumé cues), we found incremental explained variance in personality traits beyond basic demographics by adding resumé cues for openness ($\Delta R^2 = .23$), conscientiousness ($\Delta R^2 = .18$), narcissism ($\Delta R^2 = .17$), and extraversion ($\Delta R^2 = .13$), but not for agreeableness ($\Delta R^2 = .12$), and neuroticism ($\Delta R^2 = .09$).

Table 2.1.2

Results of the Hierarchical Linear Regressions Predicting Personality Traits

Cue	β	95% CI		*t*	*p*	*F*	R^2	R^2_{Adj}	ΔR^2	ΔR^2_{Adj}
		LL	*UL*							
Step 1: Baseline model for conscientiousness					.070	2.72 (2, 138)	.04	.02		
Intercept	0.00	-0.16	0.16	0.00	1.00					
Gender (0/1 = female/male)	-0.03	-0.19	0.14	-0.31	.76					
Age	-0.19	-0.36	-0.03	-2.29	.023					

Cue	β	95% CI		*t*	*p*	*F*	R^2	R^2_{Adj}	ΔR^2	ΔR^2_{Adj}
		LL	*UL*							
Step 2: Full model for conscientiousness					.018	1.94 (18, 122)	.22	.11		
					.037	1.81 (16, 122)			.18	.08
Intercept	0.00	-0.16	0.16	0.00	1.00					
Gender (0/1 = female/male)	0.06	-0.11	0.23	0.68	.50					
Age	-0.05	-0.27	0.16	-0.50	.61					
1. Page numbers	0.05	-0.12	0.22	0.60	.55					
2. Tidy information presentation	0.16	-0.02	0.33	1.76	.085					
3. Subordinate sections	0.06	-0.11	0.24	0.72	.47					
4. Internships and jobs separated	0.15	-0.03	0.32	1.65	.10					
5. Study focusses	0.09	-0.09	0.26	1.01	.31					
6. Descriptions internships/jobs	0.03	-0.14	0.20	0.35	.73					
7. Primary school	0.13	-0.05	0.31	1.44	.15					
8. School subjects	0.07	-0.10	0.24	0.84	.40					
9. Hobbies	0.13	-0.04	0.31	1.54	.13					
10. Grammar/spelling errors	-0.05	-0.05	0.12	-0.60	.55					
11. Years on secondary school	-0.13	-0.31	0.04	-1.51	.13					
12. Studies above standard period	-0.05	-0.05	0.13	-0.56	.57					
13. Average marks	-0.09	-0.30	0.12	-0.87	.39					
14. Internships/jobs	0.14	-0.03	0.32	1.59	.12					
15. Scholarships	0.01	-0.17	0.20	0.16	.88					
16. Academic extracurricular activities	0.16	-0.01	0.33	1.86	.066					
Step 1: Baseline model for extraversion					.61	0.49 (2, 138)	.01	-.01		
Intercept	0.00	-0.17	0.17	0.00	1.00					
Gender (0/1 = female/male)	0.00	-0.16	0.17	0.06	.96					
Age	0.08	-0.08	0.25	0.99	.33					
Step 2: Full model for extraversion					.024	2.23 (9, 131)	.13	.07		
					.012	2.72 (7, 131)			.13	.08
Intercept	0.00	-0.16	0.16	0.00	1.00					
Gender (0/1 = female/male)	0.02	-0.15	0.19	0.25	.80					
Age	0.06	-0.11	0.23	0.73	.46					
1. Links to online networks	0.16	-0.02	0.34	1.80	.074					
2. Appealing look	0.15	-0.01	0.32	1.87	.063					
3. Bold words	0.08	-0.09	0.25	0.93	.36					
4. Colors	0.06	-0.11	0.24	0.70	.48					
5. Study focusses on management	0.10	-0.07	0.26	1.14	.26					
6. Leadership positions in extracurricular activities	0.15	-0.01	0.32	1.81	.072					
7. Team sport hobbies	-0.14	-0.31	0.03	-1.65	.10					
Step 1: Baseline model for openness					.16	1.83 (2, 138)	.03	.01		
Intercept	0.00	-0.17	0.17	0.00	1.00					
Gender (0/1 = female/male)	0.14	-0.03	0.31	1.67	.097					
Age	0.07	-0.09	0.24	0.85	.40					
Step 2: Full model for openness					.005	2.21 (19, 121)	.26	.14		
					.007	2.22 (17, 121)			.23	.13
Intercept	0.00	-0.15	0.15	0.00	1.00					
Gender (0/1 = female/male)	0.13	-0.04	0.31	1.52	.13					
Age	-0.01	-0.21	0.18	-0.14	.89					
1. Distinctive look	0.13	-0.03	0.30	1.63	.10					
2. Types of bullets	-0.05	-0.22	0.12	-0.59	.56					
3. Fonts with and without serifs	0.05	-0.12	0.22	0.58	.56					
4. Flow text	0.13	-0.04	0.31	1.54	.13					
5. Experience before education section	0.04	-0.14	0.21	0.44	.66					
6. Vocational high school	0.17	-0.01	0.36	1.87	.063					

Cue	β	95% CI		*t*	*p*	*F*	R^2	R^2_{Adj}	ΔR^2	ΔR^2_{Adj}
		LL	*UL*							
7. Extraordinary hobbies	0.05	-0.11	0.22	0.64	.52					
8. Study focusses on marketing	0.02	-0.15	0.19	0.20	.84					
9. Study focusses on accounting/taxation	-0.05	-0.22	0.12	-0.62	.53					
10. Graphic software skills	0.06	-0.10	0.22	0.72	.47					
11. Creative hobbies	0.20	0.04	0.36	2.44	.016					
12. Mean duration internships/jobs	-0.15	-0.33	0.02	-1.74	.085					
13. Software skills	0.05	-0.12	0.22	0.63	.53					
14. Languages	0.15	-0.02	0.33	1.73	.087					
15. Latin	-0.12	-0.30	0.05	-1.36	.18					
16. Trainings	0.16	0.00	0.31	1.95	.053					
17. Financial scholarships	0.06	-0.11	0.22	0.69	.49					
Step 1: Baseline model for agreeableness					.005	5.51 (2, 138)	.07	.06		
Intercept	0.00	-0.16	0.16	0.00	1.00					
Gender (0/1 = female/male)	-0.27	-0.43	-0.11	-3.31	.001					
Age	0.00	-0.16	0.16	-0.01	.99					
Step 2: Full model for agreeableness					.005	2.52 (12, 128)	.19	.12		
					.058	1.85 (10, 128)			.12	.05
Intercept	0.00	-0.16	0.16	0.00	1.00					
Gender (0/1 = female/male)	-0.25	-0.42	-0.09	-3.07	.003					
Age	-0.04	-0.21	0.13	-0.50	.62					
1. Interpersonal skills	0.02	-0.15	0.19	0.24	.81					
2. Teams	-0.13	-0.29	0.03	-1.58	.12					
3. Extracurricular activities	-0.09	-0.28	0.09	-1.00	.32					
4. Mean duration extracurricular activities	0.18	0.02	0.35	2.21	.029					
5. Tutoring	0.12	-0.05	0.29	1.43	.16					
6. Stays abroad	0.10	-0.09	0.28	1.03	.30					
7. Mean duration stays abroad	0.13	-0.03	0.30	1.62	.11					
8. International orientation of studies	0.05	-0.12	0.23	0.63	.53					
9. Travel hobbies	0.05	-0.13	0.22	0.53	.59					
10. Intercultural skills	0.08	-0.10	0.26	0.90	.37					
Step 1: Baseline model for neuroticism					.001	7.09 (2, 138)	.09	.08		
Intercept	0.00	-0.16	0.16	0.00	1.00					
Gender (0/1 = female/male)	-0.29	-0.45	-0.13	-3.59	<.001					
Age	0.11	-0.05	0.27	1.30	.19					
Step 2: Full model for neuroticism					.002	2.94 (10, 130)	.18	.12		
					.078	1.82 (8, 130)			.09	.04
Intercept	0.00	-0.16	0.16	0.00	1.00					
Gender (0/1 = female/male)	-0.27	-0.43	-0.11	-3.39	.001					
Age	0.09	-0.08	0.25	1.04	.30					
1. Discontinued studies	0.08	-0.09	0.24	0.93	.35					
2. Academic gaps	0.04	-0.13	0.21	0.44	.66					
3. Constructive use of gaps	0.02	-0.15	0.20	0.26	.80					
4. Reputation of universities	-0.18	-0.35	-0.01	-2.07	.041					
5. Reputation of employers	-0.08	-0.26	0.10	-0.90	.37					
6. Sport extracurricular activities	-0.09	-0.26	0.08	-1.06	.29					
7. Sport hobbies	-0.02	-0.22	0.17	-0.24	.81					
8. Recreational sport hobbies	0.16	-0.02	0.34	1.77	.079					
Step 1: Baseline model for narcissism					.002	6.64 (2, 138)	.09	.07		
Intercept	0.00	-0.16	0.16	0.00	1.00					
Gender (0/1 = female/male)	0.29	0.13	0.45	3.58	<.001					
Age	-0.07	-0.23	0.09	-0.86	.39					

Cue	β	95% CI		*t*	*p*	*F*	R^2	R^2_{Adj}	ΔR^2	ΔR^2_{Adj}
		LL	*UL*							
Step 2: Full model for narcissism					<.001	3.11 (14, 126)	.26	.17		
					.008	2.39 (12, 126)			.17	.10
Intercept	0.00	-0.15	0.15	0.00	1.00					
Gender (0/1 = female/male)	0.25	0.09	0.42	3.09	.002					
Age	0.03	-0.13	0.20	0.40	.69					
1. Prominent name position	0.03	-0.13	0.18	0.33	.74					
2. Own name	-0.03	-0.19	0.13	-0.39	.70					
3. Academic comparison	0.07	-0.09	0.23	0.84	.40					
4. Accomplishments with professional experiences	-0.01	-0.17	0.15	-0.13	.90					
5. Awards	0.09	-0.08	0.26	1.08	.28					
6. Top tier business consultancies/auditing firms	0.19	0.02	0.35	2.25	.026					
7. Altruistic extracurricular activities	-0.17	-0.33	-0.02	-2.20	.030					
8. Career-oriented extracurricular activities	0.11	-0.06	0.27	1.27	.21					
9. Cognitive hobbies	0.10	-0.06	0.27	1.22	.22					
10. Business hobbies	-0.03	-0.19	0.12	-0.43	.67					
11. Pleasure hobbies	-0.13	-0.29	0.03	-1.63	.11					
12. Social hobbies	-0.13	-0.29	0.03	-1.65	.10					

Note. $N = 141$. CI = confidence interval; *LL* = lower limit; *UL* = upper limit; R^2_{Adj} = adjusted R^2. All values on *z*-scale.

2.1.5 Discussion

This study's goal was to shed light on resumés' potential for accurate personality inferences by extending our understanding of valid resumé cues signaling personality traits (big five and, for the first time, narcissism) based on 141 business students' resumés and self-reported personality. We went beyond previous research by selecting a broad set of resumé cues ($N_{Cues} = 70$) based on personality theory and previous empirical findings. We found basic demographic characteristics together with the respective resumé cues to explain substantial variance for all personality traits. With regard to specific resumé cues signaling personality, we identified 16 resumé cues being correlated with the personality trait expected to be associated with: Four cues for conscientiousness (fewer years on secondary school, better average marks, more internships and jobs, higher share of academic extracurricular activities), two cues for extraversion (more links to online networks, appealing look), three cues for openness (presence of flow text, having attended a vocational high school, higher share of creative hobbies), three cues for agreeableness (higher average duration of extracurricular activities, more stays abroad, higher average duration of stays abroad), one cue for neuroticism (lower reputation of universities), and three cues for narcissism (more top tier business consultancies/auditing firms, higher share of career-oriented extracurricular activities, lower share of pleasure hobbies). However, cue-personality correlations were rather small and many intuitive and theoretically

expected relationships between resumé cues and personality traits did not appear to be significant, leading to a mixed picture regarding resumés' potential to accurately infer personality.

2.1.5.1 Embedding the Present Findings in the Framework of the Lens Model. This study focused on the left side of the lens model (Brunswik, 1956), that is, the identification of valid resumé cues signaling personality. According to the lens model, the presence of valid cues is the necessary condition for accurate personality inferences at zero-acquaintance. We identified a valid resumé cue base for all examined personality traits, in particular, we (a) showed that resumé cues together with basic demographic characteristics (that can also be inferred from resumés) explain substantial personality variance, and (b) identified the corresponding driving valid resumé cues. However, the fact that only a fraction of theoretically sound resumé cues actually appeared to signal personality traits (with rather small associations) suggests that there is a definite and rather mediocre upper limit to the possibility of making accurate personality inferences based on resumés.

Previous studies on HR professionals' accuracy of resumé based personality inferences have only found (mixed) evidence for a modest level of accuracy of conscientiousness (Burns et al., 2014; cf. Cole et al., 2009) and extraversion inferences (Cole et al., 2009; cf. Burns et al., 2014), and no accuracy for the other big five traits. The present results suggest that HR professionals' lack of accuracy might be to some extent due to resumés as an information base holding limited capacity to signal valid personality information with the number of non-valid cues exceeding the number of valid cues. However, we also found that there are valid resumé cues for each personality trait that could be used to infer personality, which suggests that HR professionals' lack of consistent use of these valid resumé cues according to their validity might also contribute to the lack of accuracy.

2.1.5.2 Extending Preliminary Findings on Resumé Cues and Personality. This study extends our understanding of valid resumé cues signaling personality beyond initial exploratory findings (Burns et al., 2014; Cole et al., 2003b). For instance, Cole et al. (2003b) did not find valid resumé cues signaling openness. Burns et al. (2014) found eight resumé cues associated with openness. However, the conclusiveness of their findings is limited due to a small resumé sample ($N = 37$) and lacking theoretical underpinnings of the cue set, both enhancing the likelihood of type I error, that is, assuming resumé cues to signal personality which in fact do not (see Burns et al., 2014, explicitly addressing these limitations). For instance, Burns et al. (2014) found that openness was associated with a higher average length of employment. This finding seems somewhat contradictory to open individuals' curiosity to

explore new things and tendency to frequently change job positions (e.g., Ng et al., 2005; Wille et al., 2010). Also, such a finding could not be supported in the present study (the correlation between the average duration of internships/jobs was negative; r = -.12, p = .17). As further examples, Burns et al. (2014) found open individuals to be less likely to list (a) supplemental information beyond school and degree in the education section, and (b) academic awards. However, there seem to be little theoretical and empirical underpinnings to explain those findings. In contrast, characteristics of open individuals such as broad-mindedness, intellectual complexity, and the desire to meet learning opportunities, if at all, rather suggest positive associations with the aforementioned resumé cues. In the present study, we now demonstrate that resumé cues explain substantial variance in openness (even beyond basic demographic characteristics), and identify easy-to-interpret cues, such as the presence of flow text, having attended a vocational high school, and listing creative hobbies, that might be used to infer an applicant's openness based on their resumé.

Overall, the present study contributes to the broad literature on personality inferences at zero-acquaintance by adding insights on valid resumé cues to the extensive, multi-faceted information bases that can be used to make (somewhat) accurate personality inferences such as physical appearances and observed behaviors (e.g., Back et al., 2010; Borkenau & Liebler, 1992; Hirschmüller et al., 2015; Naumann et al., 2009), bedrooms and offices (Gosling et al., 2002), music preferences (Rentfrow & Gosling, 2006), written information (e.g., short stories; Küfner et al., 2010), online social network profiles (e.g., Facebook; Stopfer et al., 2014), and even e-mail addresses (Back et al., 2008), and, in particular, to information bases related to recruitment contexts such as (handshakes in; Stewart et al., 2008) job interviews (e.g., DeGroot & Gooty, 2009; Gifford et al., 1985), application photographs (Fernandez et al., 2017), and online professional network profiles (e.g., LinkedIn; Fernandez et al., 2021; Van de Ven et al., 2017). In alignment with previous zero-acquaintance research, we found that the incremental explained variance of resumé cues beyond gender and age was only significant for conscientiousness, extraversion, openness, and narcissism, but not for agreeableness and neuroticism, which represent typical difficult to observe traits in zero-acquaintance situations (e.g., Connelly & Ones, 2010; Connolly et al., 2007; Hall et al., 2008; Kenny et al., 1992, 1994).

2.1.5.3 Practical Implications. Even though we found some valid resumé cues signaling each of the examined personality traits, the present results also suggest that resumés come with a definite and rather mediocre upper limit to accurately infer personality. This speaks for using resumé based personality inferences rather for non-invasive preliminary screening purposes when confronted with high numbers of applicants. Other than that, organizations

should apply well-established personnel selection tools to infer applicants' personality such as self-report personality tests, that were demonstrated to robustly predict occupational outcomes (e.g., Barrick & Mount, 1991; Salgado, 1997; Tett et al., 1991). These can be supplemented by alternative methods to measure personality that minimize socially desirable responding, such as asking specific (biographical or situational) personality related questions in job interviews (Levashina et al., 2014). It would be intriguing to test whether supplementing self-report personality tests with resumé based personality assessments might gain incremental accuracy when predicting (a) applicants' personality and (b) occupational outcomes such as job performance. If so, resumé based personality assessments might be used as a valuable complement to well-established selection tools.

That aside, HR professionals making resumé based personality inferences (e.g., Brown & Campion, 1994; Burns et al., 2014; Cole et al., 2004, 2009) and thereby lacking accuracy (Burns et al, 2014; Cole et al., 2009) reflects daily practice in many organizations. In bad cases, inaccurate resumé based personality inferences might lead to direct false applicant rejections or impair the validity of hiring decisions at later personnel selection stages (e.g., Binning et al., 1988; Dipboye et al., 1984; Dougherty et al., 1994; Macan & Dipboye, 1990). Organizations should make efforts to reduce such erroneous decision-making, not only for reasons of fairness but also since avoiding erroneous applicant rejection has become a key competitive advantage in the "war for talent" (Beechler & Woodward, 2009). The lens model (Brunswik, 1956) suggests that the lack of consistently using resumé cues according to their validity might be to some extent accountable for HR professionals' low accuracy of resumé based personality inferences (Burns et al., 2014; Cole et al., 2009). The present results (if affirmed in future confirmatory research) might thus serve as a first step on the road to improving HR professionals' accuracy by educating about valid and non-valid resumé cues signaling personality. More specifically, a promising approach might be designing training sessions that educate HR professionals to (a) assess resumé cues in a standardized way, (b) distinguish valid and non-valid resumé cues for each personality trait, and (c) incorporate valid resumé cues consistently into personality inferences (see Karelaia & Hogarth, 2008). Cole et al. (2005) provided initial evidence that the accuracy of resumé based personality inferences could be enhanced after attending a brief training session educating about valid resumé cues (see also Powell & Bourdage, 2016, for a similar approach in the context of employment interviews).

2.1.5.4 Limitations and Future Directions. The deductive selection of resumé cues in this study took place after data collection, and thus, without preregistration. We addressed this limitation by (a) reporting cue validities for all resumé cues assessed in the original research

project and (b) demonstrating the robustness of the identified valid resumé cues using resampling methods. However, the absence of preregistration still necessitates the direct replication of our results in future confirmatory research.

Although the present study used a larger resumé sample ($N = 141$) than previous research on resumé cues signaling personality ($N = 37$ in Burns et al., 2014; $N = 122$ in Cole et al., 2003b), our power to identify significant cue validities was still rather low. Against the background of the numerous small effects in the present study (around $r = |.10|$; Gignac & Szodorai, 2016), it seems likely that many associations between personality and resumé cues occur in the range of small effect sizes (see also typical effect sizes of cues signaling personality on LinkedIn; Fernandez et al., 2021; Roulin & Levashina, 2019; Roulin & Stronach, 2022; Van de Ven et al., 2017). Our power to detect small effects ($\rho = .10$) was only .22 (testing two-tailed with an α-error of .05). Small effects are practically less relevant than medium sized effects ($\rho = .20$), which we were able to detect quite reliably ($1\text{-}\beta = .67$). However, when considered in combination, small effects might explain substantial variance, as many cues might each make a small, unique contribution (see also Fernandez et al., 2021). It would be enlightening to examine which of the numerous small effects prove robust in a sample ($N = 782$) providing sufficient power ($1\text{-}\beta = .80$).

This study dealt with the left side of the lens model (Brunswik, 1956), the identification of valid resumé cues signaling personality, representing the necessary condition for accurate personality inferences at zero-acquaintance. A further step would be to examine the extent to which HR professionals consistently use these cues. This might help paint a more comprehensive picture of HR professionals' lack of accuracy when making resumé based personality inferences (Burns et al, 2014; Cole et al., 2009). Burns et al. (2014) provide preliminary evidence by asking HR professionals to rate the personality relevance of resumé cues on Likert-scales. These findings can be aligned with the present findings on cue validities to form hypotheses on why HR professionals might lack accuracy. For instance, whereas HR professionals consider grammar/spelling errors to be the most relevant resumé cue to infer conscientiousness (Burns et al., 2014; see also Martin-Lacroux, 2017; Vignovic & Thompson, 2010), this study suggests that grammar/spelling errors do not reflect conscientiousness ($r = .00$, $p = 1.00$). Also, whereas HR professionals consider the number of jobs amongst the least relevant resumé cues to infer conscientiousness (Burns et al., 2014), the present study suggests that the number of internships/jobs reflects conscientiousness ($r = .20$, $p = .018$). However, such inferences must be drawn with caution as there is a substantial divergence between how HR professionals self-report to make resumé based inferences and how they

actually do it (e.g., Burns et al., 2014; Cole et al., 2007; Rynes et al., 2003). Taking the present cue set and examining actual personality related cue utilizations thus represents a consequential step to better understanding why HR professionals lack accuracy. Thereby, future studies might go beyond the preliminary findings on hireability related cue utilizations based on the aggregated judgment level (average perceiver approach; Burns et al., 2014; Cole et al., 2007; Cole, Feild, Giles, et al., 2004) by conducting analyses on the single judgment level (single perceiver approach; see Back & Nestler, 2016; Nestler & Back, 2017). This would allow to (a) obtain reliable results by considering the multilevel data structure (resumés nested in HR professionals and vice versa; Nestler & Back, 2017), (b) obtain practically relevant results as HR professionals seldomly draw inferences in groups, and (c) examine interindividual variations of cue utilizations (see also Dougherty et al., 1994; Kinicki et al., 1990; Zedeck et al., 1983) and which characteristics of HR professionals (e.g., job experience, intelligence) might explain these.

Given that the present findings suggest that HR professionals' lack of accuracy of resumé based personality inferences might be to some extent due to a lack of human perceivers' using valid cues consistently, it would be intriguing to examine automated perceivers' accuracy of resumé based personality inferences (Bleidorn & Hopwood, 2019; Stachl et al., 2020; Tay et al., 2020). Automated perceivers (i.e., machine learning algorithms) should have key advantages over human perceivers because they are built to (a) use cues consistently according to their validity (e.g., to predict conscientiousness, valid cues such as the number of internships/jobs would consistently be considered more than non-valid cues such as the number of grammar/spelling errors; see Alexander et al., 2020; Karelaia & Hogarth, 2008) and (b) detect and consider complex cue interactions (e.g., the simultaneous presence of good grades and many jobs/internships might be particularly predictive of conscientiousness; see also Cole et al., 2007; Hakel et al., 1970; Knouse, 1994, suggesting that HR professionals consider simple cue interactions when making resumé based hireability inferences).[11]

This study focused on business students at career start ensuring the comparability with previous studies on personality and resumé cues (Burns et al., 2014; Cole et al., 2003b). Future

[11] The results of the nested cross-validated elastic nets (see Appendix 2.1.B) might serve as preliminary evidence that automated perceivers could achieve substantial prediction accuracy levels potentially surpassing human perceivers' accuracy levels when making resumé based personality inferences (averaged prediction accuracy *r* across the ten outer folds between .16 and .35 depending on the personality trait). However, due to the relatively small sample size, prediction accuracies were quite unstable, that is, prediction accuracies showed high variation across the ten outer folds. Future research might apply a more bottom-up approach using complex machine learning algorithms designed to handle big data (several hundred cues in thousands of resumés) and to model complex cue interactions (e.g., random forests; Breiman, 2001, neural networks; LeCun et al., 2015) to identify a reliable upper-threshold of automated perceivers' resumé based prediction accuracy.

research might examine the present findings' transferability to other applicant populations. For instance, whereas a high number of professional positions served as a valid cue for conscientiousness in our young sample, this might change amongst older applicants. Here, many professional positions might be less due to diligence, but, for instance, signaling dark personality traits causing problems at work (Grijalva & Newman, 2015; O'Boyle et al., 2012) and potentially leading to job changes (Campbell and Campbell, 2009). In a similar vein, it would be fascinating to see which findings on resumé based cue validities hold up in online contexts (profiles on professional networks such as LinkedIn; see Fernandez et al., 2021; Roulin & Levashina, 2019; Roulin & Stronach, 2022; Van de Ven et al., 2017) that long-term might replace traditional resumés (e.g., Zide et al., 2014) and come with overlapping (e.g., educational/professional experiences) but also diverging sets of cues (e.g., layout aspects in resumés, number of contacts/postings in online networks).

2.1.5.5 Conclusion. Selecting a broad set of resumé cues based on personality theory and empirical findings allowed us to identify easy-to-interpret valid resumé cues explaining substantial variance of the big five traits and narcissism. However, only a fraction of the deductively derived resumé cues actually signaled personality traits suggesting that there is a definite and rather mediocre upper limit to accurately inferring personality based on resumés. The lens model (Brunswik, 1956) turned out as a useful framework to guide future research and derive practical implications: Resumés provide some valid cues signaling personality, and thus, HR professionals' potential lack of accuracy might be to some extent due to a lack of consistently using these valid cues. Future research might pick up on this by examining (a) HR professionals' personality related cue utilizations, and (b) automated perceivers' accuracy levels. Given the mediocre upper accuracy limit of resumé based personality assessments, organizations might be advised to refrain from using them for other purposes than prescreening large amounts of applicants and rather adhere to established personnel selection tools such as self-report personality tests or structured interviews. However, resumé based personality assessments represent common practice in many organizations. Thus, the present results might be applied to improve HR professionals' accuracy by designing training sessions educating about valid resumé cues.

2.1.6 References

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Appendix 2.1.A

Table 2.1.A

Measurement, Descriptive Statistics, and Correlations With All Personality Traits Considered in the Main Analyses for the Remaining Resumé Cues Not Considered in the Main Analyses

Cue	Measurement	ICC	*M*	*SD*	r_C	r_E	r_O	r_A	r_N	r_{Nar}
	Format and layout									
Curriculum vitae as header	0 = not present; 1 = present (i.e., document type used as top header, e.g., "Curriculum Vitae", "Resumé", as opposed to own name as top header/no top header, etc.)		.61	.49	.05	.10	.00	.08	.02	.04
Foot- and/or headnote	0 = not present; 1 = present		.28	.45	-.01	.06	.00	.00	.02	.07
Name and address formatted differently	0 = not present; 1 = present (i.e., name and address formatted differently, e.g., different font/font size/highlighting)		.56	.50	.05	.02	.10	.09	.03	-.01
Academic degree and university not highlighted	0 = not present; 1 = present (e.g., bold, italicized, underlined, capitalized, different color)		.33	.47	-.01	.02	-.15	.09	.08	-.12
Inconsistent date resolution	0 = not present; 1 = present (i.e., resolution of dates (days/months/years) switches)		.51	.50	.02	.14	.05	.08	-.02	.03
Dates right	0 = not present; 1 = present (i.e., more than half of the dates is presented on the right margin)		.06	.25	.04	-.02	-.08	-.09	-.16	.08
Dates left	0 = not present; 1 = present (i.e., more than half of the dates is presented on the left margin)		.84	.37	.03	.04	.09	-.02	.13	.10
Inconsistent date position	0 = not present; 1 = present (i.e., dates are positioned inconsistently, e.g., sometimes on the right, sometimes on the left, sometimes integrated in bullet points)		.43	.50	.14	.15	.07	.13	-.06	-.01
Inconsistent chronology	0 = not present; 1 = present (i.e., deviations/errors in the chronology, e.g., a descending chronology is replaced by an ascending chronology (or vice versa))		.26	.44	.01	.02	-.03	-.02	-.01	-.03
Professional layout	1 = *not at all* to 6 = *completely* (i.e., layout looks professional, elaborated)	.76	3.71	0.80	.08	-.10	-.11	**-.17**	.12	.02
Tabular layout	1 = *not at all* to 6 = *completely* (i.e., tabular presentation, e.g., use of columns, horizontal and vertical separators, short bullet points)	.71	4.11	0.79	.13	.08	-.09	-.05	.04	.11
Harmonic layout	1 = *not at all* to 6 = *completely* (i.e., layout looks well-rounded, coherent)	.62	3.57	0.84	.00	-.07	-.03	-.15	.07	-.06
Consistent formatting	1 = *not at all* to 6 = *completely* (i.e., consistent use of headings, fonts, font sizes, bullet points, highlighting, line spacing, color, etc.)	.67	3.85	0.69	.09	**-.24**	**-.18**	-.05	.06	.12
Formatting errors	1 = *not at all* to 6 = *completely* (i.e., presence of formatting inaccuracies, e.g., bullet points inconsistently intended, non-parallel lines, overlapping graphics, inconsistent paragraph use)	.60	2.52	0.89	-.01	**.24**	.04	.05	.04	-.14
Page break within section	0 = not present; 1 = present (i.e., a section is continued on the second page)		.61	.49	-.06	-.09	-.11	-.05	.09	-.11
Page break within bullet	0 = not present; 1 = present (i.e., a bullet is continued on the second page)		.11	.31	-.01	.03	-.05	-.07	**.17**	-.01
Margin width	Average margin width in centimetres (measured separately for each side (the smallest distance was used in each case) and then averaged)		2.45	0.50	-.03	-.13	-.16	-.03	.05	.11
Space between sections	1 = *very small* to 6 = *very large*	.88	3.30	1.06	-.10	-.03	-.04	-.10	.06	.01
Line spacing	1 = *very small* to 6 = *very large*	.84	3.05	1.04	-.02	-.07	-.07	-.03	.04	.04
Fonts	Numerically counted (i.e., number of different font types)		1.17	0.38	-.06	-.01	-.05	.06	-.01	-.02

Cue	Measurement	ICC	*M*	*SD*	r_C	r_E	r_O	r_A	r_N	r_{Nar}
Serious, usual fonts	Serious, usual fonts was assessed with two subjective cues (1 = *not at all* to 6 = *completely*) assessing the seriousness of fonts and distinctiveness of fonts (recoded), respectively. The two subjective cues were highly correlated (r = .65 [.54; .74], $t(138)$ = 10.06, p < .001), and thus, z-scaled and aggregated.	.77 /.80	0.00	0.91	.02	-.13	-.07	-.05	.13	.07
Font without serif	0 = not present; 1 = present		.73	.45	.16	.07	.06	-.02	-.08	.01
Font size	Numerically counted (i.e., number of different font sizes)		3.38	1.20	-.02	.00	.03	-.09	.05	-.10
Font size headers	1 = *very small* to 6 = *very large*	.81	3.28	1.14	-.09	-.03	.12	.03	.13	-.10
Font size text	1 = *very small* to 6 = *very large*	.80	3.11	1.17	-.01	.01	.00	-.12	-.02	.06
Appropriate highlighting	1 = *not at all* to 6 = *completely* (i.e., highlighting is used appropriately, e.g., to emphasize/ structure information, facilitate the reading flow)	.63	3.34	0.99	-.01	-.08	-.08	-.07	.09	.04
Italicized words	Number of italicized words divided by total number of words		.03	.08	.03	-.02	.06	-.03	-.10	.03
Underlined words	Number of underlined words divided by total number of words		.00	.01	.03	-.15	**-.18**	-.01	.07	.02
Capitalized words	Number of words with only capitalized letters divided by total number of words		.02	.04	.14	-.08	.00	-.01	-.08	-.03
Number of symbols	Numerically counted (i.e., number of symbols, pictograms, scales, diagrams, logos, etc.)		0.79	2.31	.02	**.20**	**.17**	.04	-.14	.09
Appropriate use of color	1 = *not at all* to 6 = *completely* (i.e., color is used appropriately, e.g., to emphasize/structure information, to facilitate the reading flow)	.62	3.49	0.94	-.18	-.11	-.07	-.11	.04	-.13
Number of words	Numerically counted (resumés were standardized (e.g., standardizing abbreviations, dates, words with hyphens) and the number of words was counted by (a) an online-tool (*Zeichen zählen & Wörter zählen*, 2019) and (b) the built-in Microsoft Word-function "Word Count" (*Microsoft Word*, 2022). Both results were aggregated to a single score.		303	101	.02	.04	**.18**	.06	-.05	.03
	Education									
Comprehensive/secondary school	0 = not present; 1 = present		.08	.27	-.06	.07	.05	.00	**-.17**	.06
Business focus on school	0 = not present; 1 = present (e.g., high school with business focus, business related school subjects)		.13	.33	.12	-.06	.04	.02	.00	.01
Science school subjects	Number of science related high school subjects (e.g., mathematics, physics, chemistry, biology) divided by total number of high school subjects		.07	.18	.14	.00	-.08	-.15	-.06	.09
Humanities school subjects	Number of humanities related high school subjects (e.g., history, politics, religion) divided by total number of high school subjects		.06	.16	.10	**-.17**	-.06	-.16	-.03	.02
Language school subjects	Number of language related high school subjects (e.g., German, English, French) divided by total number of high school subjects		.07	.17	-.03	**-.17**	.05	-.01	.08	-.11
Stays abroad during school	Numerically counted		0.32	0.69	.11	.10	.08	**.23**	-.01	-.07
Mean duration stays abroad during school	Total duration of stays abroad during high school in days divided by total number of stays abroad during high school		27	76	.09	.06	-.05	**.19**	-.11	**-.18**
Mean duration academic gaps	Total duration of academic gaps in days divided by total number of academic gaps		346	347	-.07	.02	.02	-.11	.07	-.02
Study programs at technical/dual colleges	Numerically counted		0.26	0.51	-.06	.04	.07	.04	.01	-.06
Duration bachelor studies	Duration of the main bachelor study program in days		1220	237	-.09	.08	.08	.01	-.02	.09
Business administration studies	Numerically counted (i.e., number of business administration or related study programs)		0.99	0.79	.12	.06	-.02	.12	-.09	-.13

Cue	Measurement	ICC	*M*	*SD*	r_C	r_E	r_O	r_A	r_N	r_{Nar}
Economics studies	Numerically counted (i.e., number of economics or related study programs)		0.22	0.57	-.10	-.04	-.01	.05	-.07	-.09
Business and economics studies	Numerically counted (i.e., number of business and economics or related study programs)		0.18	0.46	.06	.12	-.06	.04	.14	.01
Neighbouring disciplines	Numerically counted (i.e., number of business and economics neighbouring disciplines (e.g., business education, informatics, psychology) as study programs)		0.18	0.42	-.03	.03	.05	**-.17**	.06	.09
Study focusses on finance	Numerically counted (i.e., number of focusses on finance or related subjects in study programs)		0.39	0.73	.16	.11	.01	-.14	-.08	.15
Study focusses on controlling	Numerically counted (i.e., number of focusses on controlling or related subjects in study programs)		0.06	0.25	-.10	.03	-.01	.13	.07	-.04
Study focusses on logistics	Numerically counted (i.e., number of focusses on logistics or related subjects in study programs)		0.07	0.26	.00	.07	-.12	-.08	.06	-.03
Study focusses on economics	Numerically counted (i.e., number of focusses on economics or related subjects in study programs)		0.14	0.35	.11	.03	-.15	-.05	-.07	.00
Study focusses on informatics	Numerically counted (i.e., number of focusses on informatics or related subjects in study programs)		0.13	0.33	.11	.02	.04	.05	-.02	**-.17**
Study focuses on neighbouring disciplines	Numerically counted (i.e., number of focusses on business and economics neighbouring disciplines (e.g., statistics, psychology) in study programs)		0.08	0.27	.13	-.04	-.01	-.06	.04	-.15
Theses topics	Numerically counted		0.47	0.67	-.06	-.06	.12	-.06	.03	.08
Theses with companies	Numerically counted (i.e., number of theses conducted in cooperation with companies)		0.08	0.27	-.09	-.07	-.05	-.06	.00	-.13
Bachelor thesis presented with mark	0 = not present; 1 = present		.16	.37	-.04	-.07	.07	-.04	-.06	-.07
Semesters abroad	Numerically counted (i.e., number of semesters abroad at university)		0.76	0.83	.00	-.02	.06	.16	.00	.02
	Professional experiences									
Apprenticeships	Numerically counted (including completed, aspired, and discontinued apprenticeships)		0.22	0.43	.10	.14	.08	-.01	-.14	.06
Work and travel/au pair	Numerically counted		0.09	0.28	-.06	-.04	-.08	-.16	.10	.01
Internships	Number of internships divided by total number of professional positions (internships plus jobs)		.46	.28	-.05	-.15	-.11	-.04	-.02	.02
Internships/jobs relevant for position	Number of internships/jobs relevant for the advertised trainee position divided by total number of internships/jobs		.76	.26	-.05	-.07	.03	-.14	**-.21**	.07
Internships/jobs in research	Number of internships/jobs in the field of research divided by total number of internships/jobs		.15	.22	.05	.02	.01	.02	-.12	**-.19**
Internships/jobs in consulting	Number of internships/jobs at business consultancies divided by total number of internships/jobs		.06	.13	-.06	-.01	.04	.06	-.11	-.07
Internships/jobs abroad	Number of internships/jobs abroad divided by total number of internships/jobs		.10	.17	-.03	-.13	.09	-.01	-.07	.10
Inconsistent descriptions internships/jobs	0 = not present; 1 = present (i.e., descriptions of internships/jobs sometimes provided, sometimes not provided)		.29	.46	.08	.02	-.05	.14	.07	**-.33**
Detailed descriptions internships/jobs	Detailed descriptions (i.e., descriptions of internships and jobs are extensive and detailed) was assessed with two subjective cues (1 = *not at all* to 6 = *completely*) assessing the level of	.93 /.93	0.01	0.91	-.06	-.01	.07	-.09	.05	.08

Cue	Measurement	ICC	*M*	*SD*	r_C	r_E	r_O	r_A	r_N	r_{Nar}
	detail of descriptions separately for internships and jobs. The two cues (r = .52 [.37; .64], $t(108) = 6.29$, $p < .001$) were z-scaled and aggregated.									
	Language skills									
Business languages	Number of languages most relevant in business contexts (English, Chinese, Japanese) divided by total number of languages		.51	.24	.10	-.02	-.07	-.07	-.01	.01
Business English	Numerically counted (i.e., number of references to specific knowledge in Business English)		0.11	0.31	-.01	.15	-.04	.13	.01	-.07
English level	1 = *poor* to 6 = *excellent* (i.e., high level of English skills is indicated, e.g., high language test scores, advanced level according to Common European Frame of Reference (CEFR), "business fluent")	.86	3.87	1.11	-.01	.00	-.03	.00	.09	.01
English TOEFL	0 = not present; 1 = present (i.e., Test of English as a Foreign Language (TOEFL)-score)		.24	.43	.01	.01	-.01	.00	.02	-.03
English CEFR	0 = not present; 1 = present (i.e., English level reported following the CEFR)		.31	.46	.00	.02	-.02	.08	.12	-.13
Language tests	Numerically counted		0.51	0.79	.00	.07	.04	.05	.02	-.04
Language trainings	Number of language courses divided by total number of trainings		.10	.29	.09	.04	-.03	.00	.01	.03
	Software skills									
Substantial software skills	Number of substantial software skills (excluding basic, trivial skills, e.g., operating systems such as Windows, MacOS, mail programs) divided by total number of software skills		.97	.10	.02	.09	.12	.06	-.02	-.03
Mathematical software skills	Number of mathematical software skills (e.g., Matlab, R, SPSS) divided by total number of software skills		.12	.18	.14	-.03	-.06	-.08	.06	.05
Webpage software skills	Number of software skills to maintain webpages (e.g., Java, HTML, WordPress) divided by total number of software skills		.06	.12	-.08	.13	.04	-.07	-.05	-.01
IT trainings	Number of IT courses divided by total number of trainings		.05	.22	**.20**	.08	-.03	**.23**	-.05	**-.17**
	Scholarships									
German Academic Scholarship Foundation	0 = not present; 1 = present		.07	.26	.05	.04	.15	.06	**-.20**	-.06
Germany Scholarship	0 = not present; 1 = present		.09	.29	-.06	-.08	.00	**-.22**	-.01	.14
Non-financial scholarships	Number of non-financial scholarships (e.g., online scholarships (e.g., e-fellows), talent networks of renowned companies (e.g., McKinsey First Hand Program)) divided by total number of scholarships		.10	.27	.11	-.11	-.16	.04	-.04	.02
Scholarships abroad	Number of scholarships to finance stays abroad (e.g., Erasmus, PROMOS) divided by total number of scholarships		.15	.33	-.08	.07	.07	.07	.00	-.02
Erasmus	0 = not present; 1 = present		.09	.28	**-.17**	.00	-.04	.09	.05	.03
PROMOS	0 = not present; 1 = present		.06	.25	.16	.07	.05	-.03	-.06	.02
	Extracurricular activities (EAs) and hobbies									
Political EAs	Number of EAs in political contexts (e.g., political parties, political university groups, non-governmental organizations) divided by total number of EAs		.04	.12	-.11	.07	.05	-.01	.01	-.01
Religious EAs	Number of EAs in religious contexts (e.g., church communities, religiously oriented associations) divided by total number of EAs		.04	.12	-.11	.05	.14	.01	.05	-.05
EAs abroad	Number of EAs abroad divided by total number of EAs		.05	.13	.07	-.10	.00	.10	.00	-.06

Cue	Measurement	ICC	*M*	*SD*	r_C	r_E	r_O	r_A	r_N	r_{Nar}
Political/historical hobbies	Number of hobbies related to politics, history, current/world affairs, etc. divided by total number of hobbies		.01	.04	-.04	.00	.05	.08	-.15	.03
	Other									
Professional licenses/ certifications	Numerically counted (e.g., Kaufmann International Certificate, DIN-certifications)		0.11	0.38	-.03	.15	-.01	-.02	.05	.04
Driver's license	0 = not present; 1 = present		.14	.35	-.05	.10	.01	**-.22**	.06	.12
Academic/professional trainings	Number of academic/professional trainings (workshops, voluntary seminars, etc. at the university/job; no language courses, no IT courses) divided by total number of trainings		.23	.40	**-.19**	.02	**.19**	.05	-.01	.04
Quality of leadership experiences	1 = *poor* to 6 = *excellent* (i.e., various, enduring, and relevant leadership experiences)	.84	3.23	1.38	-.10	.10	.11	-.08	-.04	.04

Note. ICC = ICC (3, k). C = conscientiousness; E = extraversion; O = openness; A = agreeableness; N = neuroticism; Nar = narcissism. EAs = extracurricular activities. Correlations in bold are significant at the $p \leq .05$ level.

Appendix 2.1.B

We computed the elastic nets (Zou & Hastie, 2005) using the respective theoretically derived cues (plus gender, 0/1 = female/male, and age as controls) as features to predict the big five traits and narcissism, respectively. Elastic nets optimize the predictive performance by regularizing features' regression coefficients, that is, applying a penalization factor λ. This yields parsimonious models that only contain features adding predictive power and prevents overfitting to the data. We separated hyperparameter tuning and computing prediction accuracy by implementing a nested cross-validation approach (10 x 10 nested resampling; Cawley & Talbot, 2010; Varma & Simon, 2006; see also Stachl et al., 2020). The inner loop consisted of a 10-fold cross-validation for preprocessing and hyperparameter tuning (Kohavi, 1995). Preprocessing comprised three steps. (a) We imputed missing values using the missForest package (version 1.5; Stekhoven, 2022; see also Stekhoven & Bühlmann, 2012). (b) We winsorized extreme values to reduce their disproportionate influence (see Hastie et al., 2009). (c) We *z*-standardized features and the target output. For hyperparameter tuning, we tested 100 λ and selected the λ that minimized the MSE of the predicted from the observed values. We saved the best performing model of the 10-fold cross-validation for the evaluation on the test data in the outer loop. As measures of feature importance, we averaged the regression coefficients across the models evaluated in the ten outer folds.

Table 2.1.B1

Hyperparameter and Performance Estimates of Nested Cross-Validated Elastic Nets

	Conscientiousness				Extraversion				Openness				Agreeableness				Neuroticism				Narcissism			
	Elastic net		Baseline		Elastic net		Baseline		Elastic net		Baseline		Elastic net		Baseline		Elastic net		Baseline		Elastic net		Baseline	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
λ_{Min}	0.21	0.14			0.11	0.11			0.15	0.13			0.17	0.05			0.12	0.04			0.12	0.03		
r	.16	.22			.16	.23			.23	.21			.28	.23			.26	.23			.35	.28		
R^2	.06	.05			.07	.05			.11	.08			.06	.04			.09	.04			.13	.11		
$R^2_{\text{Adj.}}$	-.01	.02			.02	.04			.03	.07			.01	.03			.05	.04			.07	.11		
RMSE	0.96	0.05	0.96	0.00	0.96	0.07	0.96	0.00	0.96	0.07	0.96	0.00	0.93	0.05	0.96	0.00	0.94	0.07	0.96	0.00	0.92	0.12	0.96	0.00
MSE	0.93	0.09	0.93	0.09	0.92	0.13	0.93	0.00	0.92	0.13	0.93	0.00	0.88	0.10	0.93	0.00	0.88	0.12	0.93	0.01	0.86	0.23	0.93	0.00
MAE	0.79	0.06	0.79	0.04	0.81	0.08	0.81	0.05	0.77	0.07	0.79	0.04	0.77	0.05	0.79	0.03	0.74	0.05	0.78	0.03	0.76	0.11	0.81	0.03

Note. $N = 141$. Intercept-only model (mean) served as baseline model.

Table 2.1.B2

Regression Coefficients of Nested Cross-Validated Elastic Nets Predicting Personality Traits

Cue	β_M	β_{SD}	CV_{FI}
Conscientiousness			
Intercept	0.00	0.00	10
Gender (0/1 = female/male)	0.01	0.03	1
Age	-0.03	0.02	8
Page numbers	0.01	0.02	4
Tidy information presentation	0.06	0.06	6
Subordinate sections	0.02	0.03	5
Internships and jobs separated	0.05	0.05	8
Study focusses	0.01	0.02	3
Descriptions internships/jobs	0.00	0.00	1
Primary school	0.02	0.04	5
School subjects	0.02	0.03	4
Hobbies	0.05	0.03	8
Grammar/spelling errors	0.00	0.00	0
Years on secondary school	-0.05	0.04	7
Studies above standard period	-0.01	0.02	3
Average marks	-0.05	0.04	8
Internships/jobs	0.07	0.05	8
Scholarships	0.00	0.00	0
Academic extracurricular activities (EAs)	0.08	0.05	8
Extraversion			
Intercept	0.00	0.00	10
Gender (0/1 = female/male)	0.00	0.00	0
Age	0.03	0.03	8
Links to online networks	0.12	0.05	9
Appealing look	0.10	0.05	9
Bold words	0.05	0.03	8
Colors	0.05	0.03	9
Study focusses on management	0.06	0.03	8
Leadership positions in EAs	0.09	0.05	9
Team sport hobbies	-0.08	0.04	8
Openness			
Intercept	0.00	0.00	10
Gender (0/1 = female/male)	0.08	0.05	8
Age	0.00	0.00	0
Distinctive look	0.06	0.04	8
Types of bullets	0.00	0.00	0
Fonts with and without serifs	0.00	0.01	3
Flow text	0.09	0.06	8
Experience before education section	0.03	0.03	7
Vocational high school	0.09	0.06	8
Extraordinary hobbies	0.01	0.02	6
Study focusses on marketing	0.00	0.01	1
Study focusses on accounting/taxation	-0.03	0.03	7
Graphic software skills	0.03	0.03	8
Creative hobbies	0.12	0.07	8
Mean duration internships/jobs	-0.07	0.05	8
Software skills	0.02	0.02	8
Languages	0.09	0.06	8
Latin	-0.06	0.04	8
Trainings	0.08	0.05	8
Financial scholarships	0.03	0.02	8
Agreeableness			
Intercept	0.00	0.00	10
Gender (0/1 = female/male)	-0.17	0.03	10
Age	0.00	0.01	1

Cue	β_M	β_{SD}	CV_{FI}
Interpersonal skills	0.00	0.00	0
Teams	-0.04	0.04	7
EAs	0.00	0.00	0
Mean duration EAs	0.08	0.04	9
Tutoring	0.02	0.02	9
Stays abroad	0.07	0.02	10
Mean duration stays abroad	0.06	0.03	9
International orientation of studies	0.00	0.01	3
Travel hobbies	0.01	0.02	5
Intercultural skills	0.02	0.02	5
Neuroticism			
Intercept	0.00	0.00	10
Gender (0/1 = female/male)	-0.20	0.04	10
Age	0.04	0.03	8
Discontinued studies	0.04	0.03	8
Academic gaps	0.01	0.02	3
Constructive use of gaps	0.00	0.00	0
Reputation of universities	-0.12	0.03	10
Reputation of employers	-0.05	0.02	10
Sport EAs	-0.05	0.03	9
Sport hobbies	0.00	0.00	1
Recreational sport hobbies	0.09	0.05	9
Narcissism			
Intercept	0.00	0.00	10
Gender (0/1 = female/male)	0.19	0.03	10
Age	-0.01	0.03	1
Prominent name position	0.00	0.01	2
Own name	-0.02	0.04	2
Academic comparison	0.03	0.03	7
Accomplishments with professional experiences	0.00	0.00	1
Awards	0.02	0.02	9
Top tier business consultancies/auditing firms	0.15	0.03	10
Altruistic EAs	-0.09	0.03	10
Career-oriented EAs	0.08	0.02	10
Cognitive hobbies	0.05	0.03	9
Business hobbies	0.00	0.00	2
Pleasure hobbies	-0.08	0.03	10
Social hobbies	-0.06	0.04	10

Note. $N = 141$. CV_{FI} = cross-validation fold incidence, which refers to the number of outer folds the regression coefficient β of the cue was ≠ zero. EAs = extracurricular activities. All values on *z*-scale.

Appendix 2.1.C

Table 2.1.C

Intercorrelations Between All Personality Traits Considered in the Main Analyses, Age, Gender, and All Resumé Cues of the Main and Supplemental Analyses

		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
1.	Conscientiousness	-	**.19**	-.05	**.19**	**-.32**	-.09	-.03	**-.19**	.08	.13	.10	.16	.08	.02	.12	.09	.15	.00	**-.21**	-.12	**-.21**	**.20**	.02	**.21**	.08	.12	.08	.10	.01	.00
2.	Extraversion		-	**.35**	.16	**-.36**	.04	.01	.08	-.03	-.14	.02	-.03	.11	.01	.06	-.08	.09	.02	.08	.12	**.22**	-.01	.05	.03	**.20**	**.17**	.14	.16	.10	.12
3.	Openness			-	.10	**-.27**	.16	.14	.08	-.01	-.13	.06	-.13	-.08	.02	.01	.00	.10	.12	.10	.04	.08	-.10	.05	-.04	.09	.08	.07	.09	.01	-.04
4.	Agreeableness				-	**-.21**	**-.40**	**-.27**	-.01	.03	-.13	**.18**	.03	-.13	-.09	.15	-.11	.15	.06	-.04	.07	.13	.12	-.05	.04	.08	-.06	-.03	-.07	.11	.05
5.	Neuroticism					-	.05	**-.29**	.09	.07	.14	.00	-.04	.08	.06	-.06	-.04	.03	-.02	.00	-.02	-.01	.13	-.07	.00	-.16	-.01	-.13	.00	.00	-.06
6.	Narcissism						-	**.29**	-.06	-.01	.03	-.12	-.06	.01	-.02	-.02	.03	.04	.11	-.02	-.08	.01	**-.18**	.05	.04	.03	-.01	.08	.11	-.15	-.02
7.	Gender (0/1 = female/male)							-	.05	.03	.12	**-.17**	-.11	-.08	.08	-.07	.12	-.02	-.01	.08	-.02	.15	**-.22**	.05	-.15	.08	-.02	.13	-.05	-.15	.00
8.	Age								-	.01	-.05	**.24**	**-.19**	.11	.10	-.11	**-.24**	.08	-.06	**.40**	**.35**	**.43**	.02	-.11	-.12	.11	.02	-.13	**.19**	.09	-.09
9.	Page numbers									-	-.05	.04	.05	.06	.02	.07	.00	.09	.00	-.09	.07	-.01	.01	**-.21**	-.03	-.03	.04	-.01	.00	-.01	.02
10.	Tidy information presentation										-	**-.17**	**-.21**	.13	**.19**	**-.18**	.10	-.03	-.15	.07	-.11	-.03	-.10	-.05	.09	-.16	**.44**	.00	.00	.05	.07
11.	Subordinate sections											-	**.19**	-.03	-.04	.07	-.11	.15	-.04	.01	.07	-.02	.16	.09	.07	-.01	-.08	-.16	-.07	.09	-.08
12.	Internships/jobs separated												-	-.14	**-.17**	.15	-.05	-.01	-.01	-.08	-.06	-.07	.11	-.11	-.01	-.02	-.08	.07	-.07	-.12	.01
13.	Study focusses													-	**.18**	-.16	.10	.03	-.10	-.05	**.21**	-.02	.10	-.07	-.07	-.03	.16	.12	.04	**.37**	.11
14.	Descriptions internships/jobs														-	-.15	.06	.03	.04	.16	.02	.04	.01	.03	.04	.01	.16	.06	.03	.15	-.01
15.	Primary school															-	-.06	.05	.09	.02	.00	**.21**	**.17**	-.12	.05	.08	**-.19**	-.01	-.04	-.06	-.09
16.	School subjects																-	-.02	.03	-.02	-.09	-.08	-.07	.09	-.03	-.05	-.01	.16	-.14	-.07	.14
17.	Hobbies																	-	**.21**	.14	-.06	-.08	**.21**	-.03	-.06	.02	.02	-.03	.09	.05	.05
18.	Grammar/spelling errors																		-	-.12	**-.17**	.06	**.20**	-.11	.00	.14	.07	.02	.07	-.13	-.06
19.	Years on secondary school																			-	.10	**.30**	-.10	.03	-.08	**.23**	-.06	-.07	**.21**	-.13	.08

		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
20.	Studies above standard period																				-	**.32**	.02	-.13	-.04	-.07	-.09	-.06	.10	.12	-.08
21.	Average marks																					-	.01	**-.35**	**-.23**	-.06	.05	-.07	.08	-.03	-.09
22.	Internships/jobs																						-	-.16	.07	-.12	.05	.01	.11	.07	-.03
23.	Scholarships																							-	**.17**	.02	-.16	-.03	-.15	.09	.13
24.	Academic extracurricular activities (EAs)																								-	-.10	.09	-.03	-.08	-.05	.14
25.	Links to online networks																									-	-.05	.13	**.34**	-.03	-.05
26.	Appealing look																										-	.14	.01	.02	.02
27.	Bold words																											-	.02	.02	.09
28.	Colors																												-	**.17**	-.03
29.	Study focusses on management																													-	-.01
30.	Leadership positions in EAs																														-
31.	Team sport hobbies	-.04	-.14	-.06	.01	.05	-.04	.13	-.02	.11	.10	.11	.05	.08	-.13	-.01	-.04	**.19**	-.03	.06	.00	-.04	.08	.01	-.05	-.15	-.04	-.06	-.10	.03	**.22**
32.	Distinctive look	-.02	.05	.14	.04	-.07	-.11	-.11	.08	.06	-.06	-.05	-.07	.08	.03	.04	.01	-.03	.07	.19	.00	.09	-.06	-.06	-.12	**.27**	**.31**	**.27**	**.41**	.12	-.02
33.	Types of bullets	.05	-.12	.04	-.14	.12	.16	.07	.10	.04	.01	.10	-.08	.16	**.45**	**-.24**	.11	.15	**.19**	.07	.04	-.05	-.02	.03	-.13	.10	.06	-.05	.14	.08	-.05
34.	Fonts with and without serifs	-.16	.12	.04	.05	.02	-.05	-.06	.13	.16	-.05	**.18**	-.04	-.03	-.07	.13	-.10	-.08	-.04	.16	-.02	-.01	-.06	.01	-.03	.10	-.04	-.08	-.04	**.21**	-.04
35.	Flow text	-.11	.10	**.17**	-.08	**-.17**	.05	**.26**	**.20**	-.10	-.08	-.14	-.11	.09	.09	-.10	.06	.05	.05	**.24**	.10	.04	-.04	.05	-.07	.13	.06	.04	**.17**	.04	.02
36.	Experience before education section	-.10	.08	.15	-.09	.04	.13	.05	.09	.06	-.14	-.03	-.06	.04	-.08	-.12	.03	.05	.12	-.13	-.03	-.02	-.13	-.06	**-.23**	.16	.01	.03	.05	-.03	-.15
37.	Vocational high school	-.01	-.05	**.19**	-.03	-.04	-.01	.09	**.32**	-.04	-.10	.13	.00	.04	**-.19**	-.12	-.09	.00	.09	-.07	.01	.05	-.05	-.10	-.09	.16	.00	-.12	.09	-.07	-.04
38.	Extraordinary hobbies	-.05	.10	.12	.14	-.18	.13	.17	-.11	-.02	-.13	-.05	**-.22**	-.03	.04	-.01	**.22**	.08	.06	-.08	.18	.11	-.13	.05	.04	.16	-.01	.21	-.14	-.07	.10
39.	Study focusses on marketing	-.02	.03	.07	.12	.03	.15	-.12	.08	-.12	-.05	.06	-.12	**.19**	-.06	-.02	-.03	**.18**	.08	-.02	.05	.00	.07	**-.17**	-.03	.09	.16	.06	.14	**.24**	-.04
40.	Study focusses on accounting/taxation	.07	-.05	-.13	-.01	.05	-.01	-.07	-.13	.08	.16	-.02	.01	**.38**	.06	-.05	.09	-.04	-.09	-.13	-.01	-.07	.04	-.05	-.11	-.15	.12	.13	-.08	-.04	.14
41.	Graphic design software skills	-.10	-.03	.13	-.04	-.02	.02	.00	-.03	-.07	-.16	.00	.06	-.15	-.12	-.10	.12	-.09	.09	.03	.00	-.01	**.17**	-.02	.06	.01	-.05	.03	.00	-.15	.07
42.	Creative hobbies	.03	.03	**.19**	**.17**	-.02	-.04	-.02	-.03	.08	**-.20**	.10	.08	-.06	.10	.00	-.01	**.23**	.05	-.10	-.02	-.11	.15	-.02	.07	.07	-.05	.05	-.04	-.11	.00
43.	Mean duration internships/jobs	.07	.08	-.12	-.10	.03	-.04	-.09	**.31**	.06	-.04	.10	.11	.14	-.08	.00	-.12	-.09	-.11	-.07	.12	.13	.09	-.14	.08	-.11	.07	.11	.05	.11	.06

		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
44.	Software skills	-.12	-.13	.15	-.09	.15	-.02	.02	.06	.10	.04	.07	-.08	.12	-.01	**-.20**	-.14	-.04	-.03	.04	.11	-.09	.05	-.11	-.09	.01	.07	.06	.00	.02	**-.18**
45.	Languages	-.08	.11	.16	.16	**.18**	-.01	**-.24**	.07	.03	**-.23**	**.19**	-.04	-.05	.00	.00	-.02	.12	.06	.04	.09	-.10	.10	.09	.10	.12	-.15	.06	.04	**.21**	.00
46.	Latin	.04	-.01	-.16	.14	-.02	-.13	-.03	**-.25**	-.05	.05	-.07	-.03	-.10	-.10	.10	.06	-.07	.04	-.10	.00	-.02	.08	.01	.15	-.01	.07	.10	-.14	-.09	-.06
47.	Trainings	-.03	.07	.15	.10	.03	-.02	-.08	.00	.00	-.11	.07	.12	-.03	-.12	**.23**	-.15	-.01	.09	-.07	.03	.05	.16	-.07	.05	-.01	.02	-.08	.02	.04	-.06
48.	Financial scholarships	.01	-.04	.13	-.11	-.11	.03	.05	-.05	-.04	-.07	**.22**	.07	-.06	-.11	-.06	-.01	-.04	-.09	.01	-.10	**-.38**	.00	**.42**	.16	.04	-.04	-.08	-.08	-.04	.04
49.	Interpersonal skills	.05	.00	.08	.04	.03	.01	-.11	.11	.11	-.15	-.01	-.14	**.18**	.12	.04	-.01	-.08	-.02	-.10	.13	-.15	-.06	.09	.12	**.23**	**-.17**	-.01	**.22**	**.28**	-.04
50.	Teams	-.01	-.06	.03	-.11	.00	-.04	-.01	.02	.00	-.14	.01	-.07	.07	.13	**-.21**	-.01	.09	.06	-.11	.01	**-.20**	.07	-.02	.01	.13	-.07	.04	.08	.02	.15
51.	EAs	.01	-.01	.06	.01	-.09	-.02	.05	.03	.05	**-.17**	**.17**	.08	**-.19**	-.01	-.07	.06	-.08	-.07	-.10	.09	**-.21**	.04	**.29**	**.35**	.04	-.12	.13	-.05	-.01	.14
52.	Mean duration EAs	-.02	-.04	-.05	**.17**	-.07	-.09	.03	.14	.07	-.10	.05	.13	**-.17**	-.12	**.18**	.14	-.01	-.11	**.20**	.16	.09	-.07	.13	.01	-.04	**-.20**	.00	-.12	-.14	**.27**
53.	Tutoring	.13	.02	.15	.11	-.13	.01	.05	-.14	.00	.01	.02	-.09	-.03	-.02	.11	-.05	.07	.00	-.14	-.13	-.13	**.21**	.10	**.23**	.04	-.06	.14	.04	.11	.12
54.	Stays abroad	.00	.07	.11	**.21**	-.04	-.08	-.17	-.03	-.06	**-.19**	.12	-.05	-.06	**.18**	.12	.03	**.17**	**.24**	.08	.02	-.12	**.19**	**.35**	**.21**	.02	-.15	.01	-.09	.02	.04
55.	Mean duration stays abroad	-.12	.05	.05	**.18**	-.08	-.09	-.01	.10	.08	.01	.07	**-.20**	-.05	**.20**	.02	-.01	-.04	.07	.16	.12	.11	.04	**.19**	-.03	.04	.02	.01	-.02	.10	.05
56.	International orientation of studies	.06	-.07	-.10	.10	-.11	-.01	-.03	-.02	-.04	-.06	-.06	.05	-.16	**.18**	-.04	.09	.02	.14	.12	-.11	-.03	.05	.03	.00	**.28**	.03	.05	-.04	-.06	.06
57.	Travel hobbies	.02	.12	.05	.10	-.01	-.03	-.08	.13	-.06	-.04	.10	-.07	.13	.09	-.13	-.13	**.42**	.06	**.22**	.06	.01	.01	.07	.02	-.07	.09	**-.19**	-.02	**.19**	-.01
58.	Intercultural skills	-.13	.01	-.03	.12	-.02	-.06	.02	**.25**	**-.17**	-.10	.16	-.06	.07	.07	-.04	-.09	.12	.05	.15	.14	.06	.01	.09	-.01	.15	-.02	.00	.07	**.19**	-.11
59.	Discontinued studies	-.07	-.06	-.12	-.08	.14	-.12	-.04	.01	.16	-.01	.01	.00	-.10	.08	-.05	.01	.15	.02	.10	-.12	-.10	-.13	.00	.12	.08	-.01	-.07	-.07	.00	-.04
60.	Academic gaps	-.03	-.05	.03	-.01	.04	-.04	.05	**.28**	.07	.08	.10	-.07	.09	.14	.09	-.01	**.17**	.05	.04	.05	**.20**	.04	-.09	.00	-.01	-.01	-.02	.06	.03	**-.30**
61.	Constructive use of gaps	.02	.00	-.03	.06	-.05	.08	.06	.01	.01	.11	.06	-.08	**.28**	-.08	-.06	.01	.05	-.02	-.01	.00	-.03	.02	.06	-.20	.13	-.11	.01	.03	.09	-.11
62.	Reputation of universities	.13	.05	.11	.02	**-.23**	.16	.10	-.01	.05	-.06	-.09	**.24**	.04	-.05	-.02	.00	.05	.11	.13	.09	-.01	.01	-.09	.06	.05	.09	**.20**	.06	-.11	.06
63.	Reputation of employers	-.01	.04	.06	-.07	-.15	.08	.10	-.01	.01	.01	.06	.02	**.19**	**.18**	**-.25**	.08	-.12	-.11	-.01	.05	-.13	-.08	**.32**	-.03	-.11	.08	-.04	-.10	-.04	.09
64.	Sport EAs	.06	.04	-.16	.07	-.12	-.10	.00	.00	.01	.10	-.08	-.03	.12	.00	-.06	.16	**.20**	.04	-.02	-.03	.02	.04	-.06	**-.22**	-.01	.08	.14	-.02	.02	**.37**
65.	Sport hobbies	.08	-.06	-.10	-.05	.07	-.04	-.02	.01	**.17**	.14	.07	-.08	.02	-.05	-.04	.11	**.36**	.00	.11	-.14	-.03	.12	-.09	-.04	-.13	-.02	-.11	-.04	.00	.12
66.	Recreational sport hobbies	.13	.08	-.11	-.08	.16	.06	.04	.03	.15	.15	-.04	-.03	.02	.00	-.09	.03	**.42**	.04	.12	**-.21**	-.05	.12	-.06	-.07	-.06	.15	-.05	.16	.10	.04
67.	Prominent name position	-.01	.05	.08	-.04	-.04	.05	.00	-.06	-.01	.12	-.15	-.15	-.16	.08	-.01	-.01	.05	-.01	.17	-.07	-.07	-.06	.16	.14	.10	.11	.10	-.06	.06	.14
68.	Own name	.09	.11	-.07	-.11	.00	-.07	-.04	-.08	.14	-.08	-.01	.06	.05	-.01	-.03	.06	.02	-.15	.09	.01	-.01	.01	-.06	-.02	-.08	.02	.06	.03	.00	.04
69.	Academic comparison	-.07	-.03	.11	-.08	.00	.16	-.04	-.06	-.02	-.12	.13	.02	.02	.06	.12	**.22**	-.05	-.05	.05	-.06	-.13	-.07	**.20**	.08	.09	-.14	-.02	-.13	-.05	.01

		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
70.	Accomplishments with professional experiences	.04	-.04	.13	.01	-.10	.08	.11	-.03	-.01	-.05	-.04	.08	.08	.14	.00	-.02	.09	.12	-.11	-.03	-.07	.00	.02	-.01	-.07	-.01	.08	-.06	-.06	.06
71.	Awards	.00	-.06	.04	-.10	-.11	.10	.12	**-.26**	.00	-.09	.06	.08	-.07	-.11	-.09	.15	.08	-.15	-.02	-.13	**-.36**	-.09	**.45**	.01	.12	-.08	.08	.09	.02	.05
72.	Top tier business consultancies/ auditing firms	.03	.01	-.02	**-.18**	-.08	**.29**	.13	-.03	-.02	.07	.13	-.02	.07	.15	-.04	.03	.01	.02	.09	-.03	.04	-.05	**.17**	.00	-.11	-.03	-.14	-.05	-.07	.02
73.	Altruistic EAs	.05	-.14	-.05	.00	-.07	-.15	.12	.14	.11	-.11	.12	.06	-.15	.02	.05	-.01	-.01	**-.19**	.05	**.20**	.05	-.15	-.07	-.09	.05	-.13	-.12	.04	.00	-.15
74.	Career-oriented EAs	.00	-.05	.00	-.11	-.07	**.23**	.06	**-.17**	-.05	.07	-.03	.09	-.12	.06	.04	-.07	.01	**.23**	-.10	-.05	**-.17**	.05	.05	-.03	.11	.04	.02	-.03	-.07	-.12
75.	Cognitive hobbies	.10	-.05	.08	.06	.07	.14	.02	-.11	.00	-.02	.05	.03	**-.20**	-.01	.05	**.18**	**.26**	-.02	-.05	.04	-.10	-.01	.06	.00	.08	-.09	-.05	.01	-.12	.02
76.	Business hobbies	.02	.11	.10	.00	**-.17**	-.01	**.20**	-.09	-.12	.12	.01	-.12	.03	-.01	.12	.04	**.27**	-.03	-.03	-.14	.05	-.16	.10	-.11	.09	.01	.08	-.02	.15	.00
77.	Pleasure hobbies	.07	.07	.08	-.04	.05	**-.19**	-.07	**.17**	.00	.00	**.17**	-.03	.00	.12	-.02	-.11	**.19**	.06	-.03	-.13	-.08	.08	-.02	-.07	.03	-.05	-.14	.06	**.25**	-.02
78.	Social hobbies	.02	.04	-.02	.11	.05	-.13	-.07	-.03	-.04	-.09	.00	.11	.00	.02	.07	.03	**.22**	.06	.06	.03	-.02	.15	.01	-.16	-.02	**-.19**	-.12	**.17**	**.17**	-.01
79.	Curriculum vitae as header	.05	.10	.00	.08	.02	.04	.02	.13	.11	.10	.13	-.02	.06	.00	.13	-.10	.04	-.05	.02	.15	**.19**	.06	-.12	**-.17**	-.06	-.04	**-.20**	.04	.08	-.12
80.	Foot- and/or headnote	-.01	.06	.00	.00	.02	.07	-.03	-.04	.13	-.12	**.17**	.01	.10	-.02	-.11	.00	.10	.01	.13	-.05	.00	.03	.10	.01	.01	.03	.04	.10	.10	.10
81.	Name and address formatted differently	.05	.02	.10	.09	.03	-.01	-.04	-.07	-.07	.03	-.05	-.07	-.05	.12	.07	.04	.09	.16	.01	-.11	-.09	.13	.09	**.18**	.08	**.21**	.09	-.02	.02	.07
82.	Academic degree and university not highlighted	-.01	.02	-.15	.09	.08	-.12	-.15	.05	.00	**-.19**	.13	.02	-.07	**-.22**	.05	**-.18**	-.13	**-.21**	-.01	.10	.16	.04	-.13	-.02	-.13	**-.28**	**-.50**	-.05	-.13	.05
83.	Inconsistent date resolution	.02	.14	.05	.08	-.02	.03	-.07	**-.18**	.02	-.10	.07	.06	-.08	-.01	**.25**	-.02	**.19**	.12	-.03	-.04	-.12	**.23**	.13	.15	.05	.03	-.05	.03	-.08	.00
84.	Dates right	.04	-.02	-.08	-.09	-.16	.08	.11	**-.25**	-.08	**-.21**	-.08	**.17**	-.15	.14	-.09	.09	-.10	.10	-.04	**-.26**	**-.19**	.08	**.22**	.08	.15	-.09	.13	-.10	-.02	.12
85.	Dates left	.03	.04	.09	-.02	.13	.10	.11	**.25**	.07	**.37**	.10	-.13	-.02	.04	.03	-.14	**.17**	-.04	.19	.07	**.20**	.00	-.09	-.06	-.10	.13	**-.23**	.06	-.05	.01
86.	Inconsistent date position	.14	.15	.07	.13	-.06	-.01	-.01	-.03	.11	-.02	.10	-.02	-.04	.08	.02	.03	**.17**	.02	.04	-.02	-.11	**.22**	.05	**.17**	.04	.04	**-.21**	.06	.04	**.19**
87.	Inconsistent chronology	.01	.02	-.03	-.02	-.01	-.03	-.01	-.04	-.03	-.04	-.01	.13	.05	-.16	-.04	-.02	.08	-.06	-.01	.09	-.12	**.20**	.00	**.21**	-.04	.03	-.09	-.14	-.12	**.20**
88.	Professional layout	.08	-.10	-.11	**-.17**	.12	.02	.07	-.05	.00	**.56**	-.09	**-.17**	**.21**	**.27**	**-.24**	.11	.03	-.15	-.14	-.05	-.12	.04	.11	**.24**	**-.30**	**.53**	.08	**-.25**	.07	.11
89.	Tabular layout	.13	.08	-.09	-.05	.04	.11	.08	.00	.00	**.29**	.08	.02	-.01	-.04	-.14	-.04	.04	-.02	-.10	.03	.11	-.11	.00	.10	-.13	**.18**	.04	.02	-.05	.09
90.	Harmonic layout	.00	-.07	-.03	-.15	.07	-.06	.00	.01	-.01	**.58**	-.13	**-.19**	**.21**	**.19**	-.11	.04	-.04	-.10	-.05	-.04	-.01	-.02	-.01	.14	**-.22**	**.69**	.07	-.16	.08	.03
91.	Consistent formatting	.09	**-.24**	**-.18**	-.05	.06	.12	.11	-.06	-.01	**.45**	-.12	-.07	.15	.06	**-.19**	.08	.01	**-.22**	-.07	-.04	**-.18**	-.01	.12	.10	**-.20**	.16	-.04	-.07	.03	.04
92.	Formatting errors	-.01	**.24**	.04	.05	.04	-.14	-.07	.16	-.01	**-.34**	.10	.03	.00	-.05	.06	**-.20**	-.09	.16	-.05	-.03	**.17**	.10	-.09	-.09	**.23**	-.01	.03	.16	.08	.00

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
93. Page break within section	-.06	-.09	-.11	-.05	.09	-.11	-.01	.05	.04	.16	-.13	-.11	.11	**.28**	-.10	.03	.11	.05	.09	.01	-.03	.08	-.01	.13	**-.18**	.07	.07	-.07	.08	.08
94. Page break within bullet	-.01	.03	-.05	-.07	**.17**	-.01	-.02	.03	.13	-.03	-.05	-.06	.00	.02	.03	-.06	.10	.15	.08	.14	.06	-.05	.00	.11	-.10	-.06	-.08	.01	-.06	.01
95. Margin width	-.03	-.13	-.16	-.03	.05	.11	-.04	-.11	.01	**.18**	-.12	.04	-.09	-.13	.16	-.06	**-.29**	-.04	-.01	-.05	.14	-.15	-.09	-.02	**-.26**	-.14	-.05	-.11	-.11	-.12
96. Space between sections	-.10	-.03	-.04	-.10	.06	.01	**-.19**	-.11	-.11	.06	-.15	.06	.02	-.15	**.21**	-.09	-.11	-.10	.18	-.06	.03	-.05	-.08	.13	-.04	.00	-.03	.00	.03	.03
97. Line spacing	-.02	-.07	-.07	-.03	.04	.04	.01	.05	-.03	.05	-.15	.12	.01	-.09	.10	-.04	.00	.14	.06	-.05	.09	.07	-.06	-.16	-.05	.11	**.19**	.07	-.04	.01
98. Fonts	-.06	-.01	-.05	.06	-.01	-.02	-.02	.12	**.27**	-.12	.11	.01	-.03	.06	.03	-.13	.01	-.05	.09	.06	-.09	.00	-.02	.04	**.17**	-.04	-.11	.06	.10	.01
99. Serious, usual fonts	.02	-.13	-.07	-.05	.13	.07	.13	.03	-.04	.12	.10	-.05	-.11	.02	**-.17**	-.03	.03	-.04	-.03	-.04	-.05	.10	-.07	-.01	**-.18**	-.10	**-.20**	-.06	-.11	-.02
100. Font without serif	.16	.07	.06	-.02	-.08	.01	.01	-.14	-.07	.14	-.13	.08	**.17**	.06	-.15	.02	.08	-.07	-.10	.06	-.03	-.09	-.06	.05	-.08	.14	.14	-.05	-.08	.00
101. Font size	-.02	.00	.03	-.09	.05	-.10	-.01	.04	.14	-.11	**-.17**	-.10	.13	.05	.06	**.21**	.06	.03	.02	-.01	.00	.01	.02	-.09	.07	.14	.10	**.21**	.12	-.10
102. Font size headers	-.09	-.03	.12	.03	.13	-.10	-.07	-.07	.08	.03	-.09	-.06	.06	-.12	-.01	.00	.01	.14	-.03	-.03	.08	-.06	**-.18**	**-.18**	.06	**.19**	.07	**.27**	.12	-.11
103. Font size text	-.01	.01	.00	-.12	-.02	.06	-.10	-.01	.03	.02	-.01	.04	-.11	-.04	.03	-.10	-.15	.10	**-.20**	-.01	.15	**-.19**	**-.17**	-.09	.07	.14	.03	.16	-.06	-.09
104. Appropriate highlighting	-.01	-.08	-.08	-.07	.09	.04	.01	**-.22**	.03	**.54**	**-.22**	-.15	**.18**	**.27**	**-.27**	.08	.01	-.04	-.18	**-.22**	-.13	-.03	-.02	.11	**-.29**	**.50**	**.17**	-.13	.12	.08
105. Italicized words	.03	-.02	.06	-.03	-.10	.03	.00	-.09	.01	-.06	.03	.05	-.13	.11	-.03	.07	-.03	.13	.12	-.07	-.14	-.11	.10	-.13	.14	-.06	-.05	.06	.04	.02
106. Underlined words	.03	-.15	**-.18**	-.01	.07	.02	-.13	.00	.08	-.15	-.06	-.08	.15	-.14	**.24**	-.01	-.15	.00	-.09	-.06	-.03	-.02	.05	.03	-.02	**-.27**	-.14	-.03	.09	.01
107. Capitalized words	.14	-.08	.00	-.01	-.08	-.03	.01	-.02	.14	-.03	-.04	-.01	.03	-.06	**.30**	**.18**	.06	-.05	.04	-.03	.07	-.05	-.09	-.04	.10	-.02	**.18**	.04	.05	.03
108. Number of symbols	.02	**.20**	**.17**	.04	-.14	.09	.02	.16	-.02	**-.23**	.04	.00	.15	.04	-.04	-.09	.07	.16	**.29**	**.19**	.13	.12	**-.19**	-.03	**.35**	.09	.09	**.56**	.05	.05
109. Appropriate use of color	-.18	-.11	-.07	-.11	.04	-.13	-.15	-.02	.01	**.32**	.05	-.01	.02	.02	**-.23**	.05	-.13	**-.22**	.10	-.04	.08	-.10	**-.21**	.07	**-.33**	**.50**	.07	**-.24**	.03	.08
110. Number of words	.02	.04	**.18**	.06	-.05	.03	.10	.04	.01	**-.17**	.09	-.10	.10	**.37**	**-.18**	.13	**.24**	.10	.04	.06	**-.27**	**.25**	**.33**	.14	.11	.01	.11	-.03	.06	.12
111. Comprehensive/ secondary school	-.06	.07	.05	.00	**-.17**	.06	.15	.09	-.04	-.03	.07	.14	-.09	**-.23**	-.01	-.14	-.06	.06	-.04	-.11	.14	-.03	-.07	-.16	.02	.08	.08	.00	.09	-.07
112. Business focus on school	.12	-.06	.04	.02	.00	.01	.04	.10	-.02	-.04	.04	-.01	.07	.00	.01	**.32**	.01	.07	-.06	-.05	-.06	-.02	-.07	-.09	**.23**	.01	.06	.10	-.09	.05
113. Science school subjects	.14	.00	-.08	-.15	-.06	.09	.09	**-.24**	-.05	.14	-.10	-.01	.00	-.02	-.08	**.70**	-.03	.02	.06	-.13	-.06	-.09	.05	.00	.04	.02	**.25**	-.10	-.16	.09
114. Humanities school subjects	.10	**-.17**	-.06	-.16	-.03	.02	.12	**-.22**	.00	.03	-.07	-.01	.05	.06	.01	**.60**	-.07	.07	-.03	-.07	**-.19**	-.14	.05	.04	.07	.01	.12	-.09	-.14	.06
115. Language school subjects	-.03	**-.17**	.05	-.01	.08	-.11	.06	**-.18**	.00	.10	-.08	-.08	.09	.11	-.07	**.73**	-.02	.14	-.03	**-.17**	-.04	.05	.03	-.09	-.11	-.03	.03	-.12	.01	.04
116. Stays abroad during school	.11	.10	.08	**.23**	-.01	-.07	**-.27**	**-.21**	-.07	-.16	.03	.08	-.03	-.05	**.24**	-.09	**.31**	.06	.00	-.06	-.10	.16	.16	.16	-.05	-.04	-.08	-.07	-.03	.05

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
117. Mean duration stays abroad during school	.09	.06	-.05	**.19**	-.11	**-.18**	**-.21**	-.08	-.04	-.13	.06	-.08	-.09	.02	.05	-.03	-.06	-.05	-.06	-.03	-.12	.07	.09	.01	-.05	-.02	-.13	-.08	.00	.05
118. Mean duration academic gaps	-.07	.02	.02	-.11	.07	-.02	.06	**.45**	.02	.01	.16	-.16	.02	.01	.02	-.10	.07	.07	.12	-.01	**.22**	-.01	-.07	-.12	.12	-.09	-.12	.11	.01	**-.24**
119. Study programs at technical/dual colleges	-.06	.04	.07	.04	.01	-.06	-.14	.00	.11	**-.17**	.03	**.20**	.08	-.14	-.13	-.08	.04	-.01	-.03	.05	-.12	-.08	.00	.03	.08	.03	-.01	.00	.02	.02
120. Duration bachelor studies	-.09	.08	.08	.01	-.02	.09	.03	**.39**	.12	.04	-.05	-.06	**.21**	.09	.03	-.03	-.11	**-.17**	.16	**.60**	**.26**	.06	-.08	-.05	-.10	.10	-.04	.02	.02	.10
121. Business administration studies	.12	.06	-.02	.12	-.09	-.13	-.09	-.06	.05	.10	.03	.06	.16	.01	**.18**	-.08	.04	-.14	-.09	.01	-.09	.07	.04	.06	-.10	.03	-.01	-.01	.13	-.13
122. Economics studies	-.10	-.04	-.01	.05	-.07	-.09	.07	**.21**	-.01	-.08	.03	-.03	**-.24**	.02	-.05	-.10	-.10	-.01	**.24**	.08	.12	-.11	.04	.06	.09	-.06	-.12	-.16	**-.22**	-.09
123. Business and economics studies	.06	.12	-.06	.04	.14	.01	-.02	.00	-.05	.14	**.24**	-.01	**.25**	-.05	.01	.00	.02	-.09	.03	.06	.03	.11	-.11	-.06	-.05	.10	.12	.12	**.19**	**.20**
124. Neighbouring disciplines	-.03	.03	.05	**-.17**	.06	.09	.01	.16	.07	-.14	-.10	-.01	-.02	-.01	-.04	-.02	-.06	.08	-.14	.07	.12	.00	-.13	-.05	.08	.00	-.06	.07	-.13	-.08
125. Study focusses on finance	.16	.11	.01	-.14	-.08	.15	**.20**	-.05	.02	.16	-.05	-.05	**.48**	.14	.04	.16	.12	-.06	.05	.04	-.04	-.02	-.03	.02	.04	.02	**.18**	-.02	**-.17**	.14
126. Study focusses on controlling	-.10	.03	-.01	.13	.07	-.04	-.12	.00	.06	-.05	.00	-.10	**.37**	.07	-.09	.12	.11	-.03	-.07	.08	.01	.01	.12	-.03	-.07	-.02	.11	-.08	**.27**	.03
127. Study focusses on logistics	.00	.07	-.12	-.08	.06	-.03	-.03	.09	-.03	-.07	-.01	.07	**.17**	**-.19**	-.10	-.09	-.03	.03	-.15	.09	.07	.03	-.07	-.11	.03	-.02	.00	-.05	-.08	-.01
128. Study focusses on economics	.11	.03	-.15	-.05	-.07	.00	.03	-.06	-.04	.12	-.01	.04	**.25**	**.17**	-.07	.00	.01	-.01	.17	.02	-.04	-.08	.14	.15	.05	.04	-.08	-.01	.02	-.07
129. Study focusses on informatics	.11	.02	.04	.05	-.02	**-.17**	.00	-.01	.03	.03	.03	-.08	**.25**	.00	-.13	**.17**	-.01	-.02	.00	.08	-.01	.15	-.03	-.09	-.02	.12	-.01	-.01	.01	-.02
130. Study focuses on neighbouring disciplines	.13	-.04	-.01	-.06	.04	-.15	-.12	-.04	.08	-.08	-.03	-.03	**.37**	.15	-.10	.04	-.01	-.02	-.09	.10	-.13	.08	.00	.05	.02	.15	-.13	-.08	.04	-.05
131. Theses topics	-.06	-.06	.12	-.06	.03	.08	.09	**.18**	-.07	-.09	.08	-.13	**.20**	.14	.00	-.03	.04	-.01	.13	.10	-.02	-.04	-.04	.13	.05	-.02	.00	-.01	.06	-.11
132. Theses with companies	-.09	-.07	-.05	-.06	.00	-.13	-.12	.08	-.16	.00	**.21**	.14	**.19**	-.04	-.10	-.04	-.02	-.10	-.11	.10	-.09	.03	.05	-.02	-.08	.01	-.01	-.08	.04	-.05
133. Bachelor thesis presented with mark	-.04	-.07	.07	-.04	-.06	-.07	.08	-.04	-.02	-.03	-.01	-.05	**.17**	.10	-.15	**.17**	-.04	.01	-.11	-.11	-.09	.03	.11	-.02	-.12	-.09	.10	-.08	.11	-.01
134. Semesters abroad	.00	-.02	.06	.16	.00	.02	-.03	.12	.10	-.12	.15	-.10	-.07	**.24**	-.09	-.06	**.25**	**.19**	.13	.13	-.03	.14	**.20**	.04	.05	-.12	.00	.06	.05	-.08

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
135. Apprenticeships	.10	.14	.08	-.01	-.14	.06	**.19**	**.28**	-.02	.03	.06	-.09	.03	-.09	-.07	-.03	-.03	-.06	.02	.01	.14	**-.23**	.09	**-.26**	**.18**	.04	.04	.07	-.04	-.06
136. Work and travel/au pair	-.06	-.04	-.08	-.16	.10	.01	-.04	.09	-.11	.11	**.20**	.04	.01	-.02	-.02	-.03	-.04	.08	-.09	.11	-.04	**.17**	.01	.15	-.08	.15	.06	-.08	.07	-.08
137. Internships	-.05	-.15	-.11	-.04	-.02	.02	.10	-.16	.07	.08	.03	.09	-.12	**.20**	.09	.09	.06	-.03	.12	-.14	-.06	.04	.11	-.06	-.04	-.07	**-.24**	-.05	.05	.08
138. Internships/jobs relevant for position	-.05	-.07	.03	-.14	**-.21**	.07	.09	.02	.14	.10	.07	-.08	.12	**.18**	**-.17**	.06	-.01	-.02	.02	.01	-.13	-.11	.10	-.12	-.09	.10	-.08	-.04	-.04	.06
139. Internships/jobs in research	.05	.02	.01	.02	-.12	**-.19**	-.11	.02	.01	**-.19**	.02	.09	.04	-.01	-.15	.03	-.09	-.09	-.12	.08	-.15	.08	.05	.10	-.06	.00	.00	-.07	.10	.06
140. Internships/jobs in consulting	-.06	-.01	.04	.06	-.11	-.07	.07	-.08	-.01	.00	-.02	-.06	-.01	**.17**	.11	.07	.02	.05	-.01	.07	-.06	-.01	.04	-.04	**.22**	.03	-.10	.01	.04	-.13
141. Internships/jobs abroad	-.03	-.13	.09	-.01	-.07	.10	**.19**	-.03	.16	-.06	-.07	-.07	-.11	.14	.01	.13	.14	.15	.02	-.14	-.08	.00	.12	.07	.03	-.07	-.01	-.04	.11	.13
142. Inconsistent descriptions internships/jobs	.08	.02	-.05	.14	.07	**-.33**	-.12	.06	.08	-.07	.16	-.05	.08	**.34**	-.02	-.01	.02	.07	.05	.09	-.02	**.23**	.08	.10	.07	.03	.03	.04	**.18**	-.02
143. Detailed descriptions internships/jobs	-.06	-.01	.07	-.09	.05	.08	.15	.11	.00	.08	-.14	**-.19**	**.22**	**.71**	**-.30**	.11	.01	.02	.05	.11	-.05	-.04	.09	.09	.07	.10	.04	.01	.06	.00
144. Business languages	.10	-.02	-.07	-.07	-.01	.01	**.23**	.00	.04	**.26**	-.12	.07	.12	.07	-.15	-.03	-.04	-.02	-.03	-.05	.16	-.11	-.15	-.12	-.10	.15	.05	-.01	**-.20**	-.04
145. Business English	-.01	.15	-.04	.13	.01	-.07	**-.20**	-.12	.07	-.02	-.02	.01	.05	-.15	-.04	-.03	-.04	-.08	-.17	.14	-.11	-.06	.14	-.07	-.01	-.01	-.08	.10	.09	-.01
146. English level	-.01	.00	-.03	.00	.09	.01	-.15	-.13	-.02	.11	.08	-.09	.08	**.17**	**-.18**	-.02	.08	.09	.12	-.02	**-.18**	.12	.14	.01	.01	.08	.00	-.02	.13	.06
147. English TOEFL	.01	.01	-.01	.00	.02	-.03	.00	-.13	.11	.08	.03	.05	-.08	**.18**	-.09	.04	.15	.10	.15	-.13	-.12	**.18**	.04	-.05	.04	.03	-.03	-.11	-.04	.01
148. English CEFR	.00	.02	-.02	.08	.12	-.13	**-.17**	.14	.16	.08	.09	-.11	.11	-.05	-.03	-.06	.13	.10	.02	.09	.07	.04	-.09	-.02	-.13	**.21**	-.05	.10	.15	.05
149. Language tests	.00	.07	.04	.05	.02	-.04	-.02	**-.20**	-.03	.00	.01	.01	-.11	.06	-.05	.01	.04	.07	.12	-.10	-.14	**.21**	**.17**	-.02	.03	-.06	-.11	-.02	-.05	-.04
150. Language trainings	.09	.04	-.03	.00	.01	.03	-.06	.15	.03	-.03	**.17**	.09	.03	-.07	.08	-.12	.09	.02	-.02	-.01	.07	.13	-.07	-.04	.00	.03	-.08	**.23**	.11	-.04
151. Substantial software skills	.02	.09	.12	.06	-.02	-.03	.02	.09	-.14	.03	.01	-.02	.08	-.03	**-.24**	.01	.00	.00	.06	.04	.00	.00	-.04	-.04	.10	.01	.02	.01	-.12	.13
152. Mathematical software skills	.14	-.03	-.06	-.08	.06	.05	-.10	.09	-.06	.06	.02	-.14	-.03	-.02	-.03	.07	-.05	.05	.11	-.06	-.13	-.01	-.03	.15	.15	.08	.05	-.08	-.15	-.06
153. Webpage software skills	-.08	.13	.04	-.07	-.05	-.01	.16	**.19**	.10	-.05	.08	-.06	.10	-.09	-.04	.11	.01	-.06	.05	.11	.11	.00	-.05	-.02	.09	.00	.07	-.04	-.07	.15
154. IT trainings	**.20**	.08	-.03	**.23**	-.05	**-.17**	-.15	-.15	.09	.11	-.06	-.02	-.02	-.04	.10	-.04	.16	.12	-.06	-.08	-.03	**.26**	-.12	.15	-.07	.08	-.08	-.08	-.02	-.09
155. German Academic Scholarship Foundation	.05	.04	.15	.06	**-.20**	-.06	.02	-.07	-.09	-.16	.02	-.02	-.07	-.05	-.10	-.03	-.12	.01	.02	**-.24**	**-.34**	-.10	**.36**	.13	**.25**	-.01	-.02	-.11	-.12	.14
156. Germany Scholarship	-.06	-.08	.00	**-.22**	-.01	.14	.08	-.08	-.01	.05	.10	.11	-.01	-.07	.05	.01	-.09	-.14	.03	-.02	**-.19**	-.05	**.37**	.13	-.09	-.02	-.02	-.02	.05	.00

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
157. Non-financial scholarships	.11	-.11	-.16	.04	-.04	.02	.15	-.14	-.02	.12	-.05	-.02	-.03	.03	-.12	**.17**	-.05	.04	.01	-.02	-.07	-.16	**.37**	.05	-.03	-.15	.03	-.12	.02	**.23**
158. Scholarships abroad	-.08	.07	.07	.07	.00	-.02	.05	.16	-.09	-.07	.03	-.15	-.13	**.24**	-.04	-.11	-.08	-.04	.01	.10	.10	.04	**.33**	.06	-.06	.01	.05	-.14	.02	-.05
159. Erasmus	**-.17**	.00	-.04	.09	.05	.03	.07	.09	**-.17**	-.01	-.04	-.11	-.09	.16	-.11	-.09	.02	-.03	-.06	.06	**.19**	.09	**.18**	-.03	-.08	.01	.08	-.08	.07	-.01
160. PROMOS	.16	.07	.05	-.03	-.06	.02	.00	-.02	.06	.02	.01	-.10	.03	.14	**.19**	.01	-.07	-.03	-.04	.08	.00	.01	**.25**	.09	-.07	-.09	.05	-.10	.03	-.05
161. Political EAs	-.11	.07	.05	-.01	.01	-.01	-.04	**.17**	-.03	-.10	-.07	-.04	-.04	-.03	.03	.02	-.14	-.04	-.12	.11	.09	-.11	.07	-.09	.02	-.04	.07	-.11	-.08	.04
162. Religious EAs	-.11	.05	.14	.01	.05	-.05	-.02	-.05	.06	-.01	-.01	-.03	.04	-.02	.04	-.14	-.06	-.01	-.02	.02	-.01	.00	.06	-.12	.08	-.03	-.14	.04	.03	.03
163. EAs abroad	.07	-.10	.00	.10	.00	-.06	-.08	-.04	.08	.00	.01	-.11	-.11	.11	.03	-.12	-.05	.08	-.06	.02	**-.17**	-.03	-.01	.16	-.03	-.07	.06	-.10	-.04	-.10
164. Political/historical hobbies	-.04	.00	.05	.08	-.15	.03	.15	.05	.03	-.07	.02	.05	-.09	.00	-.04	-.12	**.29**	.02	.07	-.02	-.02	-.07	.09	.04	**.18**	.01	.09	-.03	-.01	.09
165. Professional licenses/ certifications	-.03	.15	-.01	-.02	.05	.04	-.04	-.05	.01	-.14	-.12	.00	.04	-.16	.02	-.06	-.07	-.01	.07	.09	.01	-.06	.08	-.11	.06	-.13	.05	.06	-.12	.12
166. Driver's license	-.05	.10	.01	**-.22**	.06	.12	-.05	.11	.01	.02	**-.21**	-.03	.02	-.13	-.07	-.09	-.05	-.08	-.06	-.02	.06	-.05	**-.22**	-.14	.05	.08	.08	**.25**	-.01	.09
167. Academic/ professional trainings	**-.19**	.02	**.19**	.05	-.01	.04	.12	.04	-.07	-.10	-.02	-.02	-.02	.03	.08	-.02	-.12	.04	-.08	.06	.03	.01	.06	-.08	.05	-.10	.15	-.01	.05	.08
168. Quality of leadership experiences	-.10	.10	.11	-.08	-.04	.04	.01	.01	-.15	**-.22**	.00	-.07	-.06	**.19**	**-.18**	.14	-.01	-.02	.05	.03	**-.21**	.03	**.27**	**.20**	**.18**	-.04	.07	.03	.01	**.38**

	31.	32.	33.	34.	35.	36.	37.	38.	39.	40.	41.	42.	43.	44.	45.	46.	47.	48.	49.	50.	51.	52.	53.	54.	55.	56.	57.	58.	59.	60.
31. Team sport hobbies	-	-.14	-.10	-.01	-.11	-.01	.15	-.08	.00	.06	-.04	-.09	-.05	.06	-.05	-.01	-.12	.07	-.11	**-.23**	-.09	.00	.12	-.02	.02	-.08	.08	-.09	.00	-.02
32. Distinctive look		-	.04	-.03	.05	.11	.07	.07	**.18**	.04	-.01	-.04	.09	.08	.03	-.02	.04	.03	.14	.06	-.07	-.07	-.05	-.07	.01	.10	-.01	.15	.13	.04
33. Types of bullets			-	-.14	-.04	.12	.12	.09	.15	.02	-.03	.12	**-.18**	.13	.01	-.13	-.08	-.02	**.21**	**.35**	-.06	-.02	-.10	.09	.02	**.21**	.15	**.19**	.03	.08
34. Fonts with and without serifs				-	.00	.04	-.11	-.09	-.05	.01	.07	-.05	.01	-.05	.13	.13	.10	.13	.00	-.03	.08	-.04	.00	.03	.05	-.08	-.06	.10	-.04	.08
35. Flow text					-	.06	-.02	.00	**.17**	-.06	-.01	-.10	-.06	.03	-.04	-.15	-.09	-.05	-.05	.04	-.04	.01	.03	-.07	.08	-.12	**.19**	**.19**	-.02	.07
36. Experience before education section						-	**.30**	.04	.14	-.06	.02	-.09	-.05	**.27**	-.03	**-.19**	.02	.10	**.19**	**.17**	**-.18**	-.12	.04	**-.19**	-.10	-.10	.02	.00	.01	-.01
37. Vocational high school							-	-.11	-.03	.00	.03	-.03	.01	**.22**	-.12	-.13	-.03	.08	.03	.11	-.04	-.13	-.02	-.14	-.14	-.10	-.06	.00	.01	-.01
38. Extraordinary hobbies								-	.05	**-.22**	.14	.02	-.12	-.02	.15	**.23**	.04	.04	.15	.09	**.23**	-.05	.11	**.34**	.21	**.24**	**-.23**	.13	-.05	.04
39. Study focusses on marketing									-	**-.21**	.00	.05	.02	.06	.02	-.13	-.02	-.06	.16	.12	-.16	-.07	.12	-.04	.01	-.03	**.30**	.06	-.07	-.07
40. Study focusses on accounting/taxation										-	-.11	.03	-.07	.01	**-.19**	.15	-.02	-.09	-.04	-.03	-.10	.00	-.05	**-.21**	-.14	**-.19**	-.02	-.03	.00	.02

		31.	32.	33.	34.	35.	36.	37.	38.	39.	40.	41.	42.	43.	44.	45.	46.	47.	48.	49.	50.	51.	52.	53.	54.	55.	56.	57.	58.	59.	60.
41.	Graphic design software skills											-	**.17**	.10	.06	.14	-.01	.03	-.02	.04	**.17**	.13	-.04	**.21**	.01	.01	-.02	-.04	.02	.05	-.06
42.	Creative hobbies												-	.04	-.02	.07	-.05	.04	.06	.05	**.22**	.02	.04	.16	.11	-.05	.09	-.08	-.06	.03	.02
43.	Mean duration internships/jobs													-	.02	.03	-.08	.09	-.03	-.06	-.04	.05	**.19**	-.03	-.12	-.06	-.12	-.13	.03	-.05	.04
44.	Software skills														-	.16	-.06	.04	.06	.09	.16	-.06	-.15	-.07	-.08	-.02	.05	-.02	.09	.04	-.09
45.	Languages															-	.01	.11	.03	**.24**	-.01	**.17**	.04	.12	**.35**	.03	.15	.05	**.24**	.07	.01
46.	Latin																-	.04	-.13	-.15	.09	**.19**	.14	.07	-.01	.03	.03	-.16	.06	.03	-.10
47.	Trainings																	-	.00	**.19**	.10	.05	-.01	-.10	.09	-.07	.02	-.08	.14	-.07	.07
48.	Financial scholarships																		-	.02	-.05	**.29**	.04	.03	.13	.03	.08	-.13	-.14	-.06	-.06
49.	Interpersonal skills																			-	.15	.15	-.07	.08	.09	.01	.04	-.06	**.25**	-.03	-.06
50.	Teams																				-	.11	.07	.02	-.01	.00	.09	.05	.08	**.19**	-.12
51.	EAs																					-	**.22**	**.24**	**.30**	**.19**	**.19**	**-.20**	.07	.02	.03
52.	Mean duration EAs																						-	.03	.09	.06	.08	.01	.06	-.07	.03
53.	Tutoring																							-	.10	.07	-.08	.01	-.04	-.02	-.13
54.	Stays abroad																								-	**.22**	**.37**	.06	**.18**	-.02	.08
55.	Mean duration stays abroad																									-	.11	.01	.14	-.06	.14
56.	International orientation of studies																										-	.01	.14	.06	-.02
57.	Travel hobbies																											-	**.26**	**.20**	.03
58.	Intercultural skills																												-	.06	.11
59.	Discontinued studies																													-	.02
60.	Academic gaps																														-
61.	Constructive use of gaps	**.28**	-.04	.04	-.01	-.20	.16	**.23**	.01	-.05	.20	-.10	-.11	-.04	.14	.04	.03	.07	.15	.08	-.13	**-.22**	-.05	.15	-.10	-.08	.03	-.09	-.07	-.16	.04
62.	Reputation of universities	-.12	.14	.01	-.13	**.20**	.06	.02	**.22**	.05	-.07	-.12	-.10	-.03	-.03	-.06	-.09	.12	.14	-.08	-.02	**.19**	-.03	-.06	.12	.01	**.20**	-.04	-.02	-.10	.15
63.	Reputation of employers	.12	.00	**.20**	-.15	.00	.05	.05	-.11	-.06	**.21**	-.01	-.15	-.12	.08	-.04	-.16	-.09	**.21**	.01	-.07	.02	-.07	-.04	.02	.12	.06	**.19**	.03	.01	-.08
64.	Sport EAs	**.23**	.12	.00	-.13	-.02	**.18**	.10	.12	.04	**.17**	.06	-.01	-.05	-.04	**-.18**	-.07	-.04	-.06	-.05	.08	-.09	.14	-.06	.01	-.02	.06	-.08	-.05	-.02	-.08
65.	Sport hobbies	**.46**	-.13	-.04	.07	-.08	-.08	-.04	.05	.02	.13	.01	-.08	-.13	-.02	-.12	.04	**-.18**	-.11	-.15	-.14	-.10	.02	.13	.00	-.04	-.02	.11	**-.17**	.15	.13
66.	Recreational sport hobbies	.04	.01	.01	.03	.12	.04	-.11	**-.24**	.15	-.02	-.08	-.09	-.04	-.03	-.04	.04	-.13	-.09	-.10	.05	-.07	-.01	.03	-.11	-.12	.03	**.24**	-.06	**.24**	.01

		31.	32.	33.	34.	35.	36.	37.	38.	39.	40.	41.	42.	43.	44.	45.	46.	47.	48.	49.	50.	51.	52.	53.	54.	55.	56.	57.	58.	59.	60.
67.	Prominent name position	.00	**.20**	.08	-.02	-.03	-.04	.02	.03	.02	-.10	.12	.11	.07	.01	-.03	-.09	-.13	.09	-.10	.01	.09	.03	.08	.04	.12	.14	.07	-.01	.13	-.06
68.	Own name	-.07	-.04	. 02	-.01	-.09	.05	-.11	-.14	-.10	-.04	.06	.04	.08	-.03	-.09	-.03	-.03	-.07	.05	.08	-.02	.00	-.10	**-.17**	-.13	.00	.02	-.16	.02	-.06
69.	Academic comparison	.05	-.14	.10	-.02	-.01	-.04	.11	.00	-.10	.00	-.06	-.05	**-.24**	.00	.09	-.11	-.10	.05	-.01	.01	.07	.05	.06	.12	.14	-.03	**-.17**	-.03	-.04	.01
70.	Accomplishments with professional experiences	.01	.00	**.20**	-.08	-.08	-.09	.09	.17	.10	.04	-.10	**.24**	-.04	.05	-.02	-.06	.14	.05	.04	**.19**	.01	.01	-.11	.14	.00	.10	-.11	-.05	.00	.11
71.	Awards	-.01	.10	-.02	-.02	.11	.10	-.01	-.01	-.07	.07	.04	.11	-.04	.04	.08	-.02	-.14	**.47**	.05	-.02	**.24**	.12	.09	.08	.01	.01	.01	.05	-.05	-.02
72.	Top tier business consultancies/ auditing firms	**.19**	-.12	.07	.04	-.05	-.12	-.09	-.08	-.15	**.24**	-.11	-.12	**-.20**	-.11	-.06	.02	-.08	.01	-.06	-.09	-.08	-.12	-.03	-.06	.10	-.06	.07	-.13	-.01	.08
73.	Altruistic EAs	-.03	.08	.08	-.04	-.05	.03	-.02	.06	-.05	-.12	-.15	.06	.07	.03	-.01	.04	-.16	.10	-.03	.07	.12	**.19**	-.01	-.06	.02	.06	-.05	-.04	**.23**	.10
74.	Career-oriented EAs	-.06	.00	-.04	.08	-.01	-.10	-.08	.16	-.09	-.01	-.04	.03	-.11	-.06	.01	.12	-.05	-.02	-.02	-.02	.02	-.09	.00	.06	-.02	.10	-.13	.03	-.01	.03
75.	Cognitive hobbies	.09	**-.20**	.02	.02	-.06	-.03	.12	.00	-.06	-.08	.05	**.22**	**-.17**	-.10	.13	-.06	-.13	.02	-.11	.02	.06	.05	.00	.03	.02	.07	-.04	-.06	-.01	-.01
76.	Business hobbies	.13	.04	-.02	-.11	.00	.09	-.02	.11	.09	-.04	-.13	-.08	-.16	-.05	-.09	.04	-.08	.02	.05	-.04	-.08	-.11	.16	-.10	.04	-.09	.14	.04	.02	.01
77.	Pleasure hobbies	-.02	-.07	-.01	**.18**	.13	-.06	-.02	-.05	-.04	-.09	-.12	.03	.04	-.04	.13	-.06	.06	.15	.00	-.04	.01	-.06	-.04	.01	-.07	.01	.02	-.07	.01	.09
78.	Social hobbies	.03	-.01	-.01	.03	**.28**	.16	-.06	**-.25**	.04	.11	-.09	-.07	-.11	-.05	-.01	-.10	.03	-.03	.04	.15	-.03	.06	-.01	-.01	.03	-.08	.11	.04	.12	.02
79.	Curriculum vitae as header	.03	**-.18**	-.04	.00	.12	-.03	-.13	-.11	.16	.02	**-.28**	-.10	-.06	-.15	-.12	-.01	.13	-.01	.06	-.03	-.14	.07	-.07	-.07	.01	-.15	.03	.04	-.13	.03
80.	Foot- and/or headnote	-.02	.07	.11	.08	-.06	-.02	-.07	.05	.15	-.06	.06	.07	.04	-.03	.01	-.05	.00	.01	.11	.13	.06	.03	-.04	.01	.04	.08	.08	-.09	-.02	-.05
81.	Name and address formatted differently	.04	**.23**	.01	-.06	.10	-.13	.09	.17	.12	.00	.11	.07	.09	.09	.11	.04	-.10	.01	-.08	-.02	.05	-.05	.05	.16	.12	.07	.00	.16	.09	-.05
82.	Academic degree and university not highlighted	.03	**-.31**	**-.24**	.04	-.03	-.06	.04	-.19	-.08	.05	.02	-.09	.01	-.07	-.11	-.03	.07	-.08	-.04	-.12	-.05	-.02	-.04	-.16	-.07	-.15	-.02	-.13	-.06	-.07
83.	Inconsistent date resolution	.01	-.04	.04	.16	.07	-.01	-.05	.10	-.02	.06	-.02	.15	**-.18**	-.10	-.05	.06	-.06	**.20**	-.01	-.02	.08	.06	**.17**	**.17**	-.04	.01	.04	-.04	-.01	.07
84.	Dates right	.06	.08	.04	.02	-.08	-.09	-.09	**.26**	-.06	-.11	**.23**	.05	-.04	-.12	.08	.15	-.06	**.18**	-.03	.12	**.27**	-.01	.14	**.24**	-.01	**.31**	-.06	.10	.09	**-.19**
85.	Dates left	.02	**-.24**	.04	.01	-.01	-.02	-.02	**-.21**	-.06	.07	**-.20**	.05	.10	.07	-.14	-.10	.06	-.08	-.06	-.09	-.07	.08	-.03	-.12	.01	-.09	.04	-.13	-.02	.14
86.	Inconsistent date position	.09	-.05	.03	.02	.07	.00	.05	.10	.05	-.12	.02	.13	-.01	.03	.02	**-.21**	.00	**.18**	.09	.00	.11	.01	.08	**.17**	.05	.11	.07	-.04	-.04	.03
87.	Inconsistent chronology	.06	-.07	-.01	.04	-.05	-.16	.05	.09	-.01	.08	.16	.10	.10	.06	-.02	.05	.00	**.23**	-.06	.05	.02	.13	-.02	.10	**-.23**	.06	.05	.09	-.06	-.12
88.	Professional layout	.09	-.16	.06	-.14	-.02	**-.19**	.02	.00	-.07	**.21**	-.08	.02	-.05	.06	-.11	.12	-.15	.04	-.16	.00	.01	-.14	.08	-.05	.09	-.01	.10	-.08	-.01	.00

	31.	32.	33.	34.	35.	36.	37.	38.	39.	40.	41.	42.	43.	44.	45.	46.	47.	48.	49.	50.	51.	52.	53.	54.	55.	56.	57.	58.	59.	60.
89. Tabular layout	-.05	.05	.06	-.15	-.16	-.11	.03	.12	-.12	.12	.00	-.12	.09	.09	-.10	.08	.02	-.07	-.12	.00	.02	-.03	-.01	-.11	-.07	.09	.05	-.08	.06	-.06
90. Harmonic layout	.13	**.17**	-.05	-.06	.05	-.05	.06	.00	.07	**.17**	-.09	-.09	.02	.10	**-.19**	.04	-.13	.03	-.12	-.10	**-.17**	**-.26**	.01	-.15	.11	-.10	.06	.03	.05	.02
91. Consistent formatting	.06	**-.19**	-.04	-.07	-.07	**-.17**	-.09	-.14	-.07	.10	.02	.02	.03	-.01	-.05	-.11	-.14	.12	-.09	-.03	.01	.01	-.02	.06	.05	.00	-.06	.00	-.08	.13
92. Formatting errors	**-.21**	**.30**	-.11	.12	-.01	.07	.13	.01	.02	-.05	-.06	-.05	**.20**	.07	.09	.10	**.21**	-.14	.10	.07	.02	-.08	-.12	-.09	.02	-.01	-.03	**.18**	.07	-.10
93. Page break within section	.06	-.12	**.21**	-.10	.12	**-.17**	**-.17**	-.02	.00	.11	-.06	-.02	-.01	-.05	-.15	.02	.04	-.08	.06	.01	-.04	.10	.01	.01	.00	.03	.13	.01	.06	-.03
94. Page break within bullet	.10	-.07	.06	-.03	-.10	-.12	-.12	.17	-.11	.01	-.07	-.03	-.10	.10	.13	.05	-.04	-.04	.09	-.01	-.04	-.04	-.08	.05	-.04	.02	.13	.01	**.24**	-.08
95. Margin width	-.01	-.12	**-.26**	.03	**-.18**	-.07	-.09	-.14	-.15	-.02	-.06	**-.21**	.02	-.02	-.15	-.11	.09	-.03	-.07	**-.34**	-.13	-.02	-.16	-.06	-.11	-.13	**-.22**	**-.18**	-.07	.02
96. Space between sections	.01	.10	-.16	**.18**	-.15	-.08	-.14	-.15	.15	.00	-.07	-.05	.02	-.08	-.11	.04	.01	.05	-.13	**-.19**	-.14	.06	-.05	-.11	-.05	-.13	-.08	-.10	-.03	.03
97. Line spacing	.06	.11	-.04	-.04	.01	.05	-.02	-.15	.02	.11	.03	-.05	.14	-.02	-.15	-.06	.10	-.06	-.07	-.06	-.10	.00	-.04	-.12	.00	-.08	-.06	-.07	-.02	.14
98. Fonts	.00	.00	.04	**.57**	.01	.08	-.10	.14	.16	-.08	.04	-.02	-.10	.01	.07	.04	.03	.08	**.28**	.12	**.24**	.01	.13	.12	.04	.08	-.08	.12	.02	.00
99. Serious, usual fonts	.14	**-.44**	.07	-.02	.10	-.10	.05	.02	-.07	.07	.04	-.05	-.06	.00	-.12	.10	-.05	-.04	**-.22**	-.04	.08	.04	.12	-.05	-.04	-.12	.02	-.09	-.03	-.03
100. Font without serif	-.03	.04	.02	**-.52**	-.06	.07	-.03	.02	-.03	.01	-.15	.00	.07	.16	-.09	-.11	.00	-.15	.07	.05	**-.20**	-.01	-.11	-.03	.01	.07	.08	-.04	.07	.04
101. Font size	-.09	**.40**	.13	.15	.15	.15	-.02	-.16	.14	.04	-.04	.01	-.04	-.03	-.02	-.02	-.01	-.07	**.19**	.02	**-.17**	-.06	-.05	-.05	-.11	-.08	.02	.13	.06	.16
102. Font size headers	-.06	**.47**	-.07	.05	.01	.13	.06	-.10	.04	.04	.01	-.09	-.01	.08	.06	-.06	.11	-.16	-.06	-.09	**-.24**	**-.24**	**-.17**	-.14	-.16	**-.21**	-.03	.06	**.17**	.07
103. Font size text	.05	.05	-.14	-.07	-.02	.15	.04	.01	.03	-.02	-.05	**-.21**	.03	-.06	-.11	-.13	-.06	-.12	-.11	-.10	-.07	**-.19**	-.04	**-.22**	-.01	-.09	-.13	-.15	.08	-.02
104. Appropriate highlighting	.03	.04	.05	-.11	-.09	-.12	-.11	-.01	.00	**.21**	-.12	.05	.05	.03	-.15	.06	-.03	-.05	-.14	.04	-.14	**-.20**	-.10	-.06	.10	.05	-.03	-.02	.05	.11
105. Italicized words	-.11	.08	.07	.01	-.01	.05	-.08	**.29**	.03	-.13	.01	-.02	-.07	-.08	.12	-.04	**-.17**	**.27**	.12	.06	.12	.14	-.06	.07	.15	.09	-.08	-.07	-.02	-.11
106. Underlined words	-.09	-.02	-.06	.09	-.01	.01	.02	.07	.00	-.12	.00	-.12	**.22**	-.09	.03	-.09	-.01	.02	**.19**	-.07	-.07	.06	.03	.12	-.02	-.11	-.12	-.02	-.09	.03
107. Capitalized words	-.02	**.29**	-.11	-.12	-.05	-.04	.05	-.10	.06	-.02	-.03	.04	-.05	-.09	.03	-.08	-.10	-.12	.09	-.06	-.08	.07	-.14	.03	-.09	.09	-.02	-.01	.03	.15
108. Number of symbols	-.11	**.35**	.09	-.09	**.36**	.00	.01	.01	**.30**	-.15	.12	.00	.05	.04	.05	-.12	.12	-.10	.08	.09	-.05	-.05	.00	.01	.02	.12	**.23**	.12	-.10	.00
109. Appropriate use of color	.07	.08	-.18	.08	.02	-.06	-.15	.08	-.06	.01	.10	-.18	.19	.08	-.04	.02	-.19	-.04	**-.29**	-.15	-.04	-.16	-.05	-.18	.08	-.03	.03	-.01	.00	-.11
110. Number of words	-.10	-.04	**.35**	-.08	**.27**	-.07	-.05	**.26**	.06	-.05	.14	**.24**	-.16	.10	**.30**	.01	.04	.09	**.19**	**.34**	**.30**	.04	.10	**.47**	**.17**	**.30**	**.20**	**.30**	.04	.03
111. Comprehensive/ secondary school	.11	.08	-.14	.09	-.08	.06	**.23**	-.12	.12	.01	-.02	-.07	.05	-.04	**-.18**	-.02	.00	-.02	-.05	-.13	-.04	-.06	-.12	**-.17**	-.05	-.06	-.07	.00	-.10	-.16
112. Business focus on school	.12	.03	**.18**	-.12	-.03	.13	**.47**	-.06	-.01	.11	.06	.08	-.01	.05	.04	-.04	-.06	-.06	.01	.07	-.03	.01	.02	-.07	-.11	.04	-.06	-.02	.06	-.03
113. Science school subjects	-.05	.00	.10	-.04	.01	.05	-.04	.14	-.02	.10	.08	-.10	-.13	-.08	-.12	.16	-.15	.04	-.05	.02	.02	.11	-.06	-.01	-.08	.11	-.16	-.10	.07	-.15
114. Humanities school subjects	-.12	.05	.07	-.13	.12	.06	-.07	.04	.00	.04	.10	.06	.00	-.06	-.12	.05	-.11	-.02	-.03	.13	.07	.16	-.04	-.03	-.05	.16	-.07	-.02	.11	-.16

	31.	32.	33.	34.	35.	36.	37.	38.	39.	40.	41.	42.	43.	44.	45.	46.	47.	48.	49.	50.	51.	52.	53.	54.	55.	56.	57.	58.	59.	60.
115. Language school subjects	-.06	.03	.06	-.08	.09	-.01	-.10	.12	-.06	-.01	.11	-.04	-.07	-.09	.07	-.03	-.06	-.05	-.01	-.06	-.07	-.02	-.03	.05	-.01	-.01	-.05	-.04	.01	.06
116. Stays abroad during school	-.04	-.05	-.03	-.04	-.14	-.13	-.13	.13	.01	-.01	-.02	.16	-.04	-.14	**.20**	.04	.02	.09	-.05	-.12	.08	.07	**.18**	**.62**	-.08	.10	.15	.04	.00	-.05
117. Mean duration stays abroad during school	.04	.04	-.12	-.06	-.11	-.11	-.12	.13	-.03	-.07	.02	-.08	.01	-.12	.07	.04	-.03	.01	.03	-.15	.08	-.02	.12	**.29**	**.25**	.03	.04	-.04	-.05	-.04
118. Mean duration academic gaps	-.01	-.02	.14	.11	-.01	.08	.15	-.02	-.01	-.01	-.06	-.02	.13	-.11	.02	-.13	.01	-.02	.05	-.02	-.06	.03	-.10	.04	.07	-.02	.01	.09	-.03	**.55**
119. Study programs at technical/dual colleges	-.07	.08	.12	-.11	.01	.13	**.17**	.16	-.04	-.07	-.04	.03	-.08	**.21**	.07	-.12	**.17**	**.21**	.01	.08	.14	-.09	-.13	.13	.02	**.25**	-.05	.05	.08	.12
120. Duration bachelor studies	.03	-.06	.01	.03	.16	-.01	.01	.15	.10	.05	.03	-.02	**.19**	-.01	-.01	-.06	-.04	-.08	.08	-.09	.04	.13	.01	-.02	.12	-.09	-.05	-.04	**-.18**	-.01
121. Business administration studies	-.08	-.01	-.09	.04	.11	.01	-.11	**-.28**	.01	**.31**	-.13	-.03	-.04	-.03	-.10	.01	.05	-.04	.05	**-.17**	**-.24**	-.01	.03	**-.18**	-.08	**-.40**	.15	-.08	-.08	.14
122. Economics studies	.03	-.13	-.09	.01	.07	-.02	-.02	-.08	**-.17**	**-.19**	.05	-.03	.04	**.17**	.13	.04	-.03	.11	.03	-.04	**.23**	**.17**	-.06	.08	**.20**	**.25**	-.05	.16	.14	-.05
123. Business and economics studies	.15	.05	.02	.03	-.12	-.05	.00	-.01	**.26**	.11	-.07	**-.19**	.09	.02	.05	.02	-.03	-.08	-.04	.11	.02	-.06	.09	-.12	-.12	**-.17**	.06	-.03	-.05	-.10
124. Neighbouring disciplines	-.06	.03	-.04	-.08	.00	.11	**.27**	.03	-.03	-.13	.10	.04	**.20**	.05	.00	-.02	-.02	**-.17**	.00	.10	.05	-.04	-.09	-.06	-.01	-.02	**-.17**	.01	-.05	-.06
125. Study focusses on finance	.10	-.09	.03	-.10	-.01	-.10	-.04	-.07	**-.18**	**.42**	-.12	.02	-.07	.00	-.12	.01	-.16	-.06	-.04	-.11	-.05	-.03	.10	-.04	-.12	-.16	-.05	-.15	-.13	.01
126. Study focusses on controlling	-.12	.01	.15	.02	.03	.00	.00	**.22**	-.06	**.22**	-.10	.05	-.10	.04	**.17**	.08	-.02	-.10	.04	.12	.06	.09	-.03	**.22**	.08	.03	.09	**.38**	.09	.11
127. Study focusses on logistics	.03	-.11	.00	-.09	-.08	.16	.08	**.23**	.03	-.15	.02	-.04	.11	.03	-.11	-.08	.05	.05	-.04	.03	-.01	.00	-.12	-.10	-.07	.02	-.12	-.13	-.10	.11
128. Study focusses on economics	.09	-.03	.04	-.06	.03	-.02	-.02	**-.23**	**-.18**	-.10	-.14	-.01	-.04	-.01	.00	-.06	.05	.08	.04	-.14	-.15	**-.17**	-.06	.03	.01	.02	.12	-.03	.05	.10
129. Study focusses on informatics	.06	.06	.05	-.12	-.03	.00	.06	.05	**.23**	-.13	.04	-.05	.11	.16	-.11	-.10	-.06	.07	-.04	.05	-.11	-.12	-.10	.00	.06	.04	.08	-.07	.00	.00
130. Study focuses on neighbouring disciplines	-.06	.06	.11	.00	.01	.06	-.02	-.03	.02	-.06	.05	.08	.13	.12	-.01	.04	.04	.10	.08	.10	-.10	-.05	-.12	.04	-.09	.13	.04	.00	-.02	-.04
131. Theses topics	-.07	.08	.09	.03	.15	-.02	.08	-.04	.15	.05	.02	.07	.00	**.21**	.01	-.05	.15	-.04	**.25**	.11	-.02	-.06	-.02	-.02	.02	-.02	**.20**	**.20**	.05	.05
132. Theses with companies	-.08	-.01	.16	.00	.01	.06	**.23**	.07	.02	.07	-.04	-.03	-.01	**.22**	-.01	-.02	.08	.15	-.05	**.20**	.02	-.03	-.12	.15	-.05	.13	.01	**.19**	-.02	.07

	31.	32.	33.	34.	35.	36.	37.	38.	39.	40.	41.	42.	43.	44.	45.	46.	47.	48.	49.	50.	51.	52.	53.	54.	55.	56.	57.	58.	59.	60.
133. Bachelor thesis presented with mark	-.01	-.12	.03	-.07	.01	-.10	-.04	-.05	-.16	**.28**	.14	**.17**	-.02	.05	.04	.10	.00	-.14	.06	.13	.10	-.04	.14	-.06	.03	-.10	-.05	.04	.02	**.17**
134. Semesters abroad	.04	-.02	**.21**	-.03	-.01	-.06	.00	**.24**	.03	**-.26**	-.03	.01	-.14	**.20**	**.33**	-.06	.02	.06	.11	.15	**.23**	-.06	.00	**.47**	**.36**	**.37**	.10	**.18**	.02	.03
135. Apprenticeships	.05	.04	.07	.01	.10	**.28**	**.23**	.06	-.10	.13	-.12	-.07	.08	.01	-.02	-.10	-.05	.07	.01	-.13	**-.17**	.06	-.07	-.07	-.13	.02	-.04	.09	-.13	.13
136. Work and travel/au pair	.02	-.09	.03	-.01	.01	-.11	-.11	-.07	-.04	-.07	.12	.13	**.20**	.10	.01	-.03	-.04	.08	-.11	-.02	.10	.08	.02	.12	.12	.05	-.06	.11	-.11	.15
137. Internships	.09	-.09	.07	.12	-.12	**-.19**	**-.19**	-.12	-.06	-.12	-.09	.08	**-.34**	-.15	-.04	-.03	.04	.06	.05	.00	.07	.02	-.08	**.17**	.03	.14	-.03	-.13	.04	.05
138. Internships/jobs relevant for position	**.17**	.13	**.17**	-.11	-.09	.12	.06	-.06	-.08	.08	-.13	-.11	-.10	**.22**	-.05	**-.20**	-.05	**.19**	.13	-.06	-.02	-.03	-.15	.05	.07	.16	.04	.01	.04	.08
139. Internships/jobs in research	-.01	.08	-.04	-.14	.07	.06	.13	-.11	-.08	.11	.05	-.03	**.18**	**.28**	**.17**	-.08	-.05	**.21**	.06	.03	.12	.06	-.03	-.04	-.02	.06	.00	.12	.01	-.16
140. Internships/jobs in consulting	-.04	.03	.12	.02	-.01	.05	-.09	**.22**	.14	-.16	-.14	-.04	-.15	-.05	-.02	.04	.14	.07	.14	.06	.13	-.05	.01	**.18**	.12	.15	-.01	**.17**	-.08	.16
141. Internships/jobs abroad	.01	.07	.12	-.01	**.22**	-.04	-.03	.19	-.01	-.15	-.03	.02	-.11	-.11	**.17**	-.03	-.07	.08	.03	.12	.15	.09	-.05	**.33**	.10	**.20**	.07	.10	**.18**	**.20**
142. Inconsistent descriptions internships/jobs	.06	.05	.12	.01	-.01	.02	-.03	-.02	-.11	.02	-.06	.16	.01	.10	.10	.09	-.03	.04	.13	.05	.10	-.01	-.05	.16	.03	.10	-.06	.06	.07	-.02
143. Detailed descriptions internships/jobs	**-.20**	-.04	**.47**	**-.20**	**.27**	-.01	-.07	.08	.06	-.04	-.03	.15	-.10	.05	.05	-.10	-.09	-.12	**.20**	**.22**	-.03	-.11	-.12	.15	.14	**.19**	**.19**	.12	.07	.03
144. Business languages	.11	-.03	.12	-.10	.09	.11	.01	.04	-.01	**.28**	-.14	-.16	-.08	.04	**-.58**	.05	-.10	**-.18**	-.15	.02	**-.19**	-.04	-.10	**-.26**	-.04	**-.20**	.03	-.07	-.05	.06
145. Business English	.08	.02	-.11	.13	-.01	.09	-.05	.12	-.11	**.18**	-.05	-.04	-.14	.00	.03	-.01	.01	.14	.09	**-.18**	-.12	-.12	-.14	.07	.01	-.04	.00	.13	-.12	.02
146. English level	.05	.02	.12	.13	-.09	-.03	**-.17**	.16	-.09	.10	-.10	-.07	**-.19**	.16	**.23**	.06	.05	.08	.01	.16	.06	-.08	-.01	**.27**	**.30**	**.18**	.09	.08	.04	.06
147. English TOEFL	.05	-.14	.04	.11	-.04	-.04	**-.20**	.00	-.16	.00	-.05	.00	-.13	.05	**.19**	-.01	-.04	.00	**-.17**	.08	-.04	-.01	.09	**.23**	.06	.16	**.19**	-.09	.16	-.05
148. English CEFR	.01	**.21**	.03	.10	-.08	.15	.10	.01	.11	.11	**-.18**	-.06	-.07	.14	.01	.02	.06	.09	.00	.01	.00	.03	-.11	.08	.10	.04	.05	.03	-.05	.08
149. Language tests	.06	-.08	-.09	-.02	-.02	.05	-.12	-.03	**-.20**	.04	-.07	.03	-.16	.12	**.25**	-.01	-.01	.16	-.11	-.04	-.06	.01	.06	**.28**	.06	.13	.12	-.05	.00	-.01
150. Language trainings	.15	-.02	.09	**.19**	-.01	.07	.15	-.07	-.04	.10	-.04	.02	.04	-.06	.03	-.15	**.32**	.01	.02	-.03	-.13	-.12	-.11	.07	-.14	-.09	-.06	.08	-.01	.12
151. Substantial software skills	.03	-.10	-.02	.01	.04	.09	.10	-.04	-.04	.10	.09	.02	-.09	.05	.16	-.01	.00	-.13	.10	.06	-.09	-.10	.03	-.09	.08	-.10	.09	.02	**-.18**	-.06
152. Mathematical software skills	.00	-.09	-.09	-.11	.04	.02	.03	.04	.10	-.14	-.06	-.13	.14	.10	.15	.01	-.14	-.01	.02	-.15	-.02	-.10	-.16	.02	.01	.02	-.03	.00	-.05	-.13
153. Webpage software skills	.03	.01	.05	-.08	**.24**	**.17**	**.18**	.12	.16	-.09	.02	-.08	-.04	.14	-.01	-.07	-.13	-.06	.07	**.27**	.06	**.17**	.05	-.03	.10	-.05	.13	.03	.13	.03
154. IT trainings	-.08	-.10	**-.18**	.03	-.07	-.09	-.09	**-.22**	-.02	.11	-.10	-.01	.00	.05	.02	.13	**.36**	-.01	-.09	-.02	-.12	.01	-.01	-.08	-.03	-.07	.09	-.03	-.09	.09

	31.	32.	33.	34.	35.	36.	37.	38.	39.	40.	41.	42.	43.	44.	45.	46.	47.	48.	49.	50.	51.	52.	53.	54.	55.	56.	57.	58.	59.	60.
155. German Academic Scholarship Foundation	.00	-.02	.00	.10	.13	-.01	.08	.16	.03	-.15	.08	.15	-.10	.00	.03	-.01	.05	**.44**	.10	**.20**	**.24**	.05	.12	.15	.05	.02	-.10	-.06	-.01	-.13
156. Germany Scholarship	.08	.03	-.05	.07	-.09	.04	-.04	-.12	-.05	.04	.01	-.09	.01	-.02	-.13	-.11	-.05	**.60**	.00	-.15	.10	.04	.00	-.01	.05	-.02	-.08	-.14	.04	.01
157. Non-financial scholarships	**.21**	-.13	.10	-.08	.01	-.06	-.10	.16	-.14	.02	.00	**-.17**	-.11	-.05	.16	.05	-.08	-.09	-.02	-.07	.14	.16	.13	**.28**	.07	**.19**	.10	-.02	-.01	-.08
158. Scholarships abroad	-.15	-.14	.07	-.01	-.04	-.15	-.10	.05	-.13	-.12	.06	.07	-.06	.04	.05	-.06	.00	-.09	.08	.05	.09	.11	-.05	**.29**	.14	.03	-.01	.15	-.07	.02
159. Erasmus	-.12	-.09	.12	-.10	.01	-.11	-.11	-.02	-.09	-.10	.06	.08	.04	.04	.01	.09	-.02	-.14	-.05	.14	.07	.10	-.06	.10	**.18**	.05	-.08	**.17**	-.11	.00
160. PROMOS	-.14	-.09	-.02	-.08	-.08	-.09	-.09	.00	-.12	-.07	-.10	-.06	-.11	-.08	-.02	-.14	-.04	-.06	.11	-.06	-.06	-.04	.05	**.20**	.05	-.04	.07	-.05	.00	.02
161. Political EAs	-.08	-.03	-.14	.04	-.04	.06	**.20**	.05	-.08	.02	.00	.00	.12	-.02	-.04	.14	-.10	.05	.05	.04	**.27**	.08	.12	-.07	.03	-.07	**-.20**	-.04	-.04	-.16
162. Religious EAs	-.13	.05	.00	**.22**	.03	.02	-.07	-.06	-.04	.04	-.09	-.02	-.09	-.07	-.01	.12	**.17**	.01	-.01	.15	.10	.16	.06	.09	-.01	.13	-.01	.01	-.08	-.04
163. EAs abroad	.01	-.13	-.10	.04	-.04	-.05	-.13	.03	.00	.04	-.02	-.08	-.04	.01	.09	.11	-.07	-.01	.04	-.13	.14	-.01	.02	**.19**	**.17**	.02	.07	-.01	.03	**.17**
164. Political/historical hobbies	.13	.01	.02	.03	.04	.01	-.01	.11	.05	-.10	.02	.06	-.12	-.14	.07	.02	-.04	.09	-.02	.13	.15	.00	.16	.10	.08	.03	.06	.10	**.24**	.03
165. Professional licenses/ certifications	.07	-.01	-.15	-.10	-.09	-.11	-.05	.09	-.13	.14	.03	-.07	-.06	-.03	.03	-.02	**.18**	-.06	-.07	-.16	.04	.00	-.07	.06	-.08	.01	.06	-.04	.01	-.01
166. Driver's license	-.02	.02	.00	.08	.03	.05	.11	.02	.01	.01	.09	-.04	.15	-.04	.03	-.06	-.05	-.12	-.05	.04	-.08	-.07	.12	**-.18**	**-.23**	-.08	-.15	-.08	-.02	-.08
167. Academic/ professional trainings	-.09	.09	-.03	-.03	-.03	-.01	-.01	**.23**	-.02	-.08	.07	-.08	.02	.06	.00	.06	**.46**	-.04	**.23**	.15	.16	.00	.04	.16	.10	.16	-.06	**.22**	-.06	-.08
168. Quality of leadership experiences	-.09	-.01	.07	.04	**.24**	-.12	-.04	**.30**	-.04	-.10	**.20**	-.01	-.11	-.13	**.21**	.08	-.03	.14	.07	**.30**	**.52**	.03	.15	**.25**	.12	**.18**	-.01	.16	.07	**-.21**

	61.	62.	63.	64.	65.	66.	67.	68.	69.	70.	71.	72.	73.	74.	75.	76.	77.	78.	79.	80.	81.	82.	83.	84.	85.	86.	87.	88.	89.	90.
61. Constructive use of gaps	-	-.01	**.47**	.11	**.25**	.03	-.12	-.19	.11	.07	.16	**.39**	**-.21**	.18	-.04	.08	-.10	.06	.06	-.17	-.17	.04	-.07	-.11	.01	-.11	-.02	.09	.11	.00
62. Reputation of universities		-	**.17**	.11	-.15	-.02	.00	.03	.09	.14	.04	-.04	-.03	.09	.01	-.04	-.05	.03	.00	.09	-.07	-.04	.02	-.04	.02	.09	.01	-.07	.04	-.06
63. Reputation of employers			-	.07	.00	-.04	.03	.00	**.21**	.06	.14	**.50**	-.15	.07	-.07	-.04	**-.23**	.00	-.09	.01	-.10	-.03	-.05	.05	-.08	.02	.02	**.25**	.01	.12
64. Sport EAs				-	**.32**	.08	.16	.06	-.03	.10	.02	.01	**-.19**	-.11	.00	.09	-.03	.14	.02	.06	-.05	.01	-.06	.00	.04	.05	.07	.04	.07	.03
65. Sport hobbies					-	**.42**	-.02	.00	.11	-.10	-.05	**.24**	-.04	-.01	-.01	.02	.07	.05	.02	.06	-.04	.15	.04	.04	.02	.06	.07	.07	-.01	.04
66. Recreational sport hobbies						-	-.04	.14	-.12	-.10	-.07	.09	-.05	.06	-.08	.06	.09	**.24**	.13	.09	-.06	.03	.08	-.06	.16	.05	-.02	.08	.09	.06

		61.	62.	63.	64.	65.	66.	67.	68.	69.	70.	71.	72.	73.	74.	75.	76.	77.	78.	79.	80.	81.	82.	83.	84.	85.	86.	87.	88.	89.	90.
67.	Prominent name position							-	.11	.01	-.04	.06	-.02	-.04	.03	.12	.02	.09	-.12	**-.38**	.08	**.52**	**-.26**	.09	.14	-.03	.15	**.18**	**.18**	.00	.13
68.	Own name								-	-.05	-.15	.00	.00	.05	-.11	.04	-.01	.10	-.04	-.02	**.62**	**-.27**	.11	.00	-.11	-.02	-.11	-.03	-.05	.01	-.07
69.	Academic comparison									-	.01	-.01	**.19**	-.03	**.18**	**.27**	-.02	-.11	.03	-.07	.01	.06	-.03	.04	.01	-.11	.14	-.09	.05	**-.24**	-.04
70.	Accomplishments with professional experiences										-	-.08	.10	.01	**.19**	.12	-.09	-.05	-.07	-.09	.03	**.17**	-.12	.02	.05	.04	.12	-.02	.01	.07	-.01
71.	Awards											-	-.05	.04	.00	.12	.13	-.13	**.18**	-.09	.13	.00	**-.18**	.16	**.23**	-.12	.09	.08	.04	-.06	-.01
72.	Top tier business consultancies/ auditing firms												-	-.10	**.30**	.06	-.06	-.08	.02	.03	.08	-.07	.07	-.02	.01	.09	-.11	-.16	.13	.13	-.01
73.	Altruistic EAs													-	-.07	.02	.02	-.04	-.07	-.02	-.04	.00	.02	-.06	.05	.01	-.10	-.04	**-.21**	-.11	-.11
74.	Career-oriented EAs														-	.11	-.04	-.09	-.07	.05	.01	.12	-.14	**.17**	.16	-.03	.09	-.02	.10	-.05	.02
75.	Cognitive hobbies															-	-.08	.02	.08	-.13	.04	.15	-.06	**.18**	-.03	.06	.08	-.06	.03	-.07	-.10
76.	Business hobbies																-	.00	.04	.10	.06	-.05	-.08	.08	-.09	.15	.03	**-.17**	.09	.15	.10
77.	Pleasure hobbies																	-	.10	.04	.00	-.02	.01	-.04	-.08	.14	.03	-.02	-.11	.02	-.16
78.	Social hobbies																		-	.12	-.06	-.12	.09	.08	-.07	.12	.00	-.07	**-.20**	-.11	**-.19**
79.	Curriculum vitae as header																			-	.04	**-.39**	**.22**	.00	**-.21**	**.24**	-.01	-.10	-.07	.07	-.09
80.	Foot- and/or headnote																				-	-.06	-.02	.10	-.03	.02	.04	-.07	-.07	.10	-.14
81.	Name and address formatted differently																					-	**-.21**	.13	**.23**	-.16	**.20**	**.19**	.13	-.07	**.26**
82.	Academic degree and university not highlighted																						-	.02	**-.18**	.10	.03	-.03	**-.22**	.01	**-.22**
83.	Inconsistent date resolution																							-	.02	-.01	**.48**	**.18**	.00	-.11	-.10
84.	Dates right																								-	**-.59**	.06	**.18**	.00	-.09	-.07
85.	Dates left																									-	.15	-.05	.12	**.32**	.04
86.	Inconsistent date position																										-	**.24**	.08	-.02	.00
87.	Inconsistent chronology																											-	.11	.06	.04
88.	Professional layout																												-	**.25**	**.70**

	61.	62.	63.	64.	65.	66.	67.	68.	69.	70.	71.	72.	73.	74.	75.	76.	77.	78.	79.	80.	81.	82.	83.	84.	85.	86.	87.	88.	89.	90.
89. Tabular layout																													-	.09
90. Harmonic layout																														-
91. Consistent formatting	.09	-.01	.10	-.02	.04	.12	-.03	-.10	.06	.10	.14	.07	-.12	.08	.08	-.02	-.13	-.03	-.02	-.10	.06	-.01	-.14	.08	-.01	-.01	-.01	**.43**	.09	**.33**
92. Formatting errors	-.09	-.01	-.03	.03	**-.18**	-.08	-.14	-.03	-.14	-.01	-.08	-.07	.06	-.11	**-.17**	-.04	.06	.03	-.04	.07	.02	.11	-.08	-.01	-.02	-.02	-.08	**-.33**	.02	**-.18**
93. Page break within section	.10	-.09	**.18**	.10	.14	.02	.12	-.08	-.12	.09	-.08	.08	-.11	-.11	.01	-.12	.03	.05	-.04	-.16	.02	**-.19**	-.03	.03	.04	-.04	.13	**.25**	.03	.11
94. Page break within bullet	-.02	-.11	.01	-.10	.14	.05	-.04	.03	-.11	.00	-.02	.07	.07	.07	-.06	-.03	.05	-.04	-.01	.04	.03	-.04	.02	-.09	.03	-.02	.11	.02	.10	.00
95. Margin width	-.05	-.09	-.16	-.07	-.05	-.13	**-.20**	-.10	-.02	-.10	-.13	-.03	-.07	-.10	-.08	-.14	-.02	-.02	.01	**-.20**	**-.18**	.15	-.10	-.08	-.03	-.12	**-.17**	-.10	.04	.01
96. Space between sections	-.08	-.03	-.17	-.03	.10	-.01	-.07	-.02	.08	-.01	-.10	-.08	.00	-.12	-.08	.03	-.02	-.01	.00	-.04	-.13	.09	-.02	-.03	-.08	-.03	.02	-.11	-.07	.13
97. Line spacing	-.06	.01	-.15	.02	.01	.04	.12	.06	**-.17**	.03	-.11	-.02	.05	-.12	**-.21**	.04	-.03	.10	**-.18**	-.02	.13	-.06	-.13	-.07	.11	**-.18**	.02	-.10	-.05	.12
98. Fonts	-.02	.05	-.04	-.07	.09	.07	-.06	.09	-.02	.04	.02	-.02	.14	.00	-.03	-.08	.12	.00	.01	**.23**	-.06	.05	.07	.11	.00	.10	.08	-.16	-.10	-.11
99. Serious, usual fonts	.09	-.02	.08	-.01	**.19**	.07	-.02	-.02	.12	-.03	-.08	.03	-.10	.04	.07	-.07	**.17**	.02	.05	-.09	-.08	**.19**	.04	-.11	**.29**	.14	.04	**.18**	.08	-.09
100. Font without serif	.12	.13	.13	.05	-.04	.06	-.06	.10	-.01	.09	-.03	.03	.02	-.01	.00	.03	-.13	-.05	.04	-.02	-.09	-.02	-.15	**-.17**	.08	-.05	-.05	.16	**.25**	.11
101. Font size	-.06	-.01	.01	.06	.00	**.20**	.07	**.17**	-.04	-.01	.09	-.02	-.05	.02	-.03	.00	.00	.15	.04	.11	.04	-.12	.11	-.08	-.13	-.07	-.06	-.08	-.13	.07
102. Font size headers	-.13	.02	-.09	.06	-.06	.08	.06	-.01	-.12	-.03	-.05	-.09	.04	-.02	-.14	-.05	-.08	.08	-.08	-.02	.16	-.06	-.07	-.05	-.11	-.14	-.12	**-.19**	-.10	.11
103. Font size text	.02	.04	.01	.05	.07	-.04	.02	-.02	-.01	-.14	-.08	.06	.06	.02	-.04	-.01	-.03	-.01	.15	-.01	.01	.11	-.11	-.01	.01	**-.21**	**-.24**	-.16	-.03	.00
104. Appropriate highlighting	.03	-.01	.10	.04	-.03	.08	**.17**	-.05	-.08	.13	.01	.08	-.15	.12	-.02	-.08	-.04	-.08	-.10	-.03	**.25**	**-.30**	-.13	.07	.08	.04	.01	**.62**	**.19**	**.60**
105. Italicized words	-.06	.01	-.06	.01	-.08	-.04	.12	-.09	.00	.08	.08	.05	.12	**.20**	.06	-.03	**.18**	-.06	.03	.04	.15	-.15	-.01	**.21**	-.05	.09	-.05	-.15	-.07	-.13
106. Underlined words	.07	-.06	-.12	-.06	-.01	-.13	-.02	.11	-.09	-.07	-.04	-.10	.07	-.08	-.08	-.08	-.02	-.06	-.02	.04	.03	.11	.01	-.07	-.09	-.11	.13	**-.21**	**-.17**	-.15
107. Capitalized words	**-.24**	.03	**-.22**	**.18**	-.01	.07	-.06	.10	.07	-.09	.04	-.14	.12	-.08	.09	**.20**	-.09	.00	.08	.09	-.01	-.10	-.09	-.05	-.10	-.14	-.15	-.10	-.06	.02
108. Number of symbols	-.02	**.26**	.03	-.02	-.06	.10	-.04	.12	-.11	-.09	.03	-.10	.00	-.09	-.05	-.07	-.05	.09	-.07	**.17**	-.01	.00	.04	.00	-.07	.02	-.02	**-.20**	-.07	-.14
109. Appropriate use of color	**-.24**	-.05	.03	.01	.06	.07	.12	-.01	-.13	-.18	-.18	-.04	.06	-.09	**-.26**	-.10	-.16	**-.20**	**-.21**	-.03	**.21**	-.12	-.17	-.05	.02	-.06	.07	**.44**	-.01	**.56**
110. Number of words	.05	.09	**.31**	-.04	-.08	.01	.08	-.08	.12	**.22**	**.28**	.04	-.14	.16	**.19**	-.06	-.03	.10	**-.19**	.06	**.18**	**-.34**	**.22**	**.26**	-.12	**.29**	.16	**.27**	-.13	-.01
111. Comprehensive/ secondary school	.02	.01	.02	**.22**	.01	.09	-.03	-.05	-.10	.03	-.02	.06	-.10	**.19**	-.06	.00	-.03	-.08	.07	.12	-.01	-.09	-.14	.03	.06	-.09	-.05	-.04	.04	-.03
112. Business focus on school	.10	-.10	.05	.07	-.01	-.02	-.01	-.04	.09	.07	-.05	-.10	.10	-.11	.15	-.03	-.03	-.06	-.13	-.09	.08	-.04	-.09	-.10	-.06	-.08	-.03	.01	-.08	-.01
113. Science school subjects	.00	.00	.00	**.21**	**.20**	.15	.02	**.17**	**.19**	-.08	.14	.02	-.08	.00	.12	.08	-.13	-.03	.04	.09	-.06	-.10	.07	.10	-.15	-.01	.01	.04	.02	-.01
114. Humanities school subjects	-.12	.01	.06	.11	.00	.02	-.01	.13	.13	-.10	.16	-.12	.05	-.05	.04	.03	-.12	-.02	-.03	.09	-.06	-.16	-.08	.08	-.13	.01	-.05	.08	-.08	.03

	61.	62.	63.	64.	65.	66.	67.	68.	69.	70.	71.	72.	73.	74.	75.	76.	77.	78.	79.	80.	81.	82.	83.	84.	85.	86.	87.	88.	89.	90.
115. Language school subjects	.10	-.03	.06	-.02	.00	.02	-.04	.03	.09	-.04	.00	.02	-.05	-.08	.09	.00	.05	.06	-.13	-.01	.05	**-.17**	-.09	.02	-.13	-.02	-.11	.07	-.09	.10
116. Stays abroad during school	-.09	.10	-.04	.11	.06	-.03	.02	-.09	-.02	.13	**.17**	-.06	-.04	.00	.02	-.03	-.04	.04	-.05	-.06	.06	.03	**.21**	.13	-.07	.12	.13	-.12	-.13	-.11
117. Mean duration stays abroad during school	-.13	.08	.06	.09	.05	-.14	-.01	-.01	-.02	-.08	-.02	.00	.12	-.09	-.12	.02	.04	-.04	-.04	-.13	-.05	.16	.01	.14	-.16	.07	-.01	-.13	-.05	-.07
118. Mean duration academic gaps	**.26**	-.11	-.08	-.10	.10	.00	.00	-.06	-.02	-.02	-.08	.05	.08	.02	-.04	.16	.09	-.04	.14	-.02	-.01	.06	-.02	-.14	.15	-.11	-.14	-.07	.00	-.07
119. Study programs at technical/dual colleges	.14	**.52**	.11	.08	-.08	.03	.05	.07	.07	.15	.05	-.16	.02	.02	-.05	-.08	.07	.03	-.03	.00	-.09	.10	-.04	-.07	-.04	.04	.12	-.02	.05	-.04
120. Duration bachelor studies	-.02	.14	.09	-.02	**-.20**	-.16	-.11	-.01	-.04	.02	-.15	-.04	.03	-.06	-.01	**-.20**	-.08	-.01	**.19**	-.05	-.09	.00	-.02	**-.23**	**.22**	.04	.09	.07	-.03	.11
121. Business administration studies	**.29**	-.01	**.20**	-.11	.06	.11	-.04	-.01	.13	-.11	.14	.16	-.16	.01	**-.17**	.06	-.04	**.17**	.11	-.07	-.09	.01	.14	**-.18**	-.01	.02	.01	.15	-.07	.09
122. Economics studies	**-.28**	-.14	.02	-.06	-.05	-.11	-.01	.03	-.09	-.10	-.08	-.09	**.28**	-.09	.03	-.05	-.02	-.01	.00	-.04	-.01	.10	**-.17**	.05	.07	-.16	.00	-.11	-.09	-.02
123. Business and economics studies	.02	.01	-.02	.12	-.02	.06	-.09	.05	-.08	.09	-.13	.02	-.02	-.08	-.01	.16	.04	.04	.07	.13	.04	.02	.05	-.11	**.18**	.09	.01	-.02	**.18**	.02
124. Neighbouring disciplines	-.11	-.12	**-.17**	.05	-.09	-.15	-.11	-.10	-.03	.16	-.16	-.05	.00	.03	.12	-.15	.02	-.05	-.06	-.08	.08	.05	**-.21**	-.05	.01	-.11	-.10	-.11	-.02	-.02
125. Study focusses on finance	**.32**	-.06	**.20**	.13	**.19**	.04	-.02	-.03	.15	-.02	.03	**.30**	-.16	.01	-.05	.10	-.08	-.09	.05	-.11	-.05	.00	.04	-.10	.10	-.04	.02	**.18**	.09	.01
126. Study focusses on controlling	.03	.11	.07	**.18**	-.07	-.04	-.04	-.15	.11	.05	.03	-.05	-.05	-.07	.06	.02	-.08	.07	-.03	.03	.06	-.12	.14	-.07	-.04	.01	.05	.07	-.02	-.02
127. Study focusses on logistics	.15	**.22**	-.03	.12	.11	-.02	-.10	.15	.09	.04	-.11	-.11	.07	.07	-.10	-.09	.10	-.07	-.06	.08	**-.20**	.10	-.06	-.07	-.03	-.02	.09	-.05	.01	-.04
128. Study focusses on economics	.03	-.10	.16	-.09	-.05	.00	-.03	.08	-.07	-.11	.03	**.25**	-.01	-.11	-.03	.01	-.01	-.05	-.01	-.02	-.09	-.15	-.05	.06	.01	-.07	.00	.11	-.01	.06
129. Study focusses on informatics	.10	.06	.14	-.11	-.02	.03	-.11	-.01	.02	.16	-.01	-.16	-.01	.00	-.09	-.09	-.03	.00	-.04	.05	.04	.01	-.09	-.01	-.06	.14	.07	.09	-.07	.14
130. Study focuses on neighbouring disciplines	-.04	-.04	.01	.01	-.12	-.07	-.03	**.20**	-.10	.03	-.02	-.12	.01	-.08	-.09	-.10	.10	-.08	-.04	**.17**	-.01	-.03	-.09	.03	-.09	.01	.13	.02	-.01	.07
131. Theses topics	-.05	.09	**.17**	-.02	.04	.04	-.02	-.02	.09	.12	-.03	.09	-.05	-.03	-.07	-.09	-.05	-.05	-.03	.04	.00	-.08	-.01	-.05	.05	.05	.13	.03	-.05	-.01
132. Theses with companies	.09	**.21**	.07	.11	-.11	**-.17**	-.10	-.16	.08	.14	.08	-.12	-.05	.05	-.09	.00	.02	.05	.07	-.06	-.06	.02	.02	-.08	-.01	.01	**.25**	.15	**.24**	.08

	61.	62.	63.	64.	65.	66.	67.	68.	69.	70.	71.	72.	73.	74.	75.	76.	77.	78.	79.	80.	81.	82.	83.	84.	85.	86.	87.	88.	89.	90.
133. Bachelor thesis presented with mark	.09	-.09	.09	-.01	.03	-.08	-.14	.02	.05	.12	.12	.13	-.05	.05	-.04	.09	.03	.07	-.08	.03	-.11	-.14	-.11	.04	-.01	-.15	-.08	.11	-.08	-.06
134. Semesters abroad	-.01	.06	.12	-.07	-.05	.08	.07	-.10	.04	.15	.02	.06	-.01	.07	.13	-.07	-.06	-.01	-.04	.08	**.17**	-.16	.08	.04	.01	.13	-.01	.02	-.03	-.06
135. Apprenticeships	**.38**	-.03	.05	**.19**	.06	-.04	-.10	-.13	-.11	-.07	.15	.00	-.01	-.06	-.04	**.23**	-.02	.02	.07	**-.17**	-.11	.00	-.03	-.07	.14	-.05	-.15	.01	.11	.01
136. Work and travel/au pair	**-.21**	-.03	-.14	-.06	-.03	-.09	.10	-.03	-.02	-.08	.04	-.09	-.07	.01	.09	-.01	.12	-.01	.04	-.02	.07	-.10	.04	-.08	.13	.04	.05	.13	.07	.06
137. Internships	-.01	-.07	.06	.05	.13	.12	-.01	-.03	.16	**.18**	.03	**.34**	.01	**.25**	.10	-.06	.15	.06	.03	.04	-.08	.00	-.01	**.17**	.04	.06	-.11	.02	-.10	-.10
138. Internships/jobs relevant for position	**.35**	**.18**	**.60**	**.20**	.11	.01	-.01	-.05	.13	.13	.14	**.30**	-.07	.09	-.11	.01	-.07	.07	-.07	-.04	-.16	-.09	-.07	-.03	.00	.03	-.11	.11	.01	.10
139. Internships/jobs in research	-.14	.10	**.22**	-.01	-.14	-.01	.03	.01	.01	-.07	.13	-.16	.03	-.04	-.02	.02	-.05	.14	-.02	-.03	.07	.03	-.01	.02	-.14	.13	.16	.01	-.03	.02
140. Internships/jobs in consulting	.02	.01	.05	-.11	-.07	-.08	-.07	-.10	.01	.13	.10	-.03	.07	.05	.03	-.02	-.03	.00	.15	-.08	.02	-.15	-.02	-.03	.10	.00	-.01	-.11	-.10	-.05
141. Internships/jobs abroad	-.18	.14	-.05	.04	-.08	.08	.08	-.06	-.04	-.06	**.18**	-.09	.11	.06	-.05	.05	.06	.03	.04	.00	.09	**-.27**	-.04	**.24**	-.05	.10	.05	.01	-.08	.04
142. Inconsistent descriptions internships/jobs	-.14	-.05	.00	.01	-.10	-.11	-.02	.14	-.11	-.04	.00	-.16	**.18**	.02	.01	-.07	.12	.04	.03	.13	.13	.02	.03	.02	-.01	.07	.13	.05	-.10	.06
143. Detailed descriptions internships/jobs	.07	.03	**.35**	-.07	**-.18**	-.09	.08	-.06	.02	**.20**	.00	.16	-.13	.02	.07	-.06	.06	.03	-.16	-.01	.10	**-.29**	-.05	.05	-.02	.06	-.10	**.28**	-.07	.11
144. Business languages	.00	.11	.10	.15	**.20**	.14	-.09	.10	-.07	.05	**-.17**	.08	.03	.08	**-.17**	.16	-.13	-.02	.15	.02	-.11	.06	-.02	-.06	.14	-.05	-.03	.11	.14	**.17**
145. Business English	.12	.09	.08	.10	-.03	-.13	-.04	-.13	.04	-.09	**.18**	-.03	-.11	.11	.07	-.03	-.01	.13	.13	-.11	-.02	.15	**.20**	-.09	-.03	.16	.06	-.06	-.05	.02
146. English level	.13	.07	.12	-.04	.06	.07	-.03	-.15	.13	**.23**	.07	**.25**	-.12	**.25**	.04	-.10	-.07	**.17**	.05	.02	.02	**-.18**	.12	.12	-.03	**.17**	-.09	.13	.07	.07
147. English TOEFL	.10	-.07	.10	-.03	.15	.08	-.01	-.02	.09	.12	.09	**.22**	-.07	**.17**	.07	-.11	-.03	**.18**	.01	.02	-.04	-.11	.15	**.26**	-.02	.14	-.03	**.17**	-.02	-.06
148. English CEFR	-.08	**.19**	-.08	.09	.02	.07	-.01	.00	-.12	.01	-.06	-.15	-.03	-.09	-.09	.00	.14	.03	.04	.06	-.02	-.08	.05	**-.18**	.05	.12	-.04	.05	.10	.15
149. Language tests	.15	.03	**.17**	.06	.02	.00	-.04	-.06	.09	.05	**.29**	.16	-.05	**.19**	.13	-.08	-.13	.14	.09	-.02	-.08	-.03	**.18**	**.20**	-.01	**.25**	.10	.08	-.07	-.05
150. Language trainings	.15	.05	-.01	.12	.05	-.13	-.05	-.09	.05	**.21**	-.05	.04	-.12	.01	.07	-.12	.02	.08	.09	-.03	-.03	.04	.01	-.09	.02	.06	-.01	-.02	-.08	-.02
151. Substantial software skills	.04	.05	.08	.01	-.02	-.01	**-.21**	-.09	.09	-.07	-.13	.12	-.07	.04	.06	.04	**-.17**	.02	-.02	-.08	-.05	.15	-.13	-.13	.06	-.09	-.10	.03	-.01	-.03
152. Mathematical software skills	**-.31**	-.12	-.16	-.04	-.03	.03	.00	-.04	-.02	-.05	-.11	-.03	.05	-.08	.06	-.07	.04	-.12	.00	-.08	.15	-.08	**-.18**	-.08	.01	-.14	-.06	-.04	-.07	.07
153. Webpage software skills	-.06	.03	.02	.01	-.08	-.03	-.11	.05	-.03	.07	-.03	-.11	.15	-.07	-.12	.13	-.06	.00	.08	-.04	-.10	-.01	-.03	-.12	.03	.06	.07	-.03	-.04	.04
154. IT trainings	.14	-.06	-.07	-.08	.05	.03	-.08	.08	-.08	-.07	-.04	-.05	-.13	-.07	-.10	-.06	.16	.07	.14	-.05	-.07	.03	-.01	-.07	.02	.08	**.17**	.05	.02	.03

	61.	62.	63.	64.	65.	66.	67.	68.	69.	70.	71.	72.	73.	74.	75.	76.	77.	78.	79.	80.	81.	82.	83.	84.	85.	86.	87.	88.	89.	90.
155. German Academic Scholarship Foundation	-.10	.06	.04	-.08	-.11	-.01	.00	-.12	**.19**	.15	.10	-.09	-.02	-.03	-.04	-.01	.03	-.07	-.12	.01	.08	-.07	.10	**.27**	**-.18**	**.20**	.16	-.05	-.13	-.01
156. Germany Scholarship	**.26**	.00	**.25**	-.06	-.04	-.03	.10	-.01	-.02	.02	**.35**	**.22**	.05	.03	-.12	-.02	.00	-.02	.05	.02	-.06	-.06	.16	.12	-.06	-.03	.09	.07	.06	.04
157. Non-financial scholarships	.04	.04	.11	. 05	.10	-.04	-.01	-.16	.06	-.06	.06	.02	-.01	-.02	.05	-.07	-.08	-.03	-.04	-.04	-.05	-.13	-.07	**.21**	-.07	.03	-.04	.04	.08	-.10
158. Scholarships abroad	-.15	**-.20**	.05	-.05	-.13	**-.19**	.09	.09	.05	.13	-.02	.04	-.08	-.02	.07	-.08	-.12	-.01	-.02	.09	.13	.01	.09	.06	-.03	-.05	.05	.11	-.04	.03
159. Erasmus	-.05	-.13	-.08	-.02	-.14	-.13	.10	-.06	-.02	.02	.06	-.13	-.07	-.09	.06	.08	-.10	.02	-.02	.04	.12	-.05	-.06	.02	.00	-.11	.00	.07	-.04	.03
160. PROMOS	-.04	-.08	**.23**	-.05	-.03	-.01	.07	**.17**	.11	.05	-.13	**.28**	-.07	.04	-.03	-.09	-.08	-.07	.03	.03	.00	.00	.08	-.07	-.04	-.05	-.09	.07	-.09	.05
161. Political EAs	-.03	-.07	-.03	-.02	-.15	-.11	-.04	.00	-.06	-.09	-.01	-.07	-.05	-.08	.03	-.03	-.07	-.03	.00	-.09	-.03	.07	.01	-.01	.06	-.06	-.12	.04	.03	.00
162. Religious EAs	-.18	-.05	-.12	-.11	-.07	.05	-.14	-.09	-.06	-.09	.00	-.10	-.05	-.08	-.05	-.11	.15	.07	.10	.02	-.09	.08	.12	.00	.05	-.04	.12	-.10	.13	-.15
163. EAs abroad	-.15	.05	-.01	-.14	-.01	-.09	-.07	-.02	-.06	-.02	-.11	-.03	.14	-.01	-.09	-.04	-.05	-.10	-.08	-.05	.05	.02	.02	.02	-.14	-.07	-.11	.01	-.13	.01
164. Political/historical hobbies	-.04	.08	-.07	.00	-.03	-.04	.00	-.14	.02	.10	.02	.00	.13	-.02	.08	**.31**	-.06	.05	-.02	-.10	.11	-.04	.07	**.19**	-.06	-.02	-.02	-.07	-.03	.02
165. Professional licenses/ certifications	.08	**.18**	.06	.05	-.03	-.11	-.01	.09	-.04	.00	.08	.03	-.09	.05	.03	.02	-.09	-.08	.01	.07	-.11	.15	-.04	-.08	.03	-.07	-.09	**-.21**	.02	-.13
166. Driver's license	-.08	.05	-.13	.03	.03	-.02	.03	.11	-.13	-.02	-.07	-.10	-.03	-.11	.04	-.08	.06	-.11	-.05	.07	.03	.11	-.05	-.11	.12	-.07	.00	-.06	.03	-.02
167. Academic/ professional trainings	.10	.08	.05	.03	-.11	-.10	-.02	-.05	-.01	.07	-.04	-.02	-.11	.04	-.16	.06	-.12	.00	.12	.01	-.09	-.07	**-.20**	.14	-.09	-.14	-.04	-.11	.10	-.08
168. Quality of leadership experiences	**-.24**	.08	.12	-.05	-.14	-.02	**.18**	.00	.15	-.02	.10	.02	-.11	.10	.15	-.07	.06	.03	-.15	.01	.11	-.13	.06	**.29**	**-.23**	**.19**	.03	.10	-.09	-.07

	91.	92.	93.	94.	95.	96.	97.	98.	99.	100.	101.	102.	103.	104.	105.	106.	107.	108.	109.	110.	111.	112.	113.	114.	115.	116.	117.	118.	119.	120.
91. Consistent formatting	-	**-.51**	-.07	**-.21**	**.20**	.03	.06	-.05	-.02	.16	-.11	.00	-.15	**.45**	-.06	-.06	.05	**-.24**	.12	.05	-.09	-.07	-.01	-.03	.12	.09	-.06	.06	-.08	-.04
92. Formatting errors		-	-.13	.08	-.08	.05	-.01	.08	-.10	-.07	.13	**.20**	.05	**-.21**	-.04	.05	.05	**.27**	-.09	-.06	.16	.11	**-.17**	-.03	**-.17**	-.10	.08	.04	-.08	-.07
93. Page break within section			-	**.28**	-.05	-.10	-.03	-.06	**.21**	.01	.01	-.14	-.10	**.22**	-.08	-.01	**-.25**	-.05	.03	**.25**	-.04	**-.17**	-.01	-.04	.05	.01	-.07	-.07	-.11	.11
94. Page break within bullet				-	-.05	**-.19**	-.08	-.03	.10	-.10	-.01	-.02	.03	-.05	-.02	.02	-.07	-.03	-.05	.09	-.01	-.06	-.05	-.03	-.07	-.03	-.06	-.03	.01	.05
95. Margin width					-	**.31**	.07	-.07	.05	.06	**-.21**	.08	.02	.06	-.07	**.17**	.16	**-.21**	.05	**-.41**	.10	-.15	-.03	-.03	.06	-.02	-.03	-.07	-.15	.02
96. Space between sections						-	.11	.08	**-.23**	.01	.10	.06	-.09	-.01	-.07	.04	**.18**	-.10	.04	**-.36**	-.02	-.10	-.05	-.04	-.05	.05	.01	-.03	-.02	.04
97. Line spacing							-	-.12	**-.24**	.02	.03	.15	.07	.07	-.08	.07	.02	.03	.13	**-.24**	-.08	-.01	-.07	-.11	.03	-.09	-.02	.07	-.02	-.02

	91.	92.	93.	94.	95.	96.	97.	98.	99.	100.	101.	102.	103.	104.	105.	106.	107.	108.	109.	110.	111.	112.	113.	114.	115.	116.	117.	118.	119.	120.
98. Fonts								-	.02	**-.32**	.11	.00	.02	-.12	.09	.05	-.15	.03	-.07	.09	.01	-.06	-.11	-.06	-.15	.04	.02	.07	.03	.12
99. Serious, usual fonts									-	-.16	**-.33**	**-.25**	-.08	.02	-.04	-.04	**-.41**	-.08	-.04	.10	-.01	.03	.02	.02	-.04	-.08	-.06	.07	-.09	.02
100. Font without serif										-	.03	-.03	-.02	**.22**	**-.20**	-.05	.05	.11	.07	-.02	-.06	-.06	.01	.01	.05	.03	.03	-.06	**.21**	-.09
101. Font size											-	**.34**	-.02	-.05	-.14	.03	**.25**	.13	-.08	.02	-.05	.13	.12	.06	.15	-.02	-.06	.10	.05	.06
102. Font size headers												-	**.33**	.11	-.04	.01	**.18**	.12	.14	**-.27**	**.18**	.02	-.12	-.01	.11	.07	.00	-.05	.07	-.07
103. Font size text													-	-.05	.06	-.03	-.02	.02	.09	**-.41**	.16	.06	-.11	.00	-.16	-.08	-.01	.04	.08	.02
104. Appropriate highlighting														-	-.08	**-.26**	-.05	**-.24**	**.45**	.08	.02	-.10	-.03	.05	.11	-.10	-.09	-.12	.00	-.08
105. Italicized words															-	.05	-.08	-.06	-.05	-.02	.00	-.06	.06	.10	.04	-.06	-.11	.05	-.10	-.06
106. Underlined words																-	.07	.05	-.11	-.11	-.07	.04	-.10	-.02	.15	.08	.14	.12	-.01	.04
107. Capitalized words																	-	.07	-.04	-.12	.11	.11	.10	**.23**	.10	.00	-.03	.02	-.06	-.05
108. Number of symbols																		-	.00	**.20**	-.04	.04	-.10	.02	-.04	-.08	-.02	-.01	.15	.03
109. Appropriate use of color																			-	-.18	.10	-.13	-.07	.04	.13	-.11	-.01	**-.21**	-.02	.11
110. Number of words																				-	**-.20**	-.01	.02	.07	.14	**.17**	.00	-.07	.10	.08
111. Comprehensive/ secondary school																					-	-.03	-.12	-.11	-.12	-.10	-.09	-.02	-.04	-.03
112. Business focus on school																						-	.16	**.36**	**.17**	-.12	-.01	.06	.02	.04
113. Science school subjects																							-	**.49**	**.28**	-.09	-.08	-.06	-.08	-.14
114. Humanities school subjects																								-	**.33**	-.10	-.03	-.16	-.07	-.07
115. Language school subjects																									-	-.07	.03	-.04	-.10	-.08
116. Stays abroad during school																										-	**.43**	-.13	.13	-.07
117. Mean duration stays abroad during school																											-	-.07	.12	-.02
118. Mean duration academic gaps																												-	-.10	-.07
119. Study programs at technical/dual colleges																													-	-.05
120. Duration bachelor studies																														-

	91.	92.	93.	94.	95.	96.	97.	98.	99.	100.	101.	102.	103.	104.	105.	106.	107.	108.	109.	110.	111.	112.	113.	114.	115.	116.	117.	118.	119.	120.
121. Business administration studies	.06	-.15	.11	-.11	.02	.13	.04	-.06	-.04	.13	**.18**	.00	-.06	.02	-.10	-.01	.00	.02	-.04	-.02	-.06	-.15	-.07	-.09	.00	-.03	-.11	.02	-.06	.03
122. Economics studies	-.04	.02	.05	.15	-.01	-.11	-.04	.09	.00	-.13	-.16	**-.17**	.08	-.15	.01	-.02	.03	-.07	.10	.00	-.02	.08	-.06	-.01	-.11	-.05	.10	.02	-.05	.01
123. Business and economics studies	-.01	.09	.00	.06	-.06	-.09	.07	.02	.05	**-.18**	-.13	.12	.05	.08	-.03	-.07	.00	.02	.06	-.06	.11	.03	-.07	-.06	.00	-.03	.01	-.09	**-.17**	.11
124. Neighbouring disciplines	-.08	**.28**	**-.20**	-.10	-.03	.02	-.01	-.02	-.05	.00	-.02	.05	.07	-.15	.06	**.17**	-.01	-.04	-.06	-.07	.12	**.19**	-.07	-.03	-.04	-.01	-.02	.05	-.09	.10
125. Study focusses on finance	.10	-.12	.11	.00	-.03	-.11	-.08	-.11	.08	.15	.04	-.13	-.01	.02	-.08	-.11	.01	-.03	-.13	.02	-.12	.14	**.17**	.11	.04	.03	-.11	.00	**-.17**	.04
126. Study focusses on controlling	.08	.03	.03	.00	-.08	-.09	-.11	.04	-.15	.03	.11	.10	-.10	.07	-.02	.04	.03	-.08	-.02	**.25**	-.08	-.01	.02	-.03	.11	**.22**	-.07	-.05	**.21**	.01
127. Study focusses on logistics	-.12	.05	-.06	-.01	.07	.08	.07	.02	.10	.11	-.16	-.11	.03	-.05	.05	.07	-.09	.10	.02	-.16	.02	-.02	-.04	-.02	-.11	-.09	-.03	.04	**.35**	-.02
128. Study focusses on economics	.12	-.13	.16	-.01	.11	-.05	.09	-.13	**-.18**	.16	.01	.05	-.06	.10	-.05	.12	.05	.00	-.04	.01	-.12	-.03	.01	-.03	.04	-.01	.04	.00	-.08	.00
129. Study focusses on informatics	.15	-.06	-.04	.07	-.04	-.06	-.02	-.06	-.02	.09	.04	.11	-.08	**.19**	-.02	-.09	.01	.09	.11	.08	-.03	.11	.02	**.20**	.15	-.08	-.07	-.09	.06	.08
130. Study focuses on neighbouring disciplines	.01	.10	-.04	-.01	-.13	.00	-.03	.08	-.05	.12	.06	.09	-.10	.03	-.11	**.21**	-.05	.08	.04	.11	-.08	.05	.03	**.19**	.06	.13	**.18**	-.02	.06	.10
131. Theses topics	-.07	.06	.15	.00	-.16	-.05	-.12	.11	-.03	.04	.10	.03	-.12	-.05	**-.17**	.02	.02	**.21**	-.05	**.19**	.11	.05	-.07	.01	-.02	-.09	-.01	-.07	.02	.11
132. Theses with companies	.05	-.07	-.09	-.10	-.10	.03	-.08	.01	.04	.12	.00	-.06	-.04	.08	-.13	-.08	-.08	-.05	-.04	.11	.01	.05	-.06	-.05	-.09	.06	-.02	.04	**.48**	.00
133. Bachelor thesis presented with mark	.02	-.08	.12	-.03	-.09	-.13	-.02	-.05	-.01	.01	.05	-.13	-.09	.05	-.05	-.04	-.04	-.08	-.07	**.21**	.01	.12	.01	.00	**.22**	-.09	-.03	.02	.00	.03
134. Semesters abroad	-.02	-.04	.08	**.24**	**-.19**	**-.32**	-.07	.09	-.05	-.06	-.09	-.12	-.08	-.06	**.19**	-.06	-.06	.10	-.06	**.42**	-.04	.01	-.06	-.10	-.02	.04	-.11	.02	.11	.10
135. Apprenticeships	.08	.02	-.10	-.07	-.01	-.11	.02	-.06	.04	.05	.02	-.03	.08	-.08	-.06	.04	.02	.05	-.11	-.03	.10	.10	-.01	-.06	-.09	-.05	-.03	**.45**	.00	-.05
136. Work and travel/au pair	.16	-.08	.04	-.11	.01	.13	.05	-.14	.02	.07	-.07	-.13	-.07	.14	-.03	-.07	.01	-.10	.15	.01	-.09	-.04	.04	.04	-.12	.01	-.03	.15	.00	.04
137. Internships	**.18**	**-.22**	.02	-.01	.07	-.03	-.03	.12	.02	-.12	.04	-.10	-.14	.01	**.20**	-.09	.10	-.13	-.11	.10	.06	**-.20**	.05	-.13	.11	.06	-.05	-.15	-.09	-.09
138. Internships/jobs relevant for position	**.19**	-.07	.07	-.06	.08	-.03	-.08	-.01	.00	**.20**	.06	-.06	.00	.09	.00	-.04	.01	.01	.00	.12	.04	.04	-.04	.00	.12	-.05	.08	.02	.09	.06
139. Internships/jobs in research	-.06	.12	-.02	-.05	**-.18**	-.05	**-.23**	-.04	-.07	.08	.13	-.01	.05	-.06	.00	-.05	-.04	-.02	.03	.07	.02	**.23**	.00	.11	-.08	-.02	.10	-.16	**.24**	.01

	91.	92.	93.	94.	95.	96.	97.	98.	99.	100.	101.	102.	103.	104.	105.	106.	107.	108.	109.	110.	111.	112.	113.	114.	115.	116.	117.	118.	119.	120.
140. Internships/jobs in consulting	-.02	.04	.01	-.01	-.16	-.04	.01	**.18**	-.06	.06	.15	.01	.04	-.06	.10	.11	-.05	.07	-.11	**.18**	-.03	.07	-.05	-.05	.09	.09	.07	.09	-.04	.09
141. Internships/jobs abroad	.03	-.03	-.04	.01	-.14	-.10	-.07	.08	-.05	-.06	.09	-.01	-.08	.09	.16	.07	**.30**	.03	-.04	**.29**	-.10	-.07	.00	.09	**.18**	.04	-.02	.06	.05	-.02
142. Inconsistent descriptions internships/jobs	-.14	.13	.06	.08	-.11	-.12	-.04	.08	-.07	.07	.03	.05	-.04	.02	.07	.07	.01	.03	-.04	.15	-.07	.13	-.02	.09	.02	.00	.02	-.05	.11	.02
143. Detailed descriptions internships/jobs	.08	-.07	**.38**	.06	**-.21**	**-.24**	**-.19**	-.02	.08	.13	.02	-.16	**-.19**	**.25**	-.03	-.08	-.15	.13	-.06	**.63**	**-.23**	-.01	-.03	.10	**.19**	-.03	-.03	-.05	-.05	**.19**
144. Business languages	.01	-.07	.11	.00	-.05	-.04	.01	-.05	**.27**	.14	-.02	-.05	.08	.09	-.11	-.08	-.14	.02	.06	**-.17**	.12	-.04	.12	.01	-.09	**-.17**	-.04	.06	.04	-.06
145. Business English	.00	-.11	-.15	.03	-.02	.03	-.07	-.03	-.05	.05	.08	.08	.10	.10	-.05	-.10	-.05	-.06	-.03	-.09	-.10	-.06	-.01	-.08	-.07	.11	.15	-.13	**.28**	.02
146. English level	.14	-.11	.03	.06	-.04	-.04	**-.20**	-.02	.02	.08	-.07	-.05	**-.17**	**.21**	.13	-.15	-.12	-.05	.11	**.29**	-.16	**-.19**	.02	-.09	.04	.10	.08	-.06	.08	-.01
147. English TOEFL	.12	-.11	.08	.02	-.01	-.06	**-.17**	.01	.08	.04	-.09	-.03	-.15	.08	.07	-.15	-.14	-.06	.07	**.29**	-.10	**-.17**	.08	.00	.11	**.17**	.05	-.11	-.12	-.01
148. English CEFR	-.04	.01	-.03	.12	.07	.04	.02	.06	.02	-.04	.08	.13	-.07	.12	.00	-.10	.09	.09	.14	-.02	.03	-.07	-.05	-.02	-.04	.07	.04	.01	**.23**	.05
149. Language tests	.03	-.08	.06	.01	-.11	-.06	**-.29**	-.10	.00	.09	-.03	-.05	-.10	.02	.07	-.13	-.10	-.06	-.10	**.25**	-.09	-.14	.03	.00	.06	**.28**	.11	-.14	.03	-.06
150. Language trainings	.08	-.04	.01	-.04	-.04	-.02	.00	.07	.12	-.09	.04	.09	.02	.03	-.11	-.01	-.12	.06	.03	-.01	-.01	.12	-.06	-.14	-.09	.10	-.10	**.20**	.05	-.06
151. Substantial software skills	-.02	.15	-.06	.12	-.07	**-.19**	-.06	**-.19**	.01	.03	-.03	-.03	-.08	-.06	-.07	-.07	.08	.11	.07	.02	.10	.05	-.01	-.09	.04	**-.17**	.01	-.01	-.03	.02
152. Mathematical software skills	-.08	.06	.01	.07	.10	.05	-.04	-.08	-.01	-.06	-.10	-.07	.03	-.07	.05	.05	**.25**	-.06	.09	-.06	.02	**.18**	.16	.04	.01	-.05	.08	-.04	-.15	.02
153. Webpage software skills	**-.18**	.05	.00	.09	**-.23**	-.09	-.02	.04	-.03	.09	.03	-.05	-.04	**-.18**	.03	.11	.01	.14	-.01	.07	-.09	**.19**	.05	.12	.01	-.11	-.03	.08	.10	**.20**
154. IT trainings	.08	.09	.14	.05	.13	.11	.05	-.03	.04	.01	-.02	.04	-.07	.15	-.10	-.01	-.07	-.09	-.14	-.03	-.07	-.10	-.08	-.06	.06	.03	-.03	-.07	-.09	-.05
155. German Academic Scholarship Foundation	.00	.04	-.06	-.10	-.04	.09	-.01	**.17**	.02	-.14	-.11	**-.17**	-.16	-.07	.06	.09	-.08	-.01	-.07	**.17**	-.08	.06	-.04	.04	.00	.03	**.18**	-.11	.08	-.12
156. Germany Scholarship	**.17**	-.16	-.10	-.03	.07	.09	.11	-.01	**-.18**	-.03	.02	-.03	.02	.04	**.21**	.03	-.11	-.11	-.01	-.06	.09	-.12	.06	.03	-.04	.03	-.03	.00	.08	.03
157. Non-financial scholarships	.08	**-.18**	.06	.03	.00	-.09	-.02	-.07	.08	.03	**-.18**	-.10	.01	-.02	-.01	.02	-.07	-.08	-.08	.16	-.07	.03	.11	.10	.12	.10	.12	-.05	-.03	.05
158. Scholarships abroad	.09	-.08	.15	.07	.01	**-.17**	.03	.00	-.08	-.02	.04	-.11	-.12	-.02	-.09	.03	.00	-.13	-.06	**.23**	-.07	-.11	-.04	-.16	-.06	.02	.00	-.01	-.11	.09
159. Erasmus	.12	-.07	.14	-.02	-.02	**-.18**	.03	-.07	.00	-.04	-.10	-.09	-.06	.04	-.11	.03	-.06	-.08	.00	.15	.01	-.12	-.03	-.12	-.02	-.03	-.10	-.02	-.05	.00
160. PROMOS	.03	-.12	.09	.10	.14	-.06	.10	-.12	**-.17**	.09	.16	-.01	.02	-.05	-.07	.12	.07	-.09	-.02	.07	-.08	-.10	-.04	-.07	.07	.09	.00	-.05	-.07	.12
161. Political EAs	-.10	.14	-.04	-.09	.02	-.04	.15	.05	.05	-.03	-.08	-.11	.09	-.11	.03	.12	-.09	-.11	.06	-.06	.07	.00	.00	.06	-.01	-.06	.00	.01	-.13	**.22**
162. Religious EAs	-.05	.08	-.06	-.02	-.03	.02	-.12	.10	.02	-.16	-.03	-.04	-.11	-.07	-.01	-.07	-.08	.04	-.16	.02	-.03	-.08	-.10	-.08	-.13	-.01	-.06	-.08	.00	.01
163. EAs abroad	.05	-.10	.07	.09	.10	.03	.01	.10	.01	-.14	-.11	.01	.02	.03	-.05	.05	.06	-.11	.09	.03	-.08	-.10	-.16	-.06	-.04	.15	**.31**	.08	-.09	.07

	91.	92.	93.	94.	95.	96.	97.	98.	99.	100.	101.	102.	103.	104.	105.	106.	107.	108.	109.	110.	111.	112.	113.	114.	115.	116.	117.	118.	119.	120.
164. Political/historical hobbies	.11	-.05	-.04	-.09	-.10	.04	.14	.12	-.03	.01	-.12	.04	.02	-.09	.03	-.05	.02	-.06	-.17	.06	-.07	-.10	-.11	-.10	-.10	.15	-.02	.15	.00	-.06
165. Professional licenses/ certifications	-.13	-.01	-.03	**.20**	-.05	-.02	.00	-.14	-.01	-.03	-.06	.07	**.20**	**-.17**	-.06	-.08	.02	.07	**-.25**	-.08	-.09	.05	-.05	-.03	-.07	.16	.16	-.07	**.22**	.02
166. Driver's license	-.03	.06	-.05	-.07	.01	-.02	.11	**.19**	.06	-.03	.01	**.19**	**.26**	.02	-.06	.13	-.11	.06	.03	**-.21**	.03	.09	-.07	-.03	-.12	.02	-.01	.03	.08	.07
167. Academic/ professional trainings	-.10	.09	.07	-.04	-.03	-.11	.06	.00	**-.17**	.00	-.03	.03	-.04	-.04	-.06	-.03	.01	.08	-.19	.14	.10	-.03	-.04	.05	.06	-.04	.11	-.11	.13	.04
168. Quality of leadership experiences	-.08	.05	.10	.05	**-.38**	**-.19**	**-.21**	.10	.09	**-.21**	.03	**-.17**	-.11	-.10	.15	-.13	**-.17**	.14	.00	**.51**	-.10	.01	.06	.10	.08	.04	.04	**-.19**	.07	.07

	121.	122.	123.	124.	125.	126.	127.	128.	129.	130.	131.	132.	133.	134.	135.	136.	137.	138.	139.	140.	141.	142.	143.	144.	145.	146.	147.	148.	149.	150.
121. Business administration studies	-	**-.45**	**-.25**	**-.42**	**.22**	-.07	.00	.06	.03	-.16	**.20**	.01	.15	-.13	-.07	-.06	.06	.13	.01	-.01	-.12	-.09	-.01	.10	.15	.03	.14	.01	.13	.12
122. Economics studies		-	-.13	.15	-.07	-.10	-.11	**.20**	-.15	.07	.03	-.11	-.07	**.22**	.01	.06	-.02	.04	**.23**	.06	.07	.14	.03	-.10	-.13	-.08	-.10	-.13	.00	-.14
123. Business and economics studies			-	-.14	.08	.09	-.05	-.08	**.17**	-.06	-.03	.00	-.01	-.07	.01	-.07	-.06	-.10	-.12	-.04	-.14	-.05	-.09	.02	-.09	.08	-.08	.13	-.05	-.04
124. Neighbouring disciplines				-	-.09	.09	.01	-.08	-.12	**.31**	-.13	.06	-.06	-.06	.05	-.01	-.03	-.09	.08	.10	-.11	.05	.08	-.06	-.15	**-.21**	-.09	**-.19**	-.13	.02
125. Study focusses on finance					-	.06	-.15	**.26**	-.12	.03	.09	-.05	**.21**	-.04	.07	-.02	.05	.15	-.03	-.03	-.12	-.11	.10	**.18**	-.06	.04	.06	-.15	.04	-.02
126. Study focusses on controlling						-	-.07	-.02	-.10	.03	.08	**.36**	**.20**	.11	.07	-.08	-.09	-.02	.14	-.04	.08	.15	.09	-.10	.10	.12	-.08	.14	.01	.01
127. Study focusses on logistics							-	-.11	**.31**	.02	-.03	**.23**	-.05	-.09	-.01	.01	-.05	.04	-.05	-.11	-.12	.01	**-.17**	.15	.08	-.09	-.16	.11	-.14	.03
128. Study focusses on economics								-	-.09	**.26**	**.20**	-.12	.10	.09	-.02	.09	.13	.11	-.06	.16	.01	.10	**.21**	-.09	-.14	.08	.10	-.14	.10	-.07
129. Study focusses on informatics									-	.13	.11	.13	-.05	.11	-.10	-.04	-.03	.09	.01	.05	-.09	.04	.05	.01	.07	.00	-.02	.11	-.09	-.02
130. Study focuses on neighbouring disciplines										-	.03	.11	-.13	-.08	-.03	.01	-.06	.06	.10	**.22**	-.06	**.22**	**.26**	-.03	-.01	-.05	-.04	.03	-.09	-.01
131. Theses topics											-	.15	**.32**	.13	-.09	.01	-.05	.11	.09	.03	-.07	.02	.16	.12	-.14	.10	-.07	.10	-.09	-.14
132. Theses with companies												-	.01	.05	.10	.10	-.12	.13	**.25**	-.07	-.06	.10	-.06	.04	.16	.08	-.10	**.20**	-.02	.13

	121.	122.	123.	124.	125.	126.	127.	128.	129.	130.	131.	132.	133.	134.	135.	136.	137.	138.	139.	140.	141.	142.	143.	144.	145.	146.	147.	148.	149.	150.
133. Bachelor thesis presented with mark													-	-.01	.04	.07	.01	.04	.08	-.07	.00	.01	.14	.09	-.09	.15	.07	-.05	.06	-.07
134. Semesters abroad														-	**-.19**	-.03	.12	.13	.02	**.23**	.16	**.17**	**.21**	**-.25**	-.07	**.29**	**.19**	.09	**.19**	-.01
135. Apprenticeships															-	.02	**-.36**	.09	.00	-.10	-.01	-.15	-.02	**.18**	.14	-.10	**-.17**	.12	-.08	**.19**
136. Work and travel/au pair																-	-.14	-.11	.12	-.04	-.12	.08	-.01	-.09	.06	.15	.07	.07	.03	.02
137. Internships																	-	**.32**	**-.31**	**.24**	**.21**	-.08	.12	-.10	-.06	.14	**.28**	-.13	.14	.04
138. Internships/jobs relevant for position																		-	**.19**	.16	.03	-.13	**.24**	-.01	.08	**.20**	.10	.07	.11	.05
139. Internships/jobs in research																			-	-.10	-.03	**.22**	-.07	-.03	.14	.05	-.10	.08	**.18**	-.05
140. Internships/jobs in consulting																				-	.02	.02	.17	-.15	-.06	.08	.10	-.09	.02	.09
141. Internships/jobs abroad																					-	.07	.15	-.09	-.04	.02	.03	-.02	.12	-.06
142. Inconsistent descriptions internships/jobs																						-	.15	.00	.08	.04	.00	.14	.08	.02
143. Detailed descriptions internships/jobs																							-	-.02	-.10	.16	**.17**	-.10	.06	-.03
144. Business languages																								-	.02	-.02	-.11	.11	-.13	-.03
145. Business English																									-	**.20**	-.09	**.21**	**.19**	**.28**
146. English level																										-	**.54**	**.36**	**.48**	**.17**
147. English TOEFL																											-	-.09	**.65**	.12
148. English CEFR																												-	-.09	.13
149. Language tests																													-	.10
150. Language trainings																														-
151. Substantial software skills	.04	.03	.03	.00	.14	.01	.00	.06	.01	-.16	.08	-.02	.05	.03	.06	-.06	-.06	-.02	.03	-.13	-.14	-.03	.00	.10	-.04	.13	.08	-.06	.06	-.10
152. Mathematical software skills	**-.17**	**.36**	.00	**.26**	.05	-.11	-.04	**.17**	-.04	.08	.08	-.09	-.02	.08	-.01	.15	-.08	-.06	.16	.03	-.01	.00	.01	-.12	-.12	.00	.00	-.09	-.03	-.13
153. Webpage software skills	-.08	.04	.15	.09	-.06	-.03	.11	-.11	**.17**	-.03	-.01	.12	.00	.09	.03	-.02	-.12	.03	.05	.05	.10	.04	.03	.10	-.08	-.05	-.05	.09	-.01	-.06
154. IT trainings	.16	-.04	.08	-.11	-.02	-.07	-.07	.08	.05	.05	.04	-.07	.02	-.05	-.13	-.08	-.04	-.09	-.01	.05	-.08	.05	-.08	-.06	-.09	.06	.09	.13	.08	-.09

	121.	122.	123.	124.	125.	126.	127.	128.	129.	130.	131.	132.	133.	134.	135.	136.	137.	138.	139.	140.	141.	142.	143.	144.	145.	146.	147.	148.	149.	150.
155. German Academic Scholarship Foundation	-.13	.14	.01	-.06	-.11	-.07	.03	.05	-.02	.13	.05	.02	-.05	-.09	-.01	-.08	-.03	-.03	.10	-.02	.11	.01	-.02	-.02	-.10	.08	-.03	-.07	.03	-.10
156. Germany Scholarship	.16	-.12	-.13	-.08	.00	-.08	.01	.08	.10	.09	-.04	.09	-.07	.00	.01	.08	.13	**.18**	-.01	.08	-.01	-.04	-.11	-.15	.13	.00	.05	.00	.01	-.03
157. Non-financial scholarships	-.10	-.01	-.02	-.09	.03	.04	-.07	.09	-.03	-.03	-.05	.04	.04	.14	**.17**	-.01	.05	.12	-.02	-.04	.13	.00	.07	.04	.10	**.17**	.09	.06	.11	-.04
158. Scholarships abroad	-.01	**.24**	-.11	.02	-.03	.10	-.10	.06	-.03	-.06	.09	-.04	**.18**	**.33**	-.08	.12	.09	-.02	-.01	.01	-.05	**.21**	**.17**	-.06	-.03	.10	.16	-.09	.09	.01
159. Erasmus	-.06	**.24**	-.12	.11	-.02	.13	-.08	.02	-.12	.01	-.02	.01	**.21**	**.24**	-.10	**.18**	.03	-.10	.05	-.02	.01	.14	**.19**	-.02	-.11	.04	.01	-.10	.03	-.02
160. PROMOS	.15	.00	.02	-.11	.14	.05	-.07	**.23**	-.01	-.08	.12	-.08	.04	**.22**	-.13	-.08	**.18**	.14	-.08	.05	-.02	-.04	.10	-.12	-.09	.08	.12	-.11	.09	-.09
161. Political EAs	-.12	.06	-.01	**.24**	-.03	-.03	.02	-.10	-.11	.06	-.05	-.05	-.02	-.05	.14	-.05	-.13	-.02	.01	.06	-.04	-.04	-.02	-.11	-.02	-.14	-.13	.01	**-.19**	-.12
162. Religious EAs	-.06	.06	.09	.00	-.02	.12	-.01	-.05	-.01	.09	.06	**.20**	-.09	.06	-.10	-.03	.15	-.05	-.10	.10	-.03	-.07	-.06	-.05	.01	.06	-.06	.03	-.02	-.12
163. EAs abroad	.00	**.18**	-.03	-.02	-.13	.03	-.10	-.04	-.01	.04	.02	-.11	.01	.07	-.06	-.11	-.09	-.03	-.06	.02	.08	.00	.07	-.05	-.04	.05	.02	.07	-.04	-.04
164. Political/historical hobbies	**-.17**	.11	.04	.06	-.06	.03	-.07	.06	-.10	.02	**-.18**	.02	-.11	.13	.09	-.08	-.04	-.03	-.11	.05	.11	.03	.01	-.08	-.09	.07	.06	.01	-.06	.05
165. Professional licenses/ certifications	-.02	.02	.08	-.09	.07	.00	.14	-.07	.00	-.09	-.07	-.09	.07	-.03	-.02	-.09	-.02	-.05	.07	-.08	-.01	-.03	-.10	.10	**.38**	.06	-.08	.04	**.21**	.07
166. Driver's license	**-.17**	-.09	.10	**.26**	-.02	.06	-.03	-.11	-.16	.03	-.07	.03	-.12	**-.18**	.12	-.05	**-.23**	-.13	.03	-.04	**-.18**	.01	-.13	-.05	-.01	**-.20**	-.09	-.05	-.13	.10
167. Academic/ professional trainings	-.04	.03	-.01	-.04	-.07	.00	.03	-.08	.00	-.03	**.23**	.13	.04	.12	-.10	-.08	.03	.09	.01	.05	.04	-.07	.01	.00	-.02	.03	-.01	-.08	.00	-.12
168. Quality of leadership experiences	**-.24**	.05	-.01	.09	-.02	.09	-.14	-.13	-.05	.01	.00	.00	.08	**.20**	-.14	-.03	.03	-.05	**.20**	.09	**.17**	.06	**.26**	-.14	-.11	.16	.07	-.01	.01	-.09

	151.	152.	153.	154.	155.	156.	157.	158.	159.	160.	161.	162.	163.	164.	165.	166.	167.	168.
151. Substantial software skills	-	.14	.07	-.05	.10	**-.23**	-.01	.04	.03	-.03	-.08	.04	.06	-.01	-.04	.03	.04	.10
152. Mathematical software skills		-	-.09	-.09	.11	-.16	-.06	.12	.02	.10	-.03	-.08	**.21**	-.09	.00	-.07	-.06	-.01
153. Webpage software skills			-	-.06	.06	-.10	.04	.00	.01	-.02	.01	-.04	-.11	**.17**	-.04	.03	-.03	.13
154. IT trainings				-	.06	-.08	-.09	-.12	-.08	-.07	-.09	.02	.03	-.07	-.08	-.10	-.09	-.15
155. German Academic Scholarship Foundation					-	-.09	.05	.01	-.08	-.07	.12	.09	.06	**.18**	-.08	-.03	.05	**.25**

	151.	152.	153.	154.	155.	156.	157.	158.	159.	160.	161.	162.	163.	164.	165.	166.	167.	168.
156. Germany Scholarship						-	-.05	-.02	-.10	.12	.02	-.04	-.03	.03	-.10	-.13	.06	-.04
157. Non-financial scholarships							-	-.10	-.06	-.06	-.01	.06	.01	.03	.11	-.15	.02	.11
158. Scholarships abroad								-	**.66**	**.47**	.01	.02	.10	.10	.01	-.13	.15	.14
159. Erasmus									-	.02	-.04	-.01	-.11	.12	-.02	-.05	.14	.13
160. PROMOS										-	.03	.04	**.20**	-.07	.00	-.11	.07	-.06
161. Political EAs											-	-.05	-.05	**.17**	-.03	**.24**	.04	**.18**
162. Religious EAs												-	-.04	-.03	.01	-.01	.10	.03
163. EAs abroad													-	-.05	.00	-.12	-.03	.00
164. Political/historical hobbies														-	-.08	.06	-.07	.13
165. Professional licenses/ certifications															-	.04	**.17**	.05
166. Driver's license																-	-.05	.02
167. Academic/ professional trainings																	-	.16
168. Quality of leadership experiences																		-

Note. EAs = extracurricular activities.
Correlations in bold are significant at the $p \leq .05$ level.

Appendix 2.1 References

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2.2 Using Valid Cues to Predict Narcissism and Intelligence From LinkedIn Profiles

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Abstract. Recruiters routinely use LinkedIn profiles to infer applicants' key personality traits like narcissism and intelligence. However, little is known about LinkedIn profiles' predictive potential to accurately infer personality. According to Brunswik's lens model, accurate personality inferences depend on (a) the presence of valid cues in LinkedIn profiles containing information about users' personality and (b) the consistent utilization of valid cues. We assessed narcissism (self-report) and intelligence (aptitude tests) in a mixed sample of 406 students/professionals along with 64 deductively derived LinkedIn cues coded by 3 trained coders. Applying nested cross-validated elastic nets, we demonstrate that (a) LinkedIn profiles contain valid information about users' narcissism (e.g., uploading a background picture) and intelligence (e.g., listing many accomplishments). Furthermore, (b) mechanical perceivers like machine learning algorithms use these valid cues consistently so that the elastic nets attained substantial prediction accuracy (r = .28/.32 for narcissism/intelligence). This way, we uncover LinkedIn profiles' potential to accurately infer personality: Personality can be inferred accurately if (a) the valid cues contained in LinkedIn profiles are (b) used consistently like a mechanical perceiver does. The results have practical implications for improving recruiters' accuracy and foreshadow potentials of automated LinkedIn based personality assessments for recruitment purposes.

Keywords: Brunswikian lens model, cybervetting, machine learning.

Open Science Statement. The data, codebook, R-script, and supplementary results are made transparent on the open science framework: https://bit.ly/3pTHr2M.

2.2.1 Introduction

Along with the growth of online networks recruiters commonly started to engage in practices like "cybervetting" and "social media assessments" (Cubrich et al., 2021; Hartwell & Campion, 2020) to inform their recruitment decisions. In particular, recruiters routinely draw on (potential) applicants' LinkedIn profiles to make personality inferences (e.g., Roulin & Levashina, 2019; Van de Ven et al., 2017). LinkedIn is currently the most popular online professional network in the world with 810 million users (LinkedIn, 2022). For instance, recruiters might use the presence of a LinkedIn profile summary as a signal for applicants' conscientiousness and the presence of a LinkedIn profile picture as a signal for trait self-presentation (Van de Ven et al., 2017). Thereby, LinkedIn profiles do not only provide information typically available in traditional resumés like educational and professional experiences or online social networks such as Facebook like the number of connections but also add information like followed interests and other users' recommendations (e.g., Fernandez et al., 2021).

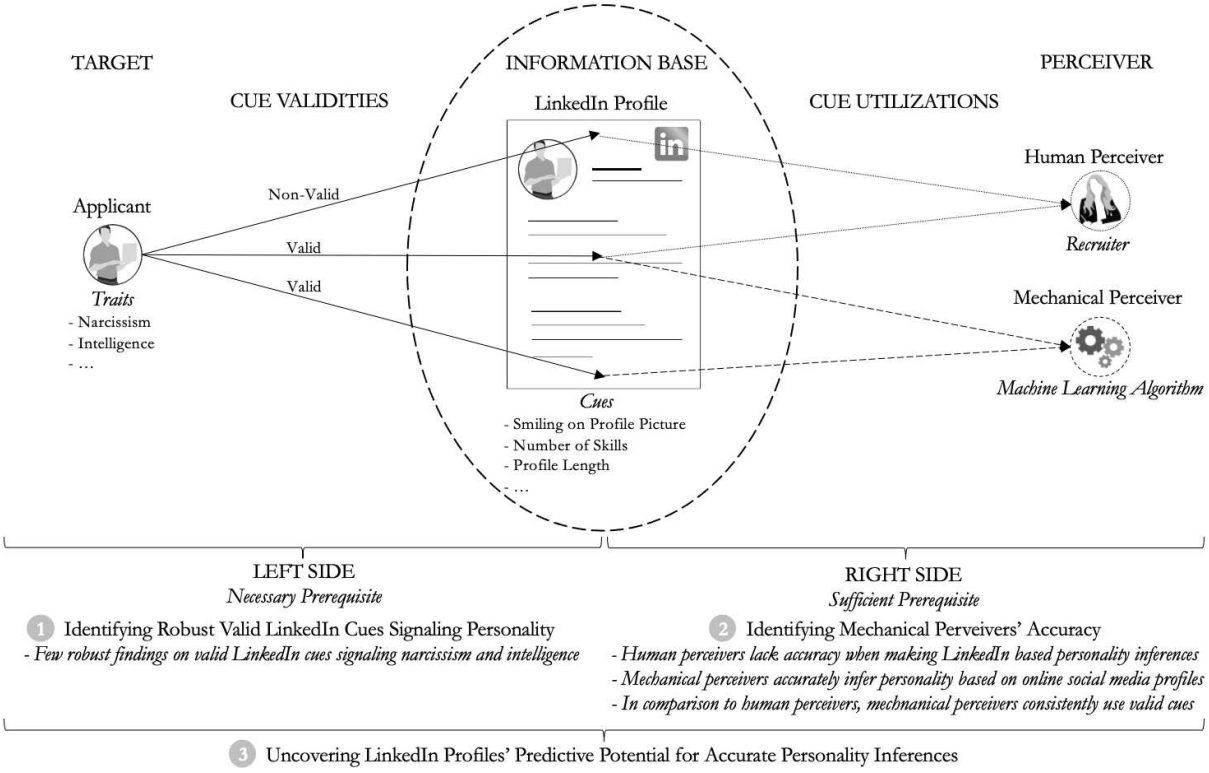
Previous research calls for empirical studies on LinkedIn based social media assessments (P. L. Roth et al., 2016; Van Iddekinge et al., 2016). Yet, LinkedIn profiles' predictive potential to accurately infer personality remains quite unclear, that is, (a) there are few robust and mixed findings on the specific LinkedIn information (*cues*) signaling personality, leading to contradictory conclusions as to whether LinkedIn profiles allow for accurate personality inferences (e.g., Fernandez et al., 2021) or not (e.g., Roulin & Stronach, 2022). In particular, we know little about whether LinkedIn profiles contain valid information on applicants' narcissism and intelligence, representing two key traits in online network and organizational contexts. Also (b) human perceivers (recruiters) were shown to achieve only modest accuracy when inferring personality on LinkedIn (*human approach*; Roulin & Levashina, 2019; Roulin & Stronach, 2022; Van de Ven et al., 2017) which may be due to LinkedIn's inherent lacking capacity to signal valid personality information or human perceivers' inconsistent use of such valid information. Yet, we know little about mechanical perceivers' accuracy of LinkedIn based personality inferences (Roulin & Stronach, 2022), that consistently use valid cues and were shown to achieve substantial accuracy levels based on online social media profiles like Facebook (Azucar et al., 2018; Settanni et al., 2018).

Therefore, this study aims to shed light on LinkedIn profiles' predictive potential for accurate personality inferences by following a two-fold approach based on the lens model framework (Brunswik, 1956): We identify (a) LinkedIn cues conveying valid information on narcissism and intelligence and (b) accuracy levels of mechanical perceivers like machine

learning algorithms (*automated approach*; Bleidorn & Hopwood, 2019; Tay et al., 2020) exploiting LinkedIn profiles' predictive potential by using these valid cues consistently (see Figure 2.2.1). We examine LinkedIn profiles in a mixed student/professional sample ($N = 406$) coded by three trained coders, and users' corresponding narcissism (self-reports) and intelligence (aptitude tests) scores. We deductively derived a broad set of 64 diverse LinkedIn cues based on theoretical underpinnings to signal narcissism and intelligence ensuring high interpretability of valid cues (Fernandez et al., 2021) and addressing lacks of content validity of automated approaches to personality assessment (Bleidorn & Hopwood, 2019; Tay et al., 2020). Applying nested cross-validated elastic nets ensured robust and easy-to-interpret results leveraging the potential for practical applications.

Figure 2.2.1

Brunswikian Lens Model in the Context of Cybervetting Based on LinkedIn Profiles



The results contribute to the literature on personality expression in recruitment relevant contexts by adding robust valid LinkedIn cues signaling narcissism (e.g., less smiling on the profile picture) and intelligence (e.g., listing schools with many followers) to the information bases providing valid personality signals (e.g., resumés, job interviews, Facebook profiles; e.g., Burns et al., 2014; Gifford et al., 1985; Stopfer et al., 2014). Also, we contribute to the literature

on automated personality assessments for recruitment purposes by demonstrating that mechanical perceivers can not only make accurate personality inferences based on online social networks like Facebook but also based on professional networks like LinkedIn (prediction accuracy r = .28/.32 for narcissism/intelligence). Combining these two contributions helped to (c) resolve mixed initial findings on the potential of LinkedIn profiles to allow accurate personality inferences: LinkedIn profiles offer the possibility to make accurate personality inferences when consistently incorporating valid cues (as identified in the present study) into personality inferences (like mechanical perceivers do).

Basing personality inferences on the wrong information can lead to misjudgments, which could add costly false positive and false negative errors to organizations' hiring decisions (i.e., suitable (unsuitable) applicants are rejected (selected)). The present study's insights on LinkedIn cues signaling personality may thus be applied in practice to improve recruiters' accuracy by training them to consistently use valid cues (Karelaia & Hogarth, 2008; see also Cole et al., 2005). Also, mechanical perceivers might be applied (a) in practice to automatize accurate LinkedIn based personality assessments for recruitment purposes, and (b) in research to obtain unobtrusive measures of personality (Morgeson et al., 2007).

2.2.2 Theoretical Background

2.2.2.1 Applying the Lens Model to Personality Inferences Based on LinkedIn Profiles. This study is concerned with how personality traits (narcissism and intelligence) of an unknown target person (applicant) can be accurately inferred from the target's observable information (LinkedIn profile). Following the lens model (Brunswik, 1956; see also Back & Nestler, 2016; Nestler & Back, 2013), personality must be inferred indirectly in this situation by drawing on cues (see Figure 2.2.1). The necessary prerequisite for accuracy is thus the presence of valid cues, that is, LinkedIn information associated with users' personality (left side of the lens model). There is initial evidence that LinkedIn profiles contain such valid information (e.g., Fernandez et al., 2021). However, little is known about valid LinkedIn cues signaling narcissism and intelligence.

The sufficient prerequisite for accurate LinkedIn based personality inferences is that cues are used consistently according to their validity (right side of the lens model). Although LinkedIn profiles likely contain some valid personality information, human perceivers' LinkedIn based personality inferences appear to lack accuracy (Roulin & Levashina, 2019; Roulin & Stronach, 2022; Van de Ven et al., 2017). Following the lens model, this may be due to human perceivers' lack of consistency in using valid cues (see also Fernandez et al., 2021). For instance, human perceivers use the presence of a profile picture as a cue for agreeableness

(Van de Ven et al., 2017), but there seems to be no association between agreeableness and the presence of a profile picture (Roulin & Levashina, 2019; Van de Ven et al., 2017). In contrast, machine learning algorithms can be construed as mechanical perceivers who consistently and correctly use valid cues to make accurate inferences about targets (Roulin & Stronach, 2022).

The lens model's (Brunswik, 1956) value lies in its scope illustrating both human and automated approaches, that is the human perceiver is replaced by a mechanical perceiver in the automated approach (Tay et al., 2020). This way, the lens model provides the opportunity to shed light on LinkedIn profiles predictive potential: If LinkedIn profiles contain a valid cue base signaling narcissism and intelligence, the mechanical perceiver should achieve prediction accuracy because it consistently uses these valid cues. This would also suggest that human perceivers' lack of accuracy is rather due to not using valid LinkedIn cues consistently than due to LinkedIn profiles' inherent limited capacity to accurately signal personality.

2.2.2.2 Previous Research on Valid Cues Signaling Personality on LinkedIn. Initial research reports cue validities for small explorative sets of LinkedIn cues ($9 \leq N_{Cues} \leq 22$) and personality traits like the big five, self-presentation, honesty-humility, and cognitive ability in rather small samples of LinkedIn users ($97 \leq N \leq 154$; Roulin & Levashina, 2019; Roulin & Stronach, 2022; Van de Ven et al., 2017). This exploratory approach led to initial important insights that make intuitive sense and contribute to a more precise understanding of valid Linked cues. For example, users high on self-presentation were found to include a summary on their LinkedIn profile, which provides opportunity for self-promotion (Van de Ven et al., 2017). Yet, other findings remain hard to explain. For instance, users high on self-presentation were found to have high education (Van de Ven et al., 2017). Also, the findings were quite instable, for example, none of the valid cues signaling personality in Roulin and Levashina (2019) was confirmed by Roulin and Stronach (2022) and vice versa. Due to the explorative nature of their findings, these studies generally draw conclusions with caution and call for (replicating) research on valid LinkedIn cues signaling personality.

Using a deductive approach recently enabled to demonstrate the existence of an easy-to-interpret valid LinkedIn cue base for big five traits. More specifically, Fernandez et al. (2021) addressed limitations of the exploratory studies by reporting cue validities of (a) a wider range of LinkedIn cues ($N_{Cues} = 33$) (b) that were deductively derived based on theoretical underpinnings to signal big five traits (c) in a large sample of 607 LinkedIn users. Yet, we only have preliminary findings on cue validities for narcissism (see findings on self-presentation and honesty-humility with partial conceptual overlap; Van de Ven et al., 2017; Roulin & Stronach, 2022) and intelligence (Roulin & Levashina, 2019; Roulin & Stronach, 2022).

In this study, we aim to extend our knowledge of valid LinkedIn cues signaling narcissism and intelligence by (a) examining an extensive set of diverse cues (N_{Cues} = 64) that (b) were deductively derived based on personality theory and previous empirical findings ensuring high interpretability (c) in a sample of 406 LinkedIn users. We also go beyond previous research by not only identifying valid cues based on bivariate correlations following the traditional analytical approach (Back & Nestler, 2016) but also based on important predictors in nested cross-validated machine learning models. This ensures robust results due to resampling and facilitates to identify cues that actually add predictive value in the context of other cues (e.g., Stachl et al., 2020).

2.2.2.3 Automated Approach to Personality Inferences Based on LinkedIn. Previous research applied the automated approach to online social networks like Facebook using various cue sets (e.g., posts, pictures, likes). Substantial prediction accuracy was found for several personality traits (Azucar et al., 2018; Settanni et al., 2018) including initial findings on narcissism (Garcia & Sikström, 2014; Preotiuc-Pietro et al., 2016; Sumner et al., 2012) and intelligence (Kosinski et al., 2013, 2014; Wei & Stillwell, 2017).

However, the automated approach has not been comprehensively applied to professional networks like LinkedIn. Online professional networks substantially differ in their cue base from social media networks like Facebook (e.g., Hartwell & Campion, 2020). They might be particularly suitable for practical applications in recruitment contexts because professional networks should suffer less from adverse impact, low acceptance, and legal issues (e.g., Cubrich et al., 2021; Stoughton et al., 2015). An initial attempt to transfer the automated approach to LinkedIn applied automated language-based big five assessments (Pennebaker et al., 2015) to 154 LinkedIn profiles but did not find prediction accuracy (Roulin & Stonach, 2022). This led to calls for research (a) relying less on limited textual information (which generally shows only small personality associations; e.g., Chen et al., 2020; Holtzman et al., 2019), and (b) predicting traits beyond the big five.

Generally, previous research following the automated approach typically applied a data-driven, explorative approach without preselecting cues based on theoretical underpinnings and empirical findings (Settanni et al., 2018). Such explorative approaches might find novel associations and contribute to theory building. However, they might also lead to lacks of content validity coming with serious limitations as, for instance, (a) related constructs might be measured rather than actual trait content, (b) the intuitive interpretability of cues might suffer (machine learning algorithm as “black box”) reducing potentials for practical applications, and (c) generalizability across users of different online networks might be impaired (e.g., Alexander

et al., 2020; Bleidorn & Hopwood, 2019; Tay et al., 2020).

In this study, we apply the automated approach to assessments of narcissism and intelligence based on the online professional network LinkedIn. Thereby, we go beyond textual cues (cf. Roulin & Stronach, 2022) by aiming for an extensive selection of cues that assess qualitatively different types of information reflecting LinkedIn profiles' broad information spectrum. This should enable the identification of divergent valid cues and potentially high accuracy ("good information", Back & Nestler, 2016; see also meta-analytical evidence that multiple types of online network cues enhance accuracy; Azucar et al., 2018; Settanni et al., 2018). We base our cue set on theory and empirical findings to ensure cues' conceptual connection to the personality traits that we intend to infer. This should lead to high interpretability and leverage potentials for practical applications.

2.2.2.4 Deriving LinkedIn Cues Potentially Signaling Narcissism and Intelligence. Grandiose narcissism is a form of entitled self-importance (Krizan & Herlache, 2018) with agentic (e.g., charm, assertiveness) and antagonistic (e.g., arrogance, manipulativeness) components (Back, 2018) coming with powerful organizational consequences (e.g., Campbell et al., 2011; Grijalva et al., 2015) beyond the big five traits (Grijalva & Newman, 2015; Judge et al., 2006). Online networks such as LinkedIn might serve narcissists[12] as ideal platform (e.g., Gnambs & Appel, 2018; McCain & Campbell, 2018) to exercise their need for external validation of their grandiose selves (Morf & Rhodewalt, 2001) by providing various self-enhancement opportunities (e.g., demonstrating achievements; Buss & Chiodo, 1991; Wallace & Baumeister, 2002). Intelligence is the ability to process complex information facilitating higher order thinking skills such as reasoning and problem solving (Gottfredson, 1997), and represents the most powerful trait to predict job performance (e.g., Sackett et al., 2021; Salgado et al., 2003). Intelligence is seen by recruiters to be particularly effectively inferred based on LinkedIn (e.g., Hartwell & Campion, 2020), whereas little is known about its expression in online contexts (e.g., Roulin & Stronach, 2022; Schroeder et al., 2020).

We inferred the present study's LinkedIn cue set used following a four-step top-down approach. (a) We derived LinkedIn cues from transferring theoretical implications and empirical findings on narcissism/intelligence from broader non-online contexts to the LinkedIn context. For example, narcissists might view leadership positions as a stage to demonstrate superiority (Campbell & Campbell, 2009) and to earn public admiration (Wallace & Baumeister, 2002), which is why they are motivated to attain leadership (Benson et al., 2016;

[12] With *narcissists*, we refer to individuals relatively higher on the continuous dimension of grandiose narcissism as a personality trait in the general population (Morf & Rhodewalt, 2001).

Brunell et al., 2008). Indeed, due to their agentic dominant-expressive behaviors, narcissists induce impressions of assertiveness (Härtel et al., 2021) potentially leading them to attain group leadership (Grijalva et al., 2015), managerial ranks (e.g., Ahmetoglu et al., 2016; Wille et al., 2019), and representative leadership positions (e.g., Deluga, 1997; Watts et al., 2013). On LinkedIn, narcissism might thus be expressed through listing leadership positions in the Experience section and leadership skills in the Skills section. The same may hold true for intelligence: Intelligent individuals[13] thrive in contexts requiring complex information processing (Gottfredson, 1997) which match leadership contexts, that involve high cognitive demands such as processing large amounts of information, problem-solving, and strategy development (Fiedler & Garcia, 1987; Kirkpatick & Locke, 1991). Accordingly, intelligence is a key leadership attribute (Lord et al., 1984; Offermann et al., 1994) and one of the most important predictors of leadership emergence (Ensari et al., 2011; Judge et al., 2004).

(b) We transferred theoretical implications and empirical findings on the association between narcissism/intelligence and cues in LinkedIn related contexts like resumés and online social media networks such as Facebook to the LinkedIn context. For instance, in line with the notion of narcissists' exploiting online networks as a vehicle to boost their grandiose selves by self-promoting, narcissists were found to frequently post on online social media networks (Gnambs & Appel, 2018; McCain & Campbell, 2018). This self-promoting strategy should be particularly effective when reaching large audiences, which may additionally serve narcissists as a direct confirmation of their popularity (Buffardi & Campbell, 2008; Davenport et al., 2014). Indeed, narcissists feature large networks on online social media platforms (Gnambs & Appel, 2018; McCain & Campbell, 2018) which aligns with their general ability to successfully initiate connections (e.g., Back et al., 2010; Leckelt et al., 2015). On LinkedIn, narcissism might therefore be expressed through displaying more activities like posting, liking, and commenting as well as larger networks. As another example, intelligence was shown to be expressed in listing scholastic awards on resumés (Cole et al., 2003). Intelligent individuals' advanced cognitive abilities predispose them to learning resulting in positive effects on various indicators of academic achievement (Kuncel et al., 2004) like better marks (B. Roth et al., 2015). Accordingly, intelligent individuals might also list honors and awards in the Accomplishments section on LinkedIn.

(c) We added LinkedIn cues showing significant relationships with narcissism/intelligence related traits (e.g., self-presentation, honesty-humility, cognitive

[13] With *intelligent individuals*, we refer to individuals relatively higher on the continuous intelligence dimension.

ability) based on previous explorative findings (see Section "2.2.2.2 Previous Research on Valid Cues Signaling Personality on LinkedIn"). For example, LinkedIn users high on self-presentation were found to show less smiling on their profile pictures (Van de Ven et al., 2017). The same may hold true for narcissists whose antagonistic, disagreeable side might predispose them to show rather arrogant facial expressions with less wide and genuine smiles.

(d) Finally, there is a research stream focusing on cues that might be used for unobtrusive measurements of CEO narcissism (e.g., Aktas et al., 2016, Chatterjee & Hambrick, 2007; see Cragun et al., 2020, for an overview). Recently, this research has begun to speculate on LinkedIn cues that may serve as CEO narcissism indicators (e.g., number of skills/interests, presence of a profile picture/About section; Aabo & Eriksen, 2018). We added these cues to the LinkedIn cues potentially signaling narcissism. Following this four-step top-down approach led to a final set of 64 LinkedIn cues. Due to reasons of parsimony the detailed deductive derivation of this study's LinkedIn cue set is summarized in Appendix 2.2.A.

2.2.2.5 Present Study. This study's goal is to uncover LinkedIn profiles' predictive potential to accurately infer personality. Therefore, we build on the lens model (Brunswik, 1956) and follow a two-step approach, that is, determining valid LinkedIn cues signaling personality traits and mechanical perceivers' prediction accuracy that use valid LinkedIn cues consistently. We go beyond previous research by (a) focusing on narcissism and intelligence, two consequential traits in online and organizational contexts, (b) examining a broad selection of diverse LinkedIn cues (N_{Cues} = 64) that (c) were deductively derived based on theoretical and empirical underpinnings ensuring high interpretability, and (d) applying resampling to get robust results. For this purpose, we collected a larger LinkedIn profile sample (N = 406; coded by three trained coders) than most previous studies in this context (Roulin & Levashina, 2019; Roulin & Stronach, 2022; Van de Ven et al., 2017). We calculated bivariate correlations between cues and traits to identify potentially valid cues. We computed nested cross-validated elastic nets to obtain robust results for valid cues and to identify mechanical perceivers' accuracy.

2.2.3 Method

2.2.3.1 Sample. The sample consisted of 406 (243 female) German-speaking LinkedIn users[14] with substantial subscribers (M = 297.15, SD = 468.32) mainly recruited via (a) postings

[14] From 8,457 participants who started the survey, we excluded 7,980 participants without sufficient responses (either due to discontinuing on own initiative or to automated termination because of not fulfilling the participation conditions, that is, fluent German, legal age, up-to-date LinkedIn profile), eight participants who indicated they did not answer seriously, five double participants, 28 participants without information to track their LinkedIn profiles, and 30 participants with LinkedIn profiles with less than ten subscribers.

on online professional (LinkedIn, Xing) and social (Facebook) network groups, (b) Surveycircle and Pollpool, online-platforms to raise participants based on mutual support, and (c) lecture ("Human Resource Management") announcements at Osnabrück University.[15] The average age was 29.47 (SD = 9.69), 283 (69.70%) participants held a bachelor's degree or higher, 258 (63.55%) participants were students (37.59% business/economics), and 215 participants (52.96%) were working at least 20 hours per week in various sectors (23.26% IT/telecommunication/media) and professions (45.58% high qualified). Sample collection took place between June 2021 and February 2022. We computed a post hoc power analysis with G*Power (Version 3.1.9.6; Faul et al., 2007) for the difference of a correlation from a constant ($\rho_0 = 0$) using the bivariate normal model to identify the power to detect significant cue validities. The power was 1.00/.98/.52 to detect a large/medium/small correlation of ρ = .30/.20/.10 (testing two-tailed with an α-error of .05; Gignac & Szodorai, 2016).

2.2.3.2 Procedure. All procedures were in line with recommendations of the German Research Foundation and the German Psychological Society. Participants filled out the online survey assessing demographics, personality traits, and basic information about/attitudes towards their LinkedIn profile. At survey start, participants were asked to connect their profiles with this study's LinkedIn showcase page. We saved the profiles with different formats to create an optimal information base for cue coding, that is, saving (a) the profile picture as separate image to ensure high quality and independence from the other information, (b) the profiles as pdf-export with the built-in function to assess the profile length (see Roulin & Levashina, 2019; Roulin & Stronach, 2022), and (c) multiple screenshots of all further relevant profile information. For a detailed survey overview see the Codebook at https://bit.ly/3pTHr2M.

2.2.3.3 Measures.

2.2.3.3.1 Personality. The 18-item Narcissistic Admiration and Rivalry Questionnaire (NARQ; Back et al., 2013) was used to measure narcissism with 6-point scales ranging from 1 (*do not agree at all*) to 6 (*agree completely*). The short version of the Hagen Matrices Test (Heydasch et al., 2012), the HMT-S (Heydasch et al., 2013), was used to measure fluid intelligence (M = 4.31, SD = 1.45). The short version of the Berlin Test for the Assessment of Fluid and Crystallized Intelligence (Wilhelm et al., 2014), the BEFKI GC-K (Schipolowski et al., 2013), was used to measure crystallized intelligence (M = 4.31, SD = 1.45). To obtain a comprehensive intelligence indicator, we aggregated both measures' z-standardized scores

[15] Participants of Surveycircle (n = 171) and PollPool (n = 19) got "points" to gain participants for own surveys. Participants of Osnabrück University (n = 27) studied business and received course grade. All participants could choose to receive personality feedback. There was no monetary compensation.

($r = .26$, $p < .001$). Descriptive statistics and Cronbach's alphas for all personality traits are displayed in Table 2.2.1.

2.2.3.3.2 LinkedIn Cues. We identified two types of cues (see Table 2.2.1). Objective cues ($n = 55$) could be unambiguously coded by a single coder (e.g., counting skills).[16] Subjective cues ($n = 9$) had decision latitude (e.g., rating physical attractiveness) and were rated by two coders on scales from 1 (*not at all*) to 6 (*completely*). The three coders (2 female) studied business or psychology and conducted the coding as part of their final theses or research internship. The subjective cue coders rated LinkedIn profiles in unique randomized orders and received extensive training[17] to ensure reliable, valid ratings. Interrater agreement was tested with the intraclass correlation coefficient ($ICC_{3,\,k}$) and was good to excellent (Cicchetti, 1994; Koo & Li, 2016; $ICC_{3,\,k} \geq .84$ for all subjective cues; see Table 2.2.1). In addition to the 64 deductively derived cues, we assessed 13 cues we did not have specific expectations for. These cues represent leftover (a) unique LinkedIn information (i.e., premium account, badges, causes), (b) cues resulting from remaining categories of the derived cues (e.g., "language" skills/accomplishments), and (c) basic photograph information (i.e., picture in color, eye contact into camera, picture with non-neutral background; Van de Ven et al., 2017). The additional cues' measurement, descriptives, and correlations with narcissism and intelligence can be found in Appendix 2.2.B.

2.2.3.4 Analytical Approach. To get an initial impression of the cue validities, we computed bivariate correlations of narcissism and intelligence with the deductively derived LinkedIn cues (Table 2.2.1). We winsorized cues to reduce extreme values' disproportionate influences ($z > |4.47|$; see Chebyshev's inequality in Saw et al., 1984). Although we derived one-sided expectations concerning cue-personality relationships, we computed two-sided *p*-values. An extensive intercorrelation table of narcissism, intelligence, age, gender, and the entire cue set can be found in Appendix 2.2.C.

To (a) test whether cue validities remain robust in the context of other cues and using resampling, and (b) examine mechanical perceivers' accuracy, we computed elastic nets (Zou & Hastie, 2005) using the deductively derived LinkedIn cues as independent variables (features) to predict the dependent variables narcissism and intelligence (target features). We also included gender (0/1 = female/male) and age as controls. Although elastic nets are

[16] One cue (picture above neckline; 0/1 = not present/present) had small decision latitude. To ensure objectivity, this cue was coded by two coders who, in rare cases of disagreement, discussed and agreed on a coding.

[17] The training sessions included (a) input on the cues (i.e., definitions, reviewing profiles to illustrate scale anchors), (b) input on rating (e.g., exploiting the scale width, avoiding biases), and (c) independently rating profiles and discussing disagreements to establish a shared understanding of the cues and scale anchors.

conceptually similar to multiple regressions, elastic nets optimize prediction performance instead of the explanation of variation in the data by regularizing features' regression coefficients. Also, elastic nets are suited to handle many (intercorrelated) features. Specifically, elastic nets apply a combination of the LASSO (least absolute shrinkage and selection operator; Tibshirani, 2011) and Ridge (Hoerl & Kennard, 1970) penalties λ to the regression coefficients, which shrinks unimportant coefficients to zero (James et al., 2013). λ is chosen so that a predictive performance criterion like the mean squared error (MSE) between the predicted and observed target feature values is optimized. Thereby, elastic nets yield parsimonious models that only contain features that add predictive power, which prevents overfitting.

Unlike "black box" machine learning algorithms like random forests (Breiman, 2001) or neural networks (LeCun et al., 2015), where it remains unclear how the algorithm makes the predictions, the elastic net results remain interpretable as the coefficients can be obtained from the final model and interpreted like multiple regression results (Alexander et al., 2020). This allowed us to compare the cue validities of the traditional approach based on bivariate correlations to the cue validities of the machine learning approach. Also, this allows the practical application in recruitment settings. The combination of prediction performance and interpretability made the elastic net the ideal machine learning algorithm for this study.

Previous research typically has used *k*-fold cross-validation (Kohavi, 1995) for hyperparameter tuning and determining mechanical perceivers' accuracy inferring personality on online social networks. However, combining the tasks of hyperparameter tuning and determining prediction accuracy leads to optimistic performance estimates (Cawley & Talbot, 2010; Varma & Simon, 2006). Thus, we used a nested cross-validation (CV) approach to fit the elastic nets and evaluate their predictive accuracy.

The inner loop consisted of a 10-fold CV for preprocessing and hyperparameter tuning. Preprocessing comprised three steps: First, we imputed missing values using the missForest algorithm, which is a computationally efficient method of imputing high-dimensional data that consists of continuous and categorical features while making no assumptions about the feature distributions (Stekhoven & Bühlmann, 2012). Second, we winsorized extreme values ($z > |4.47|$) to reduce their disproportionate influence. While outliers can represent valid observations, extreme values can hurt prediction accuracy (Hastie et al., 2009). Third, we *z*-standardized the (target) features to ensure that λ is consistently applied to the regression coefficients so that the feature importance (i.e., the regression coefficients' magnitude) is comparable across features (Tibshirani, 1997). To tune the hyperparameter λ, we tested 100 λs and selected the λ that minimized the MSE between the predicted and observed values of the

target features. We saved the best performing model of the 10-fold CV for the evaluation on the test data in the outer loop.

The outer CV loop repeated the inner CV loop ten times. Thereby, we obtained ten models that each represented the best fitting model of the corresponding 10-fold CV of the inner loop. Concerning absolute prediction performance estimates we averaged (a) the MSE, (b) the Root Mean Squared Error (RMSE), and (c) the Mean Absolute Error (MAE) across the ten outer folds. Regarding relative prediction performance estimates we averaged (d) the correlations between the predicted and observed target feature values *r*, (e) the share of variation explained by the features R^2, and (f) the adjusted share of variation explained by the features $R^2_{Adj.}$ across the ten outer folds. We Fisher *z*-transformed the correlations *r* before averaging and retransformed the mean to minimize bias (Silver & Dunlap, 1987). To evaluate the absolute prediction accuracy, we compared the absolute prediction performance estimates of the elastic net and the intercept-only model predicting the means of the target features. Finally, we computed the means, standard deviations, and cross-validation fold incidences (CV_{FI}, number of outer folds the regression coefficient of a feature was ≠ 0) of the regression coefficients of the models evaluated in the outer loop as measures of feature importance.

We provide supplementary results (Appendix 2.2.D) of the elastic nets with (a) the entire cue set as features (i.e., all cues regardless of whether deductively derived for narcissism or intelligence plus the leftover cues), (b) narcissism subdimensions, that is, narcissistic admiration and narcissistic rivalry (Back et al., 2013), as target features, and (c) narcissism measured with the German 13-item short form (G-NPI-13; Brailovskaia et al., 2019; Gentile et al., 2013) of the Narcissistic Personality Inventory (NPI; Raskin & Terry, 1988) as target feature.

We used the statistical program R (version 4.1.0; R Core Team, 2018) and the interface RStudio (version 1.4.1106; RStudio Team, 2016) for all analyses. We used the glmnet package (version 4.1-2; Friedman et al., 2010) and missForest package (version 1.5; Stekhoven, 2022) for the machine learning applications. The data and statistical code for all main and supplemental analyses can be found at https://bit.ly/3pTHr2M.

2.2.4 Results

2.2.4.1 Bivariate Correlations. Descriptive statistics and bivariate correlations of the LinkedIn cues with narcissism and intelligence are displayed in Table 2.2.1. Ten of the 48 cues expected to be correlated with narcissism were correlated with narcissism (narcissists featured (a) less smiling on the profile picture; (b) background pictures; (c) leadership positions in the Experience section; (d) more skills; (e) public speaking skills; (f) more accomplishments related

to organizations; (g) more received recommendations; (h) interests with more followers; (i) English profiles). Thereby, one cue was correlated in the opposite direction than expected (narcissists featured (j) altruistic volunteering). 15 of the 39 cues expected to be correlated with intelligence were correlated with intelligence (intelligent individuals featured (a) less dressed-up, trimmed appearances on profile pictures; (b) profile pictures above neckline; (c) more and (d) extensively described educational stations; (e) more and (f) in average longer volunteer experiences; (g) more accomplishments and more accomplishments related to (h) honors/awards, (i) publications, (j) projects, (k) test scores; (l) schools with more followers; (m) more groups; (n) English profiles; (o) longer profiles). Overall, we found significant effects for about 29% of all expected correlations, which is a higher value than would be expected by chance (i.e., 5%). These findings provide initial evidence for (a) potential valid LinkedIn cues signaling narcissism and intelligence which are yet to be confirmed by the elastic nets, and (b) the existence of a valid cue base that should allow the mechanical perceiver to make accurate personality inferences.

2.2.4.2 Machine Learning Approach. The performance estimates of the nested cross-validated elastic nets predicting narcissism and intelligence based on the deductively derived cues are shown in Table 2.2.2. The results show that narcissism and intelligence can be accurately predicted based on LinkedIn profile data. In terms of absolute prediction performance, the elastic nets outperformed the intercept-only models: The elastic nets' mean absolute performance measures (MSE, RMSE, MAE) were lower than the intercept-only models' mean absolute performance measures. Thus, the elastic nets made smaller errors when predicting narcissism and intelligence compared to the intercept-only models. In terms of relative prediction performance, the predicted target feature values were substantially correlated with the observed target feature values for narcissism (r = .28) and intelligence (r = .32).

Table 2.2.1

Measurement and Descriptive Statistics for the LinkedIn Cues and Correlations With Narcissism and Intelligence

Cue	Measurement	α/ICC	*M*	*SD*	r_N	r_I
	Cues potentially signalling narcissism and intelligence					
Profile card						
Name with title	0 = not present; 1 = present (e.g., BSc, MA, PhD, Dr., Prof.)		.17	.37	-.03	.06
Profile picture						
Profile picture	0 = not present; 1 = present (profile pictures depicting an actual person were coded as "1")		.94	.24	-.09	.01
Charming facial expression	1 = *not at all*; 6 = *completely* (i.e., confident, friendly facial expression)	.84	3.52	1.48	-.05	-.09
Professional/formal appearance	1 = *not at all*; 6 = *completely* (e.g., suit/blazer/dress, formal accessories such as necktie, fly)	.93	3.49	1.66	.05	.00
Stylish/flashy/fashionable appearance	1 = *not at all*; 6 = *completely* (e.g., extravagant/dyed hair, hair ornaments (e.g., clip), colorful/extravagantly cut clothes, eye-catching jewellery (e.g., earrings, watch) and accessories (e.g., scarf), cleavage, tattoos, piercings)	.86	3.48	1.55	.03	-.06
Dressed-up, trimmed appearance	1 = *not at all*; 6 = *completely* (e.g., plucked eyebrows, make-up (e.g., lipstick, made-up eyelashes, eye shadow), manicured fingernails, styled/gelled hair, well-groomed/neatly shaved beard)	.84	3.54	1.52	.09	**-.12**
Professional shot	1 = *not at all*; 6 = *completely* (i.e., picture looks like taken by a professional, professional lighting, high resolution, photo effects (e.g., blurred background, use of editing software))	.90	3.57	1.56	.06	.03
About						
About	0 = not present; 1 = present		.32	.47	.07	.08
Extensive About section	Number of words in About Section		22.77	50.22	.00	.08
Experience						
Professional positions	Numerically counted		4.96	2.95	-.01	.07
Leadership positions	0 = not present; 1 = present (e.g., (vice-) president, head, director, team leader, project manager)		.15	.35	**.11**	.07
Education						
Business studies	0 = not present; 1 = present (i.e., studies of business administration or subdisciplines (e.g., finance, marketing))		.35	.48	.04	-.08
Volunteering						
Volunteer experiences	Numerically counted		0.83	1.48	.04	**.13**
Altruistic volunteering	0 = not present; 1 = present (i.e., volunteering with strong helping focus (e.g., food bank, red cross))		.10	.30	**.11**	.07
Average duration	Total duration of volunteer experiences in months divided by total number of volunteer experiences		12.50	27.66	.04	**.14**
Licences and certifications						
Licences and certifications	Numerically counted		1.00	2.13	.06	-.01
Skills						
Skills	Numerically counted		12.21	11.45	**.14**	.03
Endorsements	Numerically counted		13.77	39.61	.05	.08
Leadership	0 = not present; 1 = present (e.g., team leadership/organization, people management)		.17	.37	.08	-.04

Cue	Measurement	α/ICC	*M*	*SD*	r_N	r_I
Accomplishments						
Accomplishments	Numerically counted		3.58	5.28	.08	**.21**
Recommendations						
Received recommendations	Numerically counted		0.07	0.41	**.13**	.05
Other						
Profile in English	0 = not present; 1 = present (i.e., profile at least partly in English)		.47	.50	**.10**	**.13**
Profile length	Number of words counted based on downloaded profile via LinkedIn's built-in pdf-export feature		171.57	112.65	.04	**.14**
	Cues potentially signalling narcissism	.84	2.52	0.60		
Profile card						
Extensive profile card	Number of words to briefly describe the own person		7.03	4.21	.04	-.03
Twitter	0 = not present; 1 = present (i.e., profile card contains link to user's Twitter profile)		.03	.18	.02	.05
Profile picture						
Glasses	0 = not present; 1 = present (i.e., user wears glasses as vision aid, no sunglasses)		.24	.43	.01	.04
Smiling	1 = *not at all*; 6 = *completely* (i.e., "laughing with the eyes", teeth shown)	.93	3.51	1.63	**-.18**	.01
Physical attractiveness	1 = *not at all*; 6 = *completely*	.87	3.51	1.54	-.06	-.06
Additional pictures						
Background picture	0 = not present; 1 = present		.33	.47	**.15**	.01
Self-promotional background picture	1 = *not at all*; 6 = *completely* (i.e., geared towards convincing others of user's positive qualities)	.93	3.25	1.57	.00	.02
Additional pictures/videos	0 = not present; 1 = present (i.e., user provides additional pictures/videos in the permanent profile)		.13	.34	-.02	.00
About						
Self-promotional content	1 = *not at all*; 6 = *completely* (i.e., geared towards convincing others of user's positive qualities)	.93	3.49	1.67	-.02	.02
Self-related words	Number of self-related words (e.g., "I", "me", user's name) divided by total number of words in About section		1.00	2.80	.01	.05
Featured						
Posts	Numerically counted		0.27	0.92	.02	-.01
Activities						
Average activities per day	Total number of activities (limited to latest 50 entries) divided by time period (days between newest and oldest activity)		0.56	1.30	.06	-.05
Articles/posts/documents	Numerically counted (i.e., activities categorized as "articles"/"posts"/"documents"; limited to latest 50 entries)		6.17	13.12	.04	.00
Subscribers	Numerically counted (i.e., total number of subscribers displayed on LinkedIn)		297.15	468.32	.06	.02
Experience						
Average duration	Total duration of professional positions in months divided by total number of professional positions		26.71	45.94	.04	.00
Skills						
Public speaking	0 = not present; 1 = present (i.e., skills directly related to public speaking; no presentation software skills)		.10	.30	**.14**	.01
Interpersonal	Number of skills categorized as "interpersonal" skills divided by total number of skills		.07	.11	.04	**-.14**
Teamwork	0 = not present; 1 = present (i.e., skills related to cooperatively working together towards shared goals)		.21	.41	.01	-.07
Accomplishments						

Cue	Measurement	α/ICC	*M*	*SD*	r_N	r_I
Organizations	Number of accomplishments categorized as "organizations" divided by total number of accomplishments		.02	.08	**.14**	.06
Courses	Number of accomplishments categorized as "courses" divided by total number of accomplishments		.04	.14	.08	.05
Interests						
Interests	Numerically counted (i.e., interests related to groups, influencers, companies, and schools)		40.92	65.94	-.01	-.04
Median of interests' followers	Median of number of followers of interests related to groups, influencers, companies, and schools (assessing numbers of followers was limited to the first 50 interests in each category)		56074	126762	**.16**	**-.12**
Influencers	Number of interests related to influencers divided by total number of interests		.03	.05	.07	-.02
Median of influencers' followers	Median of number of followers of interests related to influencers (assessing numbers of followers was limited to the first 50 influencer interests)		13112	174007637	.05	-.01
Other						
Sports activities	0 = not present; 1 = present (i.e., activities involving physical exertion (e.g., soccer captain, marathon))		.03	.16	.09	.02
	Cues potentially signaling intelligence (aggregate of fluid and crystallized intelligence)	.60/.54	.00	.79		
Profile picture						
Picture above neckline	0 = not present; 1 = present		.65	.48	-.01	**.17**
Experience						
Extensive description	Total number of words to describe professional positions divided by total number of professional positions		8.59	14.29	.02	.06
Education						
Marks	0 = not present; 1 = present (e.g., marks as numerical number, percentile ranks, graduation with honors)		.27	.45	.01	.06
Averaged marks	Mean of marks presented as numerical number in German grading system (1.0-4.0)		1.63	0.45	-.14	-.17
Educational stations	Numerically counted		2.64	1.48	.07	**.14**
Extensive description	Total number of words to describe educational stations divided by total number of educational stations		5.60	10.61	.00	**.11**
Average duration	Total duration of educational stations in years divided by total number of educational positions		3.58	1.61	-.05	-.03
Skills						
Industry knowledge	Number of skills categorized as "industry knowledge" skills divided by total number of skills		.17	.20	.09	.00
Tools and technologies	Number of skills categorized as "tools and technologies" skills divided by total number of skills		.13	.17	.07	.03
Accomplishments						
Honors/awards	Number of accomplishments categorized as "honors and awards" divided by total number of accomplishments		.06	.15	.05	**.18**
Publications	Number of accomplishments categorized as "publications" divided by total number of accomplishments		.03	.10	.03	**.15**
Projects	Number of accomplishments categorized as "projects" divided by total number of accomplishments		.02	.07	.05	**.10**
Test scores	Number of accomplishments categorized as "test scores" divided by total number of accomplishments		.01	.03	-.02	**.11**
Interests						
Schools	Number of interests related to schools divided by total number of interests		.11	.09	.00	.06
Median of schools' followers	Median of number of followers of interests related to schools (assessing numbers of followers was limited to the first 50 school interests)		50800	64121	**.12**	**.19**
Groups	Number of interests related to groups divided by total number of interests		.07	.10	-.03	**.13**

Note. N = narcissism; I = intelligence.
Correlations in bold are significant at the $p \leq .05$ level.

Table 2.2.2

Performance and Hyperparameter Estimates of Nested Cross-Validated Elastic Nets Predicting Narcissism and Intelligence

	Narcissism				Intelligence			
	Elastic net		Intercept-only		Elastic net		Intercept-only	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
MSE	0.905	0.081	0.975	0.001	0.892	0.092	0.975	0.001
RMSE	0.950	0.042	0.988	0.000	0.943	0.049	0.988	0.000
MAE	0.760	0.054	0.793	0.041	0.744	0.057	0.782	0.035
r	.28	.16			.32	.15		
R^2	.07	.01			.10	.03		
$R^2_{\text{Adj.}}$	.02	.01			.05	.03		
λ_{Min}	0.100	0.016			0.087	0.017		

Concerning the features driving these effects (see Table 2.2.3), we found similar LinkedIn cues to convey valid personality information than identified in the traditional approach based on bivariate correlations. Thus, the traditional approach's cue validities generally appeared to be robust when controlling for other cues and using resampling. More specifically, all ten LinkedIn cues correlated with narcissism appeared as important elastic net predictors ($\beta_M \geq |0.017|$, $CV_{FI} \geq 9$). The five most important elastic net predictors all showed significant correlations with narcissism and indicate that narcissists display (a) interests with more followers, (b) less smiling on the profile picture, (c) more accomplishments related to organizations, (d) background pictures, and (e) public speaking skills. Likewise, eleven of the 15 LinkedIn cues correlated with intelligence appeared as important elastic net predictors ($\beta_M \geq |0.017|$, $CV_{FI} \geq 7$). Four cues (extensive description of educational stations, number of volunteer experiences, profile length, English profile) that showed significant correlations with intelligence did not appear as important elastic net predictors ($\beta_M \leq |0.003|$, $CV_{FI} \leq 3$). The five most important elastic net predictors all showed significant correlations with intelligence and indicate that intelligent individuals display (a) schools with more followers, (b) profile pictures above neckline, (c) more accomplishments, (d) less dressed-up, trimmed appearances on profile pictures, and (e) more accomplishments related to honors/awards.

Table 2.2.3

Regression Coefficients of Nested Cross-Validated Elastic Nets Predicting Narcissism and Intelligence

Cue	CV_{FI}	β_M	β_{SD}	β_{Full}
Narcissism				
Interests: Median of interests' followers	10	0.098	0.016	0.106
Profile picture: Smiling	10	-0.096	0.014	-0.105

Cue	CV_{FI}	β_M	β_{SD}	β_{Full}
Gender	10	0.089	0.016	0.094
Accomplishments: Organizations	10	0.077	0.014	0.085
Additional pictures: Background picture	10	0.069	0.014	0.074
Skills: Public speaking	9	0.067	0.027	0.074
Volunteering: Altruistic volunteering	10	0.045	0.018	0.051
Profile picture	10	-0.042	0.021	-0.051
Additional pictures: Additional pictures/videos	10	-0.037	0.020	-0.056
Profile picture: Dressed-up, trimmed appearance	9	0.033	0.016	0.039
Other: Sport activities	10	0.031	0.013	0.040
Recommendations: Received recommendations	9	0.030	0.023	0.038
Experience: Leadership positions	10	0.021	0.014	0.029
Other: Profile in English	9	0.019	0.014	0.026
Skills	9	0.017	0.014	0.019
Profile picture: Professional shot	6	0.009	0.013	0.011
Education: Business studies	5	0.008	0.011	0.003
Accomplishments: Courses	9	0.007	0.009	0.013
Interests	3	-0.007	0.014	-0.015
Profile picture: Stylish/flashy/fashionable appearance	2	0.003	0.008	0.007
About: Extensive About section	2	-0.002	0.006	0.000
Skills: Endorsements	1	-0.001	0.004	0.000
Profile card: Name with title	1	0.000	0.001	0.000
Intercept	10	0.000	0.000	0.000
Intelligence				
Interests: Median of schools' followers	10	0.105	0.012	0.103
Profile picture: Picture above neckline	10	0.091	0.020	0.093
Gender	10	0.090	0.024	0.090
Accomplishments	10	0.080	0.020	0.084
Profile picture: Dressed-up, trimmed appearance	10	-0.075	0.015	-0.077
Accomplishments: Honors/awards	10	0.058	0.015	0.059
Interests: Groups	10	0.056	0.019	0.057
Accomplishments: Publications	10	0.054	0.022	0.054
Accomplishments: Test scores	10	0.045	0.010	0.045
Education: Averaged marks	9	-0.043	0.024	-0.040
Volunteering: Average duration	10	0.040	0.013	0.042
Skills: Leadership	9	-0.033	0.020	-0.032
Education: Educational stations	7	0.019	0.021	0.019
Profile picture: Charming facial expression	5	-0.019	0.026	-0.009
Accomplishments: Projects	8	0.017	0.015	0.019
Licenses and certifications	6	-0.013	0.015	-0.004
Age	5	0.011	0.015	0.000
Profile picture: Professional shot	4	0.010	0.021	0.000
Profile picture	3	0.009	0.016	0.000
Interests: Schools	3	0.007	0.011	0.000
Education: Marks	3	0.004	0.009	0.000
Volunteering: Volunteer experiences	1	0.003	0.011	0.000
Skills: Industry knowledge	1	-0.003	0.009	0.000
Experience: Leadership positions	3	0.003	0.005	0.000
Other: Profile length	3	0.003	0.005	0.000
Education: Extensive description	1	0.002	0.006	0.000
Education: Business studies	2	-0.002	0.003	0.000
Education: Average duration	1	-0.001	0.002	0.000
Recommendations: Received recommendations	1	0.001	0.002	0.000
Other: Profile in English	1	0.000	0.000	0.000
Intercept	10	0.000	0.000	0.000

Note. CV_{FI} = cross-validation fold incidence, that is, the number of outer folds the regression coefficient of a feature was $\neq 0$; β_M = regression coefficients averaged across outer folds; β_{SD} = standard deviation of regression coefficients across outer folds; β_{Full} = regression coefficients of elastic net trained on full data. Only cues are shown for that $CV_{FI} > 0$. Cues sorted by $|\beta_M|$. All values on *z*-scale.

2.2.5 Discussion

With this study we uncover LinkedIn profiles' predictive potential to accurately infer personality. Building on the lens model (Brunswik, 1956), we demonstrate that LinkedIn profiles contain a valid cue base signaling users' narcissism (e.g., less smiling on the profile picture, uploading background pictures) and intelligence (e.g., listing more accomplishments, displaying schools with more followers) suggesting that the necessary condition for accurate personality inferences is met. Consistently utilizing these valid cues, the mechanical perceiver attained substantial prediction accuracy (r = .28/.32 for narcissism/intelligence). This shows that when the sufficient condition for accurate personality inferences is met, LinkedIn based personality inferences can indeed be accurate. Thereby, this study contributes to the literature on personality expression in recruitment contexts by adding valid LinkedIn specific cues to the information bases that recruiters draw on (e.g., resumés, online social network profiles, job interviews) to make (somewhat) accurate personality inferences. Furthermore, we add to the literature on the automated approach to personality assessment by showing that mechanical perceivers cannot only make accurate personality inferences based on online social media networks like Facebook but also based on online professional networks like LinkedIn, substantially differing in their cue base.

2.2.5.1 Applying the Lens Model to Personality Inferences Based on LinkedIn Profiles. This study underlines the utility of extending the application of the lens model framework (Brunswik, 1956) from human to mechanical perceivers (machine learning algorithms) to systematically examine processes involved in accurately inferring personality (Tay et al., 2020). More specifically, mechanical perceivers are trained to use cues consistently according to their validity and thus turned out as a useful vehicle to demonstrate that LinkedIn profiles possess predictive potential as long as the valid cues contained in LinkedIn profiles are used consistently.

Thereby, the lens model perspective allowed us to resolve previous discouraging findings of human perceivers' LinkedIn based personality inferences. Human perceivers achieve (if at all) modest accuracy when inferring personality on LinkedIn (Roulin & Levashina, 2019; Roulin & Stronach, 2022; Van de Ven et al., 2017). According to the lens model (Brunswik, 1956), this may be due to a lack of a (a) valid LinkedIn cue base or (b) consistent use of valid cues. Whereas Roulin and Stronach (2022) based on a small set of explorative cues challenge the existence of a valid LinkedIn cue base, Fernandez et al. (2021) based on deductively derived cues conclude the opposite. Following the deductive approach, we identified a rich set of valid LinkedIn cues for narcissism and intelligence that appeared as

robust predictors in cross-validated machine learning models. This suggests that human perceivers' lack of accuracy may be due to a lack of consistently using valid cues.

Indeed, we found that the mechanical perceiver, trained to consistently use valid cues, achieves substantial prediction accuracy for narcissism and intelligence. Inspecting the cues used by human versus mechanical perceivers might explain this: Whereas human perceivers were found to use cues such as the presence of an About section, the number of subscribers, and the number of previous employers to infer self-presentation (Van de Ven et al., 2017), and cues such as the presence of a professional profile picture, the presence of an About section, the number of subscribers, and the number of skills (Roulin & Stronach, 2022) to infer intelligence, we did not find these cues to signal narcissism and intelligence. Thus, the mechanical perceiver did not use these cues. Also, there are valid cues used by the mechanical perceiver, such as providing English profiles to infer narcissism, that may not be used accordingly by human perceivers (Van de Ven et al., 2017). Overall, these findings are in line with meta-analytical evidence that models of human personality inferences are more accurate than humans themselves due to removing inconsistencies in cue utilizations (Karelaia & Hogarth, 2008).

2.2.5.2 Extending Previous Research on Valid Cues Signaling Personality on LinkedIn. This study contributes to the young literature on personality expression in online professional networks like LinkedIn by providing ten/eleven easy-to-interpret LinkedIn cues correlated with narcissism/intelligence tested to be robust in nested cross-validated machine learning models. Thereby, our findings on valid LinkedIn cues support some findings of previous explorative research. For instance, in line with findings on valid cues signaling trait self-presentation (Van de Ven et al., 2017), we identified less smiling on the profile picture and English profiles as valid cues signaling narcissism. However, there were also findings of previous research that could not be supported in this study, such as the presence of an About section signaling trait self-presentation (Van de Ven et al., 2017). This might be due to previous research having focused on distinct, albeit-related personality traits (e.g., trait self-presentation) that show only partly conceptual overlap with the traits of the present study (e.g., narcissism) and might thus differently relate to cues. Also, a strength of this study is that we tested the robustness of valid cues using resampling methods which previous research did not. As such, some previous findings appeared to be instable across studies. For example, whereas the presence of an About section was found to be associated with self-presentation (Van de Ven et al., 2017), it was not found to be associated with the (negatively) related construct honesty-humility (Roulin & Stronach, 2022).

Taking a broader perspective, this study contributes to the literature on personality expression in recruitment relevant contexts by adding valid LinkedIn cues to the information bases recruiters can draw on to make (somewhat) accurate personality inferences such as resumés (e.g., Burns et al., 2014; Cole et al., 2003), application photographs (Fernandez et al., 2017), online social networks (e.g., Back, Stopfer, et al., 2010; Gnambs & Appel, 2018; Stopfer et al., 2014), job interviews (e.g., DeGroot & Gooty, 2009; Gifford et al., 1985), or even handshakes in on-site personnel selection procedures (Stewart et al., 2008). In particular, we add valid LinkedIn specific cues such as a high number of received recommendations and listing interests with many followers for narcissism or listing groups and schools with many followers for intelligence, that are unavailable on other recruitment relevant information bases such as resumés or Facebook profiles.

Yet, we also found several LinkedIn cues that might have been expected to signal personality based on findings in other contexts to not signal personality in the LinkedIn context. For example, narcissism has been shown to be expressed in several cues related to their everyday physical appearance (e.g., charming facial expression, professional/formal appearance; e.g., Back, Schmukle, et al., 2010; Vazire et al., 2008). Yet, we found that most of these cues did not signal narcissism based on the physical appearance displayed in the LinkedIn profile photo. This might be due to LinkedIn profiles representing a situation strongly imposing commonly accepted norms (e.g., showing a professional/formal appearance) and broadly triggering most individuals to engage in professional self-promotion (e.g., showing a charming facial expression). This could make some cues less discriminative on LinkedIn than in other, less contextually restricted situations (e.g., the everyday physical appearance). Likewise, whereas narcissism has been shown to be expressed in cues such as more connections and activities like posting (Gnambs & Appel, 2018; McCain & Campbell, 2018) on rather unconstrained online social networks like Facebook (Hartwell & Campion, 2020), this seems not to be the case on LinkedIn. Here, most individuals might feel obliged to build a large professional network and post about professional topics. Overall, these findings underline that personality traits are expressed differently depending on the surrounding situation's strength (R. D. Meyer et al., 2010; Mischel, 1973).

2.2.5.3 Automated Approach to Personality Inferences Based on LinkedIn. This study advances the literature on automated personality assessments based on online (professional) networks by applying the automated approach to LinkedIn based personality inferences (a) using a broad set of divergent cues (cf. Roulin & Stronach, 2022) and (b) following calls (e.g., Bleidorn & Hopwood, 2019; Tay et al., 2020) to preselect features based

on theoretical and empirical underpinnings. This way, we obtained (a) high predictivity (Back & Nestler, 2016; see Azucar et al., 2018; Settanni et al., 2018) and (b) the ability to provide explanations to our findings (see Yarkoni & Westfall, 2017), both central aspects for practical application purposes.

The machine learning models' accuracies predicting narcissism/intelligence were substantial (r = .28/.32, see G. J. Meyer et al., 2001; Roberts et al., 2007) and within the expectable range of automated personality assessments based on online social networks like Facebook (.29 ≤ r ≤ .40; Azucar et al., 2018; Settanni et al., 2018). LinkedIn profile's predictive potential is especially noteworthy because LinkedIn as a professional online network represents a substantially stronger situation than less contextually restricted online social networks such as Facebook (Hartwell & Campion, 2020). Accordingly, on LinkedIn, the situation dominates the behavior much more strongly limiting possibilities of personality expression. Against this background, it is remarkable how well accurate personality inferences can be made based on LinkedIn data when consistently using divergent valid cues.

Comparing mechanical versus human perceivers, mechanical perceivers' LinkedIn based accuracy seems to be at the upper border of human perceivers' accuracy: Concerning narcissism, human perceivers' prediction accuracy lay between .16 (honesty-humility; Roulin & Stronach, 2022) and .29 (self-presentation; Van de Ven et al., 2017). Concerning intelligence, human perceivers' prediction accuracy lay between -.02 and .30 (Roulin & Levashina, 2019; Roulin & Stronach, 2022). However, the human perceivers' accuracy levels refer to the accuracy of averaged inferences of groups of human perceivers (*aggregated perceiver approach*; Back & Nestler, 2016; ten/two-four/≥ six perceivers in Van de Ven et al., 2017/Roulin & Levashina, 2019/Roulin & Stronach, 2022). Substantially lower accuracy levels (possibly no accuracy at all; see Van Iddekinge et al., 2016) are to be expected for the average individual perceiver (*single perceiver approach*; Back & Nestler, 2016), such as the single recruiter inferring personality based on LinkedIn in real-life recruitment settings.

2.2.5.4 Practical Implications. This study shows that LinkedIn profiles possess predictive potential if the valid cues contained in LinkedIn profiles are used consistently. Yet, recruiters, routinely inferring personality based on LinkedIn, lack accuracy (Roulin & Levashina, 2019; Roulin & Stronach, 2022; Van de Ven et al., 2017). This might lead to erroneous decision-making in recruitment processes because, for instance, suitable applicants might be immediately falsely rejected due to their apparent "not suitable" personality. Also, inaccurate initial personality impressions might transfer to hiring decisions in advanced selection stages and harm their validity (e.g., Dougherty et al., 1994; Macan & Dipboye, 1990).

Trainings educating about incorporating valid LinkedIn cues (as identified in the present study) consistently into personality inferences could improve recruiters' accuracy (see Cole et al., 2005; Karelaia & Hogarth, 2008; Powell & Bourdage, 2016).

Besides, the present findings might raise the notion of leaving LinkedIn based personality inferences to mechanical rather than human perceivers. This seems to have great potential due to possibly enhanced accuracies and massive resource savings. However, it would be premature to conclude that based on the current state of research. For example, it should be noted that mechanical perceivers are trained to optimally predict self-reported personality, whereas human perceivers usually more broadly try to infer "true personality. Indispensable steps preceding practical applications of automated LinkedIn based personality inferences for recruitment purposes are thus examining the extent automated personality inferences (a) actually predict work outcomes, particularly job performance (criterion-related validity, see also Cubrich et al., 2021) and (b) thereby explain incremental variance beyond recruiters' LinkedIn inferred personality as well as established self-report personality and aptitude tests. Until then, organizations may be well advised to not rely too heavily on automated LinkedIn based personality inferences to base their selection decisions on but rather use these for non-invasive pre-screening practices when facing high applicant numbers.

The automated approach might also be applied for research purposes to measure personality efficiently and non-invasively. This could be leveraged to (a) reach large samples for which it is challenging to obtain personality traits,[18] (b) evade limitations of self-reports such as faking, social desirability, and restricted introspection (e.g., Morgeson et al., 2007), and (c) add incremental validity to self-reports. We finally emphasize the need to handle the present results responsibly as there are ethically controversial applications of automated LinkedIn based personality inferences such as tailoring LinkedIn contents and design to users' personality for purposes of enhancing user experience and time spent online (e.g., Alves et al., 2020), targeted advertising (e.g., Shumanov et al., 2021), or exerting political influence (e.g., Zarouali et al., 2022).

[18] An illustrative example might be research on consequences of CEO-narcissism whereby it is difficult to obtain self-reported narcissism due to CEO's time constraints. Research often circumvents this by combining public information (e.g., CEO's picture size in the annual report, number of CEO references in press releases) to narcissism scores (Cragun et al., 2020). Such scores have been validated against third-party reports (e.g., Patel & Cooper, 2014), but not self-reported narcissism. Aabo and Eriksen (2018) picked up on this and proposed a CEO-narcissism measure based on LinkedIn cues, that is, the number of (a) skills, (b) subscribers, and (c) professional positions, and the presence of a (d) profile picture, (e) About section, and (f) interests. However, Aabo and Eriksen (2018) do not demonstrate convergent validity. The present results might be valuable to optimize unobtrusive CEO-narcissism measures (if transferability to a CEO sample can be shown), as in our study many of the cues proposed to signal CEO-narcissism did not signal self-reported narcissism (only the number of skills had predictive value).

2.2.5.5 Limitations and Directions for Future Research. This study followed a top-down approach (Bleidorn & Hopwood, 2019; Tay et al., 2020) and focused on (a) deductively derived LinkedIn cues based on theoretical and empirical underpinnings to signal narcissism and intelligence, and (b) an easy-to-grasp machine learning algorithm, that is, the elastic net. This ensured robust results and interpretability leveraging our understanding of personality expression in online (professional) networks and potentials for practical applications. It is crucial for recruitment purposes to have clear insights into how selection decisions are made to ensure fair, transparent procedures and to adhere to legal arrangements prohibiting to consider specific personal characteristics (e.g., gender, ethnicity; Brown & Vaughn, 2011) to prevent discrimination (Goretzko & Finja Israel, 2022; Köchling & Wehner, 2020). Yet, future research might profit from a bottom-up approach (see Alexander et al., 2020) exploring hundreds of (automatically processed)[19] LinkedIn cues in thousands of users to detect robust novel cues signaling personality that might be used for theory refinement. Thereby, complex machine learning algorithms working best in big data environments and taking complex cue interactions into account such as random forests may be applied to identify an upper-threshold of mechanical perceivers' LinkedIn based prediction accuracy.

Mechanical perceivers seem to infer personality on LinkedIn more accurately than single human perceivers which might be due to human perceivers not using valid cues consistently. However, we have only limited evidence on human perceivers' cue utilizations based on small exploratory cue sets (Roulin & Stronach, 2022; Van de Ven et al., 2017). Preliminary evidence suggests that human perceivers might focus on the "wrong" cues, that is, they seem to use non-valid cues and disregard valid cues. To better understand this process, future research could examine the extent human perceivers incorporate deductively derived LinkedIn cues into personality inferences. This may also facilitate designing effective trainings that educate especially about those valid cues with a large discrepancy between recruiters' cue utilization. Thereby, researchers might refrain from solely using the aggregated perceiver approach (Nestler & Back, 2017). Conducting analyses on the single perceiver level would allow to (a) attain more relevant accuracy estimations, as recruiters typically view LinkedIn profiles individually rather than averaging inferences in groups, and (b) examine individual characteristics (e.g., personality traits, job experience) that might explain interindividual

[19] In this study, LinkedIn cues were coded manually by humans. An efficient practical application of a bottom-up approach to automated LinkedIn based personality inferences would require automatically processing cues ranging from simple web-scraping (e.g., Youyou et al., 2015) to complex deep learning methods (e.g., Wei & Stillwell, 2017). Yet, legal conditions are to be considered as to whether LinkedIn data is allowed to be automatically collected (LinkedIn prevents such practices; e.g., Goldfein & Keyte, 2017).

differences in accuracies (see Kinicki et al., 1990; Zedeck et al., 1983).

Although LinkedIn as a professional online network is a more contextually restricted platform compared to online social networks like Facebook (Hartwell & Campion, 2020), the information depth (e.g., pictures, skills, interests) seems to be sufficient for accurate personality inferences. This is positive news for applications in recruitment settings, as online social networks come with various obstacles, such as adverse impact, low acceptance, and legal disputes (e.g., P. L. Roth et al., 2016; Van Iddekinge et al., 2016), which are less pronounced in LinkedIn as a platform tailored to professional information (e.g., Cubrich et al., 2021; Stoughton et al., 2015). Future research might (a) directly compare prediction accuracies of (automated) personality assessments based on online social and professional networks using identical participants' profiles across networks and (b) test differences in the predictive value of similar cues across networks (e.g., number of LinkedIn subscribers and Facebook friends). This would contribute to a context specific understanding of personality expression in online social versus professional networks in alignment with situational strength theories (R. D. Meyer et al., 2010; Mischel, 1973).

Finally, future lens model research examining the processes involved in accurately inferring personality may profit from employing an alternative methodological approach. That is, identifying valid cues based on the feature importance in nested cross-validated machine learning models using cues to predict personality instead of based on bivariate correlations and multiple regressions. (a) Machine learning models optimize prediction instead of explanation which should be more appropriate when examining accurate personality inferences that inherently represent a predictive question (Yarkoni & Westfall, 2017). Also, (b) machine learning models are well-suited to handle environments with many intercorrelated cues (James et al., 2013) which should be the case for most information bases used to infer personality. Thereby, the importance of features provides practically relevant information for the weighting of specific cues in the context of a multitude of other cues. In addition, (c) resampling procedures ensure robust results which helps to avoid and clarify contradictory findings on valid and non-valid cues (e.g., Roulin & Levashina, 2019; Roulin & Stronach, 2022). Finally, (d) the machine learning approach provides solid metrics to quantify a specific information base's predictive potential. We hope that our research inspires other scholars to further investigate the potential of LinkedIn profiles for inferring personality characteristics in recruitment contexts.

2.2.6 References

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Appendix 2.2.A

In the LinkedIn profile card, users provide brief personal information (e.g., job titles, contact details). Narcissists might use this for self-promotion by listing more information and an academic title. Also, they could link a Twitter profile (e.g., Davenport et al., 2014; Panek et al., 2013). Due to their vanity, narcissists may include a profile picture (Aabo & Eriksen, 2018; cf. Van de Ven et al., 2017). Theron narcissists could display (a) fewer glasses (Vazire et al., 2008), (b) a charming facial expression (Back et al., 2010), (c) less smiling (Van de Ven et al., 2017), (d) a formal appearance (Back et al., 2010; Vazire et al., 2008; see also Van de Ven et al., 2017; cf. Roulin & Stronach, 2022), (e) a stylish, flashy appearance (Back et al., 2010; Cisek et al., 2014; Vazire et al., 2008; see also McCain et al., 2016), (f) a dressed-up, trimmed appearance (Davis et al., 2001; Giacomin & Rule, 2019; Holtzman & Strube, 2013; Vazire et al., 2008; see also McCain et al., 2016), (g) a professional edited shot (Fox & Rooney, 2015; Wang, 2019), and (h) physical attractivity (Holtzman & Strube, 2010; see also Buffardi & Campbell, 2008; Kapidzic, 2013). Also, narcissists could feature a (self-promotional) background picture and further pictures/videos as they post more pictures (Gnambs & Appel, 2018; McCain & Campbell, 2018).

In the About section (formerly "Summary") users highlight personal characteristics and experiences. Narcissists may use this for self-promotion by filling out the About section (Aabo & Eriksen, 2018; cf. Roulin & Stronach, 2022), providing more (self-promoting) information (Roulin & Stronach, 2022), and using more self-related words (e.g., "I/me"; see Cragun et al., 2020; cf. Carey et al., 2015). Narcissists spend more time and post frequently on online networks (Gnambs & Appel, 2018; McCain & Campbell, 2018). Thus, they could feature more average activities (e.g., liking posts), self-made posts, and posts in the Featured section. Narcissists are skilled in initiating connections (e.g., Back et al., 2010; Leckelt et al., 2015) and strive for large networks providing an audience (Wallace & Baumeister, 2002) and confirmation of popularity (Buffardi & Campbell, 2008; Davenport et al., 2014). Thus, narcissists have many connections on online networks (Gnambs & Appel, 2018; McCain & Campbell, 2018), which may also apply on LinkedIn (Aabo & Eriksen, 2018; Van de Ven et al., 2017; cf. Roulin & Stronach, 2022).

Narcissists could display more professional positions as they may include irrelevant experiences to show all previous achievements (Aabo & Eriksen, 2018; Van de Ven et al., 2017; cf. Roulin & Stronach, 2022). Narcissists excel at personnel selection procedures (e.g., Brunell et al., 2008; Paulhus et al., 2013), but mid-term cause problems at work (e.g., Grijalva & Newman, 2015) potentially leading to frequent job changes (Campbell & Campbell, 2009).

Thus, narcissists might feature lower average durations per professional position. Narcissists attain group leadership (Grijalva et al., 2015; e.g., Härtel et al., 2021), managerial ranks (e.g., Ahmetoglu et al., 2016; Wille et al., 2019), and representative leadership positions (e.g., Deluga, 1997; Watts et al., 2013), and thus, may display leadership positions. Concerning educational experiences, narcissists could display business studies (Bergman et al., 2010; Westerman et al., 2012). Narcissists focus on their own welfare (Campbell & Foster, 2007), and thus, might display less volunteering. However, narcissists may engage in volunteering for egoistic purposes (e.g., Brunell et al., 2014; Konrath et al., 2016), and thus, might particularly display less altruistic volunteering. They also prefer low effort volunteering (Konrath & Tian, 2018) and may thus display shorter average volunteering durations.

Narcissists may list more information concerning “Licenses and Certifications”, “Skills”, and “Accomplishments”, as these sections trigger self-promotion (cf. Roulin & Stronach, 2022). Skills can be endorsed, which narcissists could use as grandiosity affirmation (Van Dijck, 2013; cf. Roulin & Stronach, 2022). This might also apply to received recommendations (cf. Roulin & Stronach, 2022), which may be fostered by narcissists’ ability to make positive initial impressions (Back et al., 2018). Concerning specific skills, narcissists might list leadership and public speaking, matching their agentic side, and less “interpersonal skills” and teamwork, clashing with their antagonistic side (see also Fernandez et al.’s, 2021, findings on extraversion and agreeableness). Concerning specific accomplishments, narcissists might list low effort accomplishments such as “organizations” and “courses”. Users follow groups, influencers, companies, and schools in the Interest section. Narcissists might feature more interests to display self-promoting details (Aabo & Eriksen, 2018). They tend to associate with high status others (Campbell, 1999; see also Barry & McDougall, 2018), and thus, may list interests with many followers, particularly many influencers with many followers. Finally, narcissists could feature (a) sports (e.g., Bruno et al., 2014; Spano, 2001), (b) English profiles to reach big audiences (Van de Ven et al., 2017), and (c) long profiles due to exploiting the various self-promotion opportunities (cf. Roulin & Stronach, 2022).

Intelligent individuals may list an academic title in the profile card as intelligence predicts academic degree attainment (Kuncel et al., 2004). They might also include a LinkedIn profile picture (Roulin & Levashina; 2019). Intelligent individuals feature a self-assured facial expression and a less showy dress (Borkenau & Liebler, 1995). This could translate to a charming facial expression and a less stylish, flashy, and dressed-up, trimmed appearance on the profile picture. Intelligent individuals were found to feature a “high quality headshot with professional dress” on LinkedIn (Roulin & Levashina, 2019) which might translate to the cues

(a) professional edited shot, (b) picture above neckline, and (c) formal appearance (cf. Roulin & Stronach, 2022). Intelligent individuals could also include an (extensive) About section (Roulin & Levashina, 2019; cf. Roulin & Stronach, 2022).

Intelligence predicts career success (e.g., Judge et al., 1999; Ng et al., 2005) which may translate to listing more (extensively described; Roulin & Levashina, 2019; cf. Roulin & Stronach, 2022) professional positions (cf. Roulin & Stronach, 2022). Intelligence is a key leadership attribute (e.g., Offermann et al., 1994) and predicts leadership emergence (e.g., Judge et al., 2004). Thus, intelligent individuals might list leadership positions. Intelligence predicts academic achievement (Kuncel et al., 2004) and thus, intelligent individuals could display (good) marks (Roth et al., 2015), and more (extensively described) educational stations (Roulin & Stronach, 2022). Intelligent individuals take more time to finish their studies (Kuncel et al., 2004), and thus, might feature longer average durations of educational stations. They have low enterprising vocational interests (Pässler et al., 2015), and thus, may display fewer business studies. Intelligence is associated with prosocial behavior and volunteering (Guo et al., 2019; Kail & Car, 2020; Rosenthal et al., 1998). Thus, intelligent individuals could feature more (altruistic) volunteering and longer average durations.

Intelligent individuals may list more information concerning “Licenses and Certifications”, “Skills”, and “Accomplishments” (cf. Roulin & Stronach, 2022), as they efficiently acquire job knowledge and skills (Hunter, 1986) and excel at trainings (Hunter & Hunter, 1984; Salgado et al., 2003). In a similar vein, intelligent individuals might feature endorsed skills and received recommendations (cf. Roulin & Levashina, 2019; Roulin & Stronach, 2022) due to their positive internship appraisals (Kuncel et al., 2004) and job performance. Concerning specific skills, they could list skills related to job knowledge (“industry knowledge”, “tools and technologies”) and leadership. Concerning specific accomplishments, intelligent individuals might list accomplishments requiring cognitive complexity (see Gottfredson, 1997) such as “honors/awards” (Cole et al., 2003; Roulin & Stronach, 2022), “publications”, “projects”, and “test scores”. Concerning interests, due to their academic achievement, they may list more schools with more followers. They could also list rather groups (cf. Roulin & Levashina, 2019), serving professional purposes, than showing off influencers. Finally, as intelligent individuals attain high-wage level jobs (Judge et al., 1999; Ng et al., 2005) often requiring English skills (Stöhr, 2015) they might provide English profiles. They may have long profiles because they should have obtained more job-relevant experiences and describe these in detail (Roulin & Levashina, 2019; cf. Roulin & Stronach, 2022).

Appendix 2.2.B

Table 2.2.B

Measurement, Descriptive Statistics, and Correlations of the Leftover LinkedIn Cues With Narcissism and Intelligence

Cue	Measurement	*M*	*SD*	r_N	r_I
Profile card					
Premium account	0 = not present; 1 = present	.07	.25	.03	.00
Profile picture					
Badges	0 = not present; 1 = present (i.e., badges ("open to work", "hiring") presented with profile picture)	.04	.20	**-.09**	.02
Picture in color	0 = not present; 1 = present	.91	.29	.05	.08
Eye contact into camera	0 = not present; 1 = present	.95	.21	.02	.08
Picture with non-neutral background	0 = not present; 1 = present (neutral background was defined as neutral photograph settings such as plain colored walls, whereas non-neutral background was defined as more natural settings such as outdoors)	.36	.48	.01	.05
Skills					
Language	Number of skills categorized as "language" skills divided by total number of skills	.02	.06	-.01	-.06
Other	Number of skills categorized as "other" skills divided by total number of skills	.18	.21	.05	**.15**
Accomplishments					
Languages	Number of accomplishments categorized as "languages" divided by total number of accomplishments	.39	.43	-.01	.03
Recommendations					
Given recommendations	Numerically counted	0.07	0.30	**.14**	.04
Interests					
Companies	Number of interests related to companies divided by total number of interests	.79	.12	.01	**-.15**
Median of groups' followers	Median of number of followers of interests related to groups (assessing numbers of followers was limited to the first 50 group interests)	16493	66382	.05	.06
Median of companies' followers	Median of number of followers of interests related to companies (assessing numbers of followers was limited to the first 50 company interests)	78250	220055	**.12**	**-.12**
Causes					
Causes	0 = not present; 1 = present	0.05	0.21	-.03	.04

Note. N = narcissism; I = intelligence.
Correlations in bold are significant at the $p \leq .05$ level.

Appendix 2.2.C

Table 2.2.C

Intercorrelations Between Narcissism, Intelligence, Age, Gender, and All LinkedIn Cues of the Main and Supplemental Analyses

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
1. Narcissism	-	.00	**.82**	**.78**	**.56**	.03	**.19**	-.03	-.09	-.05	.05	.03	.09	.06	.07	.00	-.01	**.11**	.04	.04
2. Intelligence		-	-.01	.02	-.07	.07	**.17**	.06	.01	-.09	.00	-.06	**-.12**	.03	.08	.08	.07	.07	-.08	**.13**
3. Narcissistic admiration			-	**.27**	**.52**	.02	**.10**	.01	-.05	.05	.04	.04	.09	.03	.05	-.02	.00	**.13**	.03	.07
4. Narcissistic rivalry				-	**.37**	.02	**.20**	-.06	-.10	**-.14**	.04	.01	.04	.07	.07	.03	-.01	.05	.04	.00
5. Narcissism (NPI)					-	-.03	.09	-.03	-.05	**.17**	**.14**	.02	**.13**	**.15**	.09	.03	.04	**.11**	.09	**.14**
6. Age						-	**.27**	-.06	.01	**-.10**	**.10**	-.10	**-.18**	-.03	**.22**	**.22**	.07	**.50**	**-.12**	**-.14**
7. Gender							-	-.04	**-.10**	**-.12**	**.13**	**-.29**	-.05	-.05	.07	.08	.02	**.20**	-.07	.01
8. Name with title								-	.06	-.03	-.02	-.09	-.09	-.02	.03	.03	**.10**	-.05	-.07	**.12**
9. Profile picture									-	-	-	-	-	-	.05	.02	**.10**	-.01	-.01	-.04
10. Charming facial expression										-	**.26**	.09	**.27**	**.52**	-.02	-.01	**.13**	-.03	.05	**.13**
11. Professional/formal appearance											-	-.07	**.21**	**.42**	.08	.08	.06	**.10**	**.12**	-.01
12. Stylish/flashy/ fashionable appearance												-	**.37**	.10	.05	.02	.07	-.01	-.03	.06
13. Dressed-up, trimmed appearance													-	**.28**	.00	-.07	.01	-.09	**.11**	-.01
14. Professional shot														-	.07	.04	**.13**	.00	**.17**	**.14**
15. About															-	**.66**	**.26**	**.21**	-.07	**.16**
16. Extensive About section																-	**.23**	**.24**	.04	**.13**
17. Professional positions																	-	**.11**	-.01	**.27**
18. Leadership positions																		-	.02	.01
19. Business studies																			-	.02
20. Volunteer experiences																				-
21. Altruistic volunteering	**.11**	.07	**.14**	.03	**.12**	-.09	-.05	.04	-.06	**.10**	-.01	.04	.00	.01	.01	-.01	.09	.06	-.03	**.42**
22. Average duration of volunteer experiences	.04	**.14**	.07	-.01	.10	.02	.08	.06	-.04	**.10**	.06	-.05	.02	.09	.07	.02	**.11**	**.10**	-.04	**.40**
23. Licenses and certifications	.06	-.01	.06	.04	.07	**.15**	**.13**	-.01	.08	-.03	.01	.06	-.01	-.02	**.23**	**.15**	**.21**	**.19**	.04	**.14**
24. Skills	**.14**	.03	**.14**	.08	**.11**	**.28**	**.14**	.02	.06	-.01	**.11**	.01	.03	.05	**.46**	**.31**	**.29**	**.30**	-.08	.10
25. Endorsements	.05	.08	.09	.00	.07	**.41**	**.15**	.01	.04	.01	**.16**	.01	.02	.09	**.33**	**.28**	**.27**	**.37**	-.07	.08
26. Leadership skills	.08	-.04	**.10**	.02	.07	**.35**	**.18**	.02	.03	-.03	**.10**	-.02	-.02	.00	**.26**	**.24**	**.14**	**.33**	.02	.04

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
27. Accomplishments	.08	**.21**	.06	.07	**.12**	-.01	.05	**.14**	.02	.04	.07	.08	.03	**.11**	**.34**	**.27**	**.35**	.05	**-.10**	**.32**
28. Received recommendations	**.13**	.05	**.17**	.03	.06	**.13**	**.15**	-.03	.02	.07	.09	.03	**.11**	**.17**	**.14**	.09	**.12**	**.13**	.02	**.11**
29. Profile in English	**.10**	**.13**	.07	.09	**.11**	-.04	-.01	**.18**	.03	.02	.10	.04	.08	**.11**	**.21**	**.19**	**.35**	.05	.02	**.29**
30. Profile length	.04	**.14**	.02	.04	.08	**.11**	.06	**.13**	.09	.06	**.12**	.10	.01	**.15**	**.51**	**.56**	**.70**	**.19**	.01	**.34**
31. Extensive profile card	.04	-.03	.06	.01	.03	.03	.02	**.12**	.05	**.12**	.03	.02	.06	**.18**	**.20**	**.26**	**.17**	.09	.02	**.10**
32. Twitter	.02	.05	.00	.03	.01	**.22**	.05	-.04	.05	-.01	-.01	**.11**	.01	**.14**	**.20**	**.17**	**.16**	**.20**	-.02	**.19**
33. Glasses	.01	.04	-.03	.05	-.08	.07	.05	.04	-	**-.15**	-.09	.00	**-.15**	-.07	.05	.04	**.14**	.05	-.05	.06
34. Smiling	**-.18**	.01	-.08	**-.22**	-.01	**-.10**	**-.25**	.02	-	**.51**	.07	.05	.00	**.15**	-.03	.03	**.16**	-.04	-.07	**.15**
35. Physical attractiveness	-.06	-.06	-.01	-.09	.02	**-.45**	**-.29**	.04	-	**.45**	-.04	.08	**.37**	**.20**	**-.14**	**-.15**	.07	**-.29**	**.12**	.07
36. Background picture	**.15**	.01	**.17**	.07	**.16**	.03	.01	.00	.09	.03	-.05	**.11**	.03	.05	**.31**	**.26**	**.16**	**.10**	-.03	**.21**
37. Self-promotional background picture	.00	.02	.03	-.03	-.06	**.29**	**.23**	-.05	.13	.12	.02	.00	.03	.06	.16	.15	.10	**.20**	**-.21**	-.01
38. Additional pictures/ videos	-.02	.00	.00	-.04	.06	**.21**	**.20**	-.04	.07	.08	**.14**	.04	.02	**.10**	**.29**	**.37**	**.24**	**.23**	**-.10**	**.25**
39. Self-promotional content	-.02	.02	-.01	-.02	.02	**.22**	.02	-.14	-.04	.02	.15	-.03	.02	-.01	.13	**.59**	.16	**.33**	.04	.02
40. Self-related words	.01	.05	-.01	.02	.02	.08	.01	.03	.00	-.01	.05	.05	.00	.04	**.52**	**.79**	**.18**	**.13**	.09	.09
41. Posts	.02	-.01	.07	-.05	.02	**.20**	**.14**	.01	.06	.02	.06	.09	-.03	.08	**.29**	**.29**	**.16**	**.23**	**-.11**	**.22**
42. Average activities per day	.06	-.05	.07	.04	**.10**	**.24**	.03	.03	.07	.05	**.17**	.09	.09	.09	**.28**	**.29**	**.17**	**.27**	.00	.08
43. Articles/posts/ documents	.04	.00	.04	.02	.07	**.42**	.09	-.02	.09	.05	**.17**	.04	.02	**.10**	**.40**	**.38**	**.16**	**.39**	-.09	.09
44. Subscribers	.06	.02	.05	.04	**.15**	**.26**	**.14**	.03	.05	.08	**.21**	.05	**.12**	**.16**	**.29**	**.25**	**.28**	**.28**	.03	**.17**
45. Average duration of professional positions	.04	.00	.05	.02	-.02	**.59**	**.15**	-.07	-.02	-.08	.03	-.03	**-.11**	-.03	**.12**	.07	**-.15**	**.26**	**-.12**	**-.12**
46. Public speaking skills	**.14**	.01	**.13**	.08	**.12**	.03	.07	.00	.05	.07	-.03	-.01	-.01	.06	**.16**	**.13**	**.16**	.04	-.03	**.19**
47. Interpersonal skills	.04	**-.14**	**.10**	-.04	.04	**.11**	-.06	.02	.00	.09	-.02	.09	.04	.05	**.11**	**.10**	**.12**	**.14**	.05	**.12**
48. Teamwork skills	.01	-.07	.03	-.01	.02	**-.14**	**-.12**	.00	.05	**.11**	-.05	.04	.06	.07	.04	.05	**.12**	**-.12**	.02	.06
49. Organizations	**.14**	.06	**.14**	.08	.09	**.19**	.04	.01	.04	.04	.05	.09	.03	.07	**.21**	.07	**.12**	**.21**	**-.14**	.04
50. Courses	.08	.05	.04	.10	.08	-.01	.09	.01	.01	.01	-.02	-.01	-.01	-.03	**.23**	**.21**	**.19**	.04	-.04	.07
51. Interests	-.01	-.04	.00	-.02	.07	.09	.09	.05	.09	.06	**.14**	.05	.09	**.16**	**.30**	**.35**	**.28**	**.14**	.08	**.25**
52. Median of interests' followers	**.16**	**-.12**	**.11**	**.15**	.05	**-.17**	.06	.05	.02	.02	.05	**-.12**	.03	-.02	-.01	-.04	**-.12**	**-.10**	.04	.02
53. Influencers	.07	-.02	.09	.01	**.13**	.04	**.11**	-.06	.02	.07	**.11**	.02	**.11**	.00	.00	.07	.06	.07	**.12**	.06
54. Median of influencers' followers	.05	-.01	.02	.05	.05	-.07	.10	.02	.02	.01	-.03	.08	.04	-.10	.05	.01	.05	.05	.07	**.11**
55. Sports activities	.09	.02	.04	**.10**	**.10**	-.01	.08	.05	.04	**-.11**	-.06	.02	-.06	.00	.05	.06	.06	.02	-.06	**.19**
56. Picture above neckline	-.01	**.17**	-.04	.03	-.04	.01	**.11**	.06	-	**-.20**	.09	**-.21**	.05	-.03	.03	.07	**-.11**	-.04	-.06	-.02

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
57. Extensive description of professional positions	.02	.06	.03	.00	.03	**.10**	.00	**.11**	.02	.04	**.11**	**.13**	.04	**.11**	**.35**	**.39**	**.31**	**.16**	.00	**.19**
58. Marks	.01	.06	.02	.01	.03	**-.13**	-.04	.04	.00	.09	-.01	**.12**	.07	.06	.06	.04	**.22**	-.05	-.05	**.16**
59. Averaged marks	-.14	-.17	-.08	-.15	-.04	.14	.08	-.10	.15	-.05	.05	-.04	-.03	-.04	.12	.09	.00	.02	-.04	**-.22**
60. Educational stations	.07	**.14**	.04	.06	**.10**	-.07	-.02	**.10**	.05	.04	.04	.03	-.01	.09	**.22**	**.16**	**.35**	.02	.06	**.33**
61. Extensive description of educational stations	.00	**.11**	-.01	.02	.09	-.10	.00	.10	.06	**.12**	.00	.09	.01	**.11**	**.23**	**.23**	**.28**	.00	.01	**.40**
62. Average duration of educational stations	-.05	-.03	-.04	-.04	-.02	**-.27**	-.06	.02	-.03	.00	.00	-.03	.00	-.02	-.02	-.05	-.02	**-.15**	.04	.02
63. Industry knowledge skills	.09	.00	.07	.07	.08	**.18**	-.02	-.01	.04	.01	-.01	.04	-.01	-.02	**.24**	**.22**	**.26**	**.18**	-.02	.10
64. Tools and technologies skills	.07	.03	.05	.06	.02	**-.26**	.04	.09	.07	-.04	-.01	-.04	.09	.02	**.14**	.08	.05	-.09	.06	**.17**
65. Honors/awards	.05	**.18**	.02	.06	.04	**-.10**	.09	**.15**	-.01	.03	.04	-.03	.03	.04	.04	.03	**.17**	-.05	.00	**.28**
66. Publications	.03	**.15**	.06	-.02	.04	.07	.02	**.18**	.06	.07	**-.11**	.03	.02	.00	**.16**	**.14**	**.14**	.06	**-.11**	.09
67. Projects	.05	**.10**	.08	-.01	.06	**.11**	.07	.04	-.07	-.02	.02	.09	-.04	.05	**.17**	.09	**.15**	.09	**-.16**	**.13**
68. Test scores	-.02	**.11**	-.06	.03	-.03	-.06	-.05	.07	.05	.03	.09	.08	.05	.07	.06	.07	.09	.02	.06	**.11**
69. Schools	.00	.06	.01	-.02	-.05	**-.24**	**-.10**	.07	-.09	-.10	**-.17**	.01	-.05	-.05	**-.17**	**-.16**	**-.15**	**-.20**	.00	-.02
70. Median of schools' followers	**.12**	**.19**	**.13**	.05	**.12**	-.09	.04	.04	.00	.09	.08	.04	**.10**	.06	**.19**	.04	**.12**	-.05	-.06	**.11**
71. Groups	-.03	**.13**	-.07	.02	-.03	**.43**	.08	.07	.06	-.08	.04	.02	-.09	-.08	**.16**	**.14**	**.10**	**.25**	**-.10**	.02
72. Premium account	.03	.00	.03	.02	.06	**.25**	.00	-.04	.07	**.14**	.09	.07	.03	**.17**	**.18**	**.12**	.07	**.23**	.01	-.09
73. Badges	-.09	.02	-.09	-.06	-.02	.07	.03	.01	.00	-.05	-.08	.00	-.06	.00	**.15**	**.14**	.09	.09	-.05	-.03
74. Picture in color	.05	.08	.02	.07	.00	-.01	.06	-.08	-	**-.10**	**.12**	.07	.05	-.06	.04	.04	-.04	.00	.03	.00
75. Eye contact into camera	.02	.08	.03	.00	.06	-.07	.00	-.03	-	**.24**	**.18**	.01	**.14**	**.19**	.05	.08	.08	.02	**.11**	.06
76. Picture with non-neutral background	.01	.05	.00	.02	.07	**.10**	.00	-.02	-	.00	**-.22**	**.14**	**-.10**	**.13**	.01	.01	.04	**.11**	-.01	**.11**
77. Language skills	-.01	-.06	.04	-.06	-.03	**-.15**	**-.17**	.04	.04	-.01	-.06	.03	.04	.00	.07	.05	.03	-.09	.04	.04
78. Other skills	.05	**.15**	.06	.02	.07	**.22**	**.18**	-.07	.02	.03	**.16**	-.10	-.02	**.10**	**.20**	**.13**	.07	**.14**	**-.12**	-.03
79. Languages	-.01	.03	-.02	.01	.00	-.06	-.05	-.02	.03	.00	.06	.04	.03	.02	**.11**	.02	**.12**	-.03	.08	.08
80. Given recommendations	**.14**	.04	**.14**	.08	**.11**	**.23**	**.17**	-.05	.06	.03	**.11**	-.06	.06	.08	**.20**	.06	**.12**	**.23**	-.04	.03
81. Companies	.01	**-.15**	.02	-.01	.02	**-.19**	-.03	-.08	.00	**.10**	.04	-.02	.07	**.13**	.00	-.02	-.01	-.09	.05	-.01
82. Median of groups' followers	.05	.06	.04	.04	.00	-.02	-.05	.08	-.06	-.05	-.04	.04	.01	.03	.06	.06	.03	-.02	.07	.00
83. Median of companies' followers	**.12**	**-.12**	**.12**	.07	.01	**-.15**	.01	.04	.03	-.05	.01	-.05	.03	-.05	.01	-.01	**-.15**	-.09	.03	.02
84. Causes	-.03	.04	-.04	-.01	-.04	**.14**	.08	.09	.01	-.05	.04	.04	.03	.05	**.22**	**.21**	**.19**	**.17**	-.01	**.18**

	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.	33.	34.	35.	36.	37.	38.	39.	40.
21. Altruistic volunteering	-	**.31**	.07	-.06	-.01	.01	.08	.07	**.16**	**.12**	.02	-.01	-.03	.06	.06	.01	-.15	.07	.07	.00
22. Average duration of volunteer experiences		-	.02	**.11**	.04	.06	**.13**	.00	**.21**	**.13**	-.03	.02	-.04	.10	.06	.03	-.02	**.12**	.02	.00
23. Licenses and certifications			-	**.44**	**.23**	**.30**	**.22**	**.15**	**.12**	**.26**	**.11**	**.10**	.00	-.01	**-.14**	**.18**	.14	**.21**	.05	.08
24. Skills				-	**.49**	**.49**	**.32**	**.20**	**.21**	**.40**	**.20**	**.18**	.02	-.05	**-.16**	**.33**	.17	**.29**	.17	**.26**
25. Endorsements					-	**.32**	**.33**	**.39**	**.18**	**.36**	**.19**	**.34**	**.13**	-.02	**-.21**	**.24**	**.33**	**.37**	**.26**	**.17**
26. Leadership skills						-	**.11**	**.15**	**.10**	**.28**	.03	**.15**	.01	-.09	**-.21**	**.14**	**.25**	**.24**	**.20**	**.23**
27. Accomplishments							-	**.13**	**.35**	**.47**	**.18**	**.13**	**.12**	.05	-.05	**.25**	.09	**.33**	.10	**.19**
28. Received recommendations								-	**.10**	**.18**	**.11**	**.31**	.08	-.01	-.10	**.18**	.10	**.31**	.14	.08
29. Profile in English									-	**.45**	**.25**	.08	.01	.04	.04	**.19**	.07	**.20**	**.18**	**.16**
30. Profile length										-	**.31**	**.23**	.10	.08	-.06	**.29**	.14	**.37**	**.48**	**.50**
31. Extensive profile card											-	.05	.03	.03	.00	**.23**	**.20**	**.14**	.16	**.17**
32. Twitter												-	.10	.09	-.10	**.17**	**.19**	**.22**	.14	**.16**
33. Glasses													-	-.01	**-.27**	.04	.01	.04	.05	.04
34. Smiling														-	**.21**	-.03	.06	.02	.08	.01
35. Physical attractiveness															-	-.02	-.06	**-.14**	-.17	**-.11**
36. Background picture																-	-	**.21**	.16	**.21**
37. Self-promotional background picture																	-	**.24**	.12	.06
38. Additional pictures/ videos																		-	**.25**	**.27**
39. Self-promotional content																			-	**.52**
40. Self-related words																				-
41. Posts	.09	**.11**	**.26**	**.35**	**.45**	**.28**	**.21**	**.37**	**.15**	**.30**	**.19**	**.36**	.06	.00	**-.16**	**.22**	**.32**	**.65**	**.21**	**.24**
42. Average activities per day	-.03	-.03	**.31**	**.37**	**.47**	**.30**	**.26**	**.18**	**.12**	**.27**	**.18**	**.21**	.00	.05	**-.12**	**.23**	**.34**	**.25**	**.20**	**.28**
43. Articles /posts/ documents	-.02	.00	**.25**	**.41**	**.52**	**.33**	**.14**	**.26**	**.10**	**.31**	**.15**	**.40**	.09	.09	**-.21**	**.26**	**.37**	**.44**	**.25**	**.26**
44. Subscribers	-.01	.06	**.21**	**.37**	**.66**	**.25**	**.27**	**.32**	**.23**	**.35**	**.19**	**.31**	.08	.10	**-.11**	**.23**	**.31**	**.42**	.13	**.14**
45. Average duration of professional positions	-.05	.00	.03	.09	**.20**	**.15**	**-.10**	.09	**-.10**	**-.10**	-.03	**.26**	-.02	-.08	**-.27**	.04	**.21**	**.15**	.05	.00
46. Public speaking skills	**.11**	.06	.09	**.26**	**.11**	**.15**	.08	.08	**.14**	**.21**	**.14**	.03	-.07	.02	.01	**.16**	.01	**.13**	.00	**.12**
47. Interpersonal skills	**.13**	**.14**	**.15**	**.26**	.09	**.39**	.07	.07	**.10**	**.20**	**.12**	.09	-.01	.01	-.01	**.12**	-.08	**.14**	.16	**.10**
48. Teamwork skills	.02	.02	**.11**	**.24**	-.02	**.15**	.09	-.03	**.15**	**.15**	.01	-.06	.00	.09	**.14**	.05	**-.20**	.09	.07	.10
49. Organizations	-.03	.07	**.19**	**.25**	**.34**	**.12**	**.22**	**.24**	.05	**.14**	.06	**.23**	-.03	.03	-.06	.04	**.25**	**.16**	.06	.03
50. Courses	.05	.02	**.11**	**.17**	.06	**.15**	**.59**	.05	**.17**	**.24**	.05	.02	.06	-.04	-.03	**.12**	.11	**.20**	.14	**.24**

	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.	33.	34.	35.	36.	37.	38.	39.	40.
51. Interests	-.04	.03	**.20**	**.41**	**.37**	**.24**	**.23**	**.32**	**.24**	**.38**	**.14**	**.33**	.07	.09	-.05	**.22**	.14	**.37**	.11	**.30**
52. Median of interests' followers	.08	-.02	-.04	.00	-.06	.06	-.01	-.02	.02	-.08	-.05	-.01	-.02	-.07	-.01	-.01	-.15	-.08	.02	-.01
53. Influencers	.05	.08	.01	.07	.08	**.12**	.04	.02	.06	.06	.04	.00	-.03	-.02	.05	.08	.00	.05	.13	.05
54. Median of influencers' followers	**.14**	-.02	.09	.07	.00	.05	.09	-.03	.03	.04	.01	**.10**	.05	-.03	.05	.08	-.10	.01	.04	.03
55. Sports activities	.05	.05	.03	.01	.00	-.03	**.16**	-.03	.03	**.11**	.01	**.23**	.05	.08	-.06	**.18**	.12	.07	-.11	.05
56. Picture above neckline	-.05	.02	-.05	-.03	.07	-.06	.03	.01	.02	-.02	-.04	.02	.09	-.03	-.09	-.05	-.07	.01	.09	.01
57. Extensive description of professional positions	**.11**	.07	**.15**	**.27**	**.33**	**.25**	**.28**	**.14**	**.21**	**.70**	**.18**	**.21**	.04	-.02	-.08	**.22**	.13	**.27**	**.26**	**.35**
58. Marks	.04	.08	.01	**.11**	-.01	.05	**.22**	-.01	**.11**	**.25**	.03	-.02	.02	-.01	.10	**.16**	**-.24**	.09	.01	.05
59. Averaged marks	-.14	-.08	.07	.09	-.11	.08	-.03	-.11	**-.20**	.07	-.13	-.15	-.01	-.14	-.16	.09	.10	-.09	.18	**.19**
60. Educational stations	**.11**	**.26**	**.18**	**.22**	**.13**	.07	**.39**	-.04	**.31**	**.43**	**.11**	.07	**.13**	.09	.00	**.14**	.03	.10	.11	**.15**
61. Extensive description of educational stations	**.14**	.09	**.20**	**.20**	**.15**	.10	**.37**	.08	**.28**	**.47**	**.15**	.08	.04	.09	.02	**.25**	-.08	**.30**	.09	**.23**
62. Average duration of educational stations	.05	-.03	-.04	.01	-.05	-.01	-.01	-.02	-.07	.01	-.02	-.06	-.05	-.02	.09	-.01	**-.25**	-.06	-.08	-.05
63. Industry knowledge skills	.00	.08	**.19**	**.49**	**.39**	**.19**	**.15**	**.11**	**.18**	**.31**	.07	.09	.04	.01	-.09	**.19**	.07	**.13**	**.32**	**.11**
64. Tools and technologies skills	.04	**.12**	.03	**.19**	-.09	-.06	**.14**	-.08	**.11**	**.12**	**.13**	-.07	.02	-.01	**.16**	**.14**	-.12	-.05	.03	**.12**
65. Honors/awards	**.23**	.09	.07	.00	.03	-.02	**.27**	.06	**.20**	**.20**	**.14**	-.01	.09	.01	-.03	.09	-.10	.04	-.02	-.02
66. Publications	.02	.08	.07	**.15**	**.20**	.06	**.33**	.04	**.15**	**.23**	.08	.05	-.01	.04	.02	**.14**	.15	**.19**	.06	.06
67. Projects	-.05	.05	**.13**	**.24**	**.11**	**.21**	**.28**	.03	.04	**.16**	.02	**.15**	.05	.07	**-.12**	**.14**	.17	**.10**	-.08	.07
68. Test scores	-.06	.05	.03	.04	.00	.01	**.19**	.06	**.11**	**.12**	.02	.03	-.01	.01	.06	.05	-.02	.05	-.01	.09
69. Schools	.03	-.05	-.09	**-.24**	**-.14**	**-.16**	.05	-.09	-.09	**-.13**	**-.12**	**-.15**	-.03	-.07	.03	**-.17**	-.09	**-.14**	-.13	**-.12**
70. Median of schools' followers	.08	.08	.01	.06	.08	.02	**.11**	**.15**	**.23**	**.17**	.06	-.03	.04	.05	.02	.07	-.04	.07	.06	.07
71. Groups	.06	**.11**	**.14**	**.29**	**.27**	**.18**	.08	**.12**	**.10**	**.14**	.07	**.14**	.04	-.06	**-.21**	**.11**	.13	**.17**	.09	.04
72. Premium account	-.09	-.05	**.17**	**.24**	**.23**	**.15**	.04	**.15**	.07	**.13**	**.18**	.06	-.03	.05	-.04	.07	.16	**.13**	-.02	.00
73. Badges	-.03	-.08	**.13**	**.10**	.01	**.11**	.08	-.04	-.05	.09	.00	.03	.04	-.08	-.03	.01	-.01	.03	.00	.05
74. Picture in color	.00	-.03	-.02	.02	.03	-.06	-.03	-.06	-.09	-.01	-.02	.01	**-.13**	-.01	-.05	.01	**-.17**	-.01	.04	.00
75. Eye contact into camera	.07	.07	-.03	.00	.07	-.10	.06	.04	.06	**.12**	.06	-.03	.01	**.13**	.10	-.02	-.05	.02	.18	.08
76. Picture with non-neutral background	.06	.09	.04	.04	.02	.03	**.11**	.04	.07	.04	.01	.04	.03	-.02	-.03	**.10**	-.11	.08	-.02	.00
77. Language skills	.04	.06	-.03	**.13**	-.04	-.05	.00	-.05	.07	.05	-.01	-.06	-.03	.02	.09	.03	-.06	-.06	-.06	.08
78. Other skills	-.08	.04	**.17**	**.47**	**.15**	**.24**	**.11**	**.10**	-.02	**.12**	.07	.06	-.03	-.05	**-.13**	**.12**	.16	**.20**	-.10	**.12**
79. Languages	.04	**.11**	.01	.09	**.10**	.01	**.18**	-.02	**.10**	**.15**	.09	.03	.02	.00	.05	.06	-.11	-.02	.06	.05

	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.	33.	34.	35.	36.	37.	38.	39.	40.
80. Given recommendations	.01	.00	**.33**	**.34**	**.55**	**.21**	**.18**	**.52**	.04	**.16**	**.13**	**.24**	**.13**	-.03	**-.14**	**.21**	.16	**.20**	.08	.03
81. Companies	-.08	-.08	-.04	-.09	**-.14**	-.08	**-.12**	-.03	-.03	-.04	.03	.00	.01	.10	**.12**	-.01	-.05	-.06	-.04	.05
82. Median of groups' followers	.03	-.04	-.02	.08	-.01	.02	.09	.00	.08	.06	.05	.03	.04	-.02	.03	**.12**	-.11	-.01	.05	**.12**
83. Median of companies' followers	**.13**	-.01	-.05	-.02	-.06	.07	.01	-.03	-.06	-.09	-.04	.01	-.01	-.10	-.02	.03	-.16	-.07	-.01	-.02
84. Causes	.09	**.17**	**.13**	**.18**	**.23**	**.28**	**.15**	.08	**.14**	**.32**	-.03	**.42**	-.01	-.09	-.01	.10	.10	**.15**	.13	**.16**
	41.	42.	43.	44.	45.	46.	47.	48.	49.	50.	51.	52.	53.	54.	55.	56.	57.	58.	59.	60.
41. Posts	-	**.38**	**.56**	**.45**	**.16**	**.17**	.09	-.02	**.14**	**.10**	**.35**	-.06	.04	.05	**.10**	-.02	**.30**	-.02	-.02	.03
42. Average activities per day		-	**.55**	**.53**	**.20**	.09	.09	-.03	**.23**	**.12**	**.45**	-.08	.09	.03	.01	-.04	**.27**	-.05	**.23**	.06
43. Articles/posts/ documents			-	**.58**	**.30**	**.14**	**.19**	.05	**.22**	.06	**.34**	-.07	**.12**	.00	.08	-.01	**.30**	-.04	.00	.02
44. Subscribers				-	**.28**	.04	.05	.00	**.24**	.07	**.62**	-.07	**.15**	-.02	**.10**	.05	**.29**	.01	-.16	**.16**
45. Average duration of professional positions					-	-.03	.02	**-.10**	**.13**	-.05	.04	-.08	.01	-.05	.03	.01	-.02	**-.12**	-.02	**-.17**
46. Public speaking skills						-	**.31**	**.19**	.00	.04	**.10**	-.06	-.03	.00	-.01	**-.11**	**.10**	.05	.01	**.10**
47. Interpersonal skills							-	**.46**	.05	.05	.05	.02	.07	.04	-.09	-.07	**.17**	**.12**	.01	.08
48. Teamwork skills								-	-.02	.08	.05	.08	.05	.02	-.09	-.03	.04	**.12**	-.17	**.13**
49. Organizations									-	-.01	**.20**	-.06	.02	-.04	.02	-.02	.09	.03	-.19	.03
50. Courses										-	**.10**	-.01	.01	**.13**	.08	-.02	**.12**	.07	.04	**.18**
51. Interests											-	-.02	.09	.03	.06	-.02	**.25**	.05	.10	**.13**
52. Median of interests' followers												-	**.27**	**.21**	-.01	-.03	-.05	-.02	-.11	-.04
53. Influencers													-	**.24**	.03	-.07	.09	.06	.14	.01
54. Median of influencers' followers														-	-.04	-.04	.04	**.13**	.04	.01
55. Sports activities															-	.09	.07	-.07	-	**.13**
56. Picture above neckline																-	.02	-.08	.05	-.01
57. Extensive description of professional positions																	-	**.20**	.02	**.17**
58. Marks																		-	-	**.23**
59. Averaged marks																			-	-.10
60. Educational stations																				-
61. Extensive description of educational stations	**.25**	**.11**	**.15**	**.19**	-.09	**.16**	**.13**	**.18**	.04	**.12**	**.18**	-.08	.03	**.11**	.09	-.06	**.45**	**.22**	-.13	**.25**
62. Average duration of educational stations	**-.11**	**-.10**	**-.11**	-.06	**-.24**	-.01	.00	.02	.04	-.02	.01	**.10**	.03	.00	.02	-.03	.06	**.14**	-.03	-.03

	41.	42.	43.	44.	45.	46.	47.	48.	49.	50.	51.	52.	53.	54.	55.	56.	57.	58.	59.	60.
63. Industry knowledge skills	**.17**	**.17**	**.26**	**.27**	.03	.07	**.23**	**.17**	**.11**	.05	**.25**	-.01	**.14**	.02	-.05	-.05	**.20**	.05	-.06	**.20**
64. Tools and technologies skills	-.07	-.05	**-.13**	-.03	**-.17**	.07	.01	.05	-.06	**.12**	.02	.08	**.12**	.06	**.14**	.09	.08	**.16**	.10	**.19**
65. Honors/awards	.00	.02	-.07	.10	**-.11**	.00	-.03	.00	.04	.01	.07	.08	.06	.05	.00	.08	**.14**	**.10**	**-.33**	**.20**
66. Publications	**.24**	.10	**.12**	**.15**	-.02	**.11**	.05	.05	.09	.02	-.01	.04	.03	.06	.04	.02	**.16**	.05	-.08	.09
67. Projects	**.19**	.08	**.11**	.09	.05	.05	.05	-.02	.07	.03	**.14**	-.07	-.03	-.01	**.14**	-.06	**.13**	**.15**	-.04	.03
68. Test scores	-.03	-.01	-.02	.01	-.05	.00	.06	.02	.00	.05	.05	-.02	-.01	.00	-.03	-.01	.09	**.14**	-.13	**.14**
69. Schools	**-.14**	**-.24**	**-.30**	**-.22**	**-.19**	-.06	-.08	-.02	-.08	.01	**-.34**	-.05	**-.21**	-.09	-.02	.03	-.07	-.02	-.04	**.16**
70. Median of schools' followers	.05	.05	.06	.09	-.09	.05	.00	.02	**.18**	.08	.07	**.14**	.00	.05	-.03	.05	.07	-.01	**-.25**	**.14**
71. Groups	**.22**	**.15**	**.30**	**.18**	**.27**	.08	**.15**	.04	.09	.00	.03	**-.15**	-.04	.00	-.06	.02	**.17**	.06	-.11	-.01
72. Premium account	**.18**	**.17**	**.35**	**.26**	**.10**	**.10**	**.18**	.08	**.23**	-.05	**.18**	-.09	.01	-.05	-.04	-.05	.09	.04	.16	.00
73. Badges	.03	.08	.03	-.04	.01	-.07	**.15**	-.02	**.12**	.04	.01	-.06	.02	.08	-.03	-.01	**.12**	**.12**	.14	-.01
74. Picture in color	.01	.04	.06	-.02	.04	-.01	.03	.01	-.04	**-.12**	-.08	-.03	.04	.02	.00	.00	.02	-.04	-.07	-.02
75. Eye contact into camera	.03	.02	.03	.07	**-.18**	.04	-.01	-.01	-.01	.00	.04	-.04	-.07	-.02	.04	.09	.05	-.03	.04	.05
76. Picture with non-neutral background	.08	.02	.02	.05	.05	.06	.02	.05	**.12**	.00	.08	-.04	.00	.03	.00	**-.22**	.01	.03	-.16	.00
77. Language skills	-.06	-.03	-.08	-.05	-.09	.08	.09	**.13**	-.09	.01	.07	.04	-.05	-.07	-.01	-.04	.03	.05	.18	**.11**
78. Other skills	**.21**	**.10**	**.18**	.07	**.13**	**.13**	-.08	.06	**.15**	.04	**.12**	-.06	.01	.04	.02	.00	.07	.08	.09	.04
79. Languages	.00	.06	.05	.05	**-.10**	.09	.08	**.13**	-.03	-.07	.05	.00	.07	.05	.08	.02	.06	.09	**.24**	**.17**
80. Given recommendations	**.26**	**.28**	**.37**	**.42**	.10	**.19**	.09	-.03	**.22**	**.15**	**.27**	.00	.02	-.02	-.04	.06	**.13**	-.04	.04	.09
81. Companies	-.09	.03	-.06	-.04	-.07	-.05	-.09	-.04	-.02	.00	**.20**	.05	**-.25**	-.03	.05	.01	**-.11**	-.09	.07	**-.11**
82. Median of groups' followers	.00	-.03	-.01	-.01	.00	-.06	.04	.04	-.04	.08	.01	.03	.00	.00	-.04	-.09	.03	.07	-.07	.01
83. Median of companies' followers	-.06	-.06	-.07	-.08	-.07	-.04	.07	.04	-.07	.01	-.04	**.79**	**.18**	**.20**	-.01	**-.11**	-.04	-.02	-.16	-.01
84. Causes	**.24**	**.15**	**.20**	**.16**	.04	.04	**.15**	.03	**.13**	.05	**.17**	.03	.06	.09	-.04	.01	**.31**	.05	-.03	**.17**

	61.	62.	63.	64.	65.	66.	67.	68.	69.	70.	71.	72.	73.	74.	75.	76.	77.	78.	79.	80.
61. Extensive description of educational stations	-	.01	**.13**	**.10**	**.17**	**.17**	**.13**	**.16**	-.01	**.11**	**.12**	**.10**	.04	-.02	**.10**	.06	.02	.09	**.11**	.02
62. Average duration of educational stations		-	.02	**.18**	.05	-.03	**-.11**	-.01	.06	.04	**-.12**	-.03	.05	.06	-.03	-.07	.04	-.06	.07	-.07
63. Industry knowledge skills			-	-.04	.05	.09	.03	.04	**-.18**	.05	**.20**	**.12**	.02	-.02	.04	.02	**.11**	-.08	.09	**.22**
64. Tools and technologies skills				-	**.10**	-.02	-.02	.02	-.03	**.10**	-.07	-.07	-.07	.07	-.03	-.02	**.15**	-.08	**.18**	**-.11**
65. Honors/awards					-	.05	.08	.05	.07	**.15**	-.04	-.06	-.02	.00	-.01	.05	-.04	-.06	-.09	.08

	61.	62.	63.	64.	65.	66.	67.	68.	69.	70.	71.	72.	73.	74.	75.	76.	77.	78.	79.	80.
66. Publications						-	.10	-.01	**.12**	.04	.06	.04	-.02	-.03	.06	**.11**	.05	.08	-.05	.03
67. Projects							-	.06	-.08	-.03	.09	.03	.02	-.04	-.01	.10	-.02	**.21**	-.04	.01
68. Test scores								-	.04	.04	.00	-.01	-.01	.06	.04	-.04	.02	.02	.03	-.03
69. Schools									-	**. 13**	**-.25**	**-.18**	-.04	.02	.01	-.03	.01	-.09	-.04	-.07
70. Median of schools' followers										-	.00	.05	-.08	-.03	.07	-.01	-.07	.03	.05	**.10**
71. Groups											-	**.21**	.07	-.03	-.01	.03	-.01	**.14**	.03	.07
72. Premium account												-	.04	.01	.01	.09	.02	**.13**	**.10**	**.20**
73. Badges													-	-.03	-.02	.01	-.01	.06	.08	-.05
74. Picture in color														-	.02	.02	.03	-.02	.07	-.05
75. Eye contact into camera															-	**-.19**	.07	.02	**.14**	.01
76. Picture with non-neutral background																-	**-.12**	.03	-.03	-.03
77. Language skills																	-	**-.12**	.00	-.04
78. Other skills																		-	.01	.09
79. Languages																			-	.00
80. Given recommendations																				-
81. Companies	-.10	.04	-.07	.04	-.04	**-.15**	.00	-.02	**-.42**	-.08	**-.63**	-.04	-.03	-.01	.04	-.02	.04	-.08	-.04	-.01
82. Median of groups' followers	-.01	-.02	**.10**	.03	.04	.01	**.10**	.01	-.05	.01	.09	-.05	.06	.06	-.09	.10	.09	-.04	.02	-.01
83. Median of companies' followers	-.09	.05	-.03	.06	.06	.05	.03	-.02	-.03	.02	**-.12**	-.08	-.05	.00	-.03	.02	**.11**	-.06	.00	-.02
84. Causes	.08	.01	**.17**	-.02	.07	**.13**	**.12**	**.10**	-.08	.02	**.17**	-.01	.07	.03	-.01	.01	-.07	.03	.03	**.11**

	81.	82.	83.	84.
81. Companies	-	-.02	.05	**-.10**
82. Median of groups' followers		-	.01	.08
83. Median of companies' followers			-	.02
84. Causes				-

Note. Correlations in bold are significant at the $p \leq .05$ level.

Appendix 2.2.D

(a) Deductively deriving features might not rule out including explorative features because these might contribute to the predictive performance and be used for hypothesis derivation in future confirmatory research contributing to theory refinement (Stachl et al., 2020). We report the elastic nets with the deductively derived cues likely to contribute information in the main paper because many uninformative features might harm predictive performance and interfere with sparse, easy-to-interpret, and practically applicable models (Bleidorn & Hopwood, 2019; Stachl et al., 2020). Most importantly, the elastic nets based on the entire cue set yielded similar results concerning absolute (smaller prediction errors compared to intercept-only models) and relative performance estimates (r = .24/.33 for narcissism/intelligence; see Table 2.2.D1) as well as important features (see Table 2.2.D2). However, some additional features appeared to be important that might be tested in future confirmatory research such as narcissists listing fewer badges, fewer causes, and giving more recommendations or intelligent individuals listing fewer "interpersonal skills", interests with fewer followers, and more "other" skills.

(b) Following factor-analytically supported (e.g., Ackerman et al., 2011; Back et al., 2013) conceptualizations, grandiose narcissism is a multidimensional construct with agentic and antagonistic components that go along with distinct social (e.g., Back et al., 2018) and organizational consequences (e.g., Campbell et al., 2011). Computing elastic nets using the deductively derived cues for narcissism as features and NARQ-measured narcissistic admiration (α = .84) and rivalry (α = .82; Back et al., 2013) as target features, in terms of absolute prediction performance, we found both models to show smaller prediction errors compared to the intercept-only models (see Table 2.2.D1). However, we found lower relative prediction performance estimates for narcissistic admiration (r = .16) compared to rivalry (r = .27) and global narcissism (r = .28). This could seem somewhat counterintuitive because online networks might be seen as providing opportunities for self-promotion rather than ego-threat triggering antagonistic narcissism (Bushman & Baumeister, 1998), so that narcissists might seldomly be urged to deviate from their agentic default strategy (Grapsas et al., 2020). Yet, it may be that LinkedIn stimulates most users to engage in impression management, so that cues geared towards self-promotion become less discriminative. Indeed, the two most important global narcissism predictors, median of interests' followers (β_M = 0.098) and smiling on the profile picture (β_M = -0.096), rather predicted narcissistic rivalry (β_M = 0.070, β_M = -0.106) than admiration (β_M = 0.044, β_M = -0.011). Overall, inspecting the important features to predict narcissistic admiration versus rivalry (see Table 2.2.D2) revealed some preliminary

insights on features differently important to narcissism subdimensions. For instance, in line with research showing that narcissists' leadership emergence is rather due to their agentic than their antagonistic side (e.g., Härtel et al., 2021), the presence of leadership positions was only an important feature when predicting narcissistic admiration ($\beta_M = 0.035$) and not rivalry ($\beta_M = 0.000$). In a similar vein, in line with research showing that narcissists' positive first impressions are rather due to their agentic than their antagonistic side (Back et al., 2018), the number of received recommendations was only an important feature when predicting narcissistic admiration ($\beta_M = 0.060$) and not rivalry ($\beta_M = 0.000$). Future confirmatory research might build on this by deriving theoretically sound expectations for divergent cue validities of narcissism subdimensions and testing these.

(c) We report supplemental results on NPI-measured narcissism (Raskin & Terry, 1988) because it has long been the most common measure of non-clinical narcissism (Tamborski & Brown, 2011). However, we focus on NARQ-measured narcissism (Back et al., 2013) in the main analysis because the NPI has been shown to suffer from unrelatedness to conceptual models, problems with item content, unstable factor structure, and lack of internal consistency (e.g., Ackerman et al., 2016; Wetzel et al., 2016). The elastic net predicting NPI-measured narcissism ($\alpha = .58$) based on the deductively derived cues for narcissism, in terms of absolute prediction performance, showed smaller prediction errors compared to the intercept-only model (see Table 2.2.D1). However, we found lower relative prediction performance estimates for NPI-measured narcissism ($r = .16$) compared to NARQ-measured narcissism ($r = .28$). NPI-measured narcissism's prediction accuracy was similar to narcissistic admiration's prediction accuracy ($r = .16$), which aligns with findings of NPI-measured narcissism being biased towards measuring agentic rather than antagonistic narcissism (Back et al., 2013). Indeed, the two most important features predicting NARQ-measured narcissism, median of interests' followers ($\beta_M = 0.098$) and smiling on the profile picture ($\beta_M = -0.096$), that were rather related to narcissistic rivalry than to admiration, were substantially less important when predicting NPI-measured narcissism ($\beta_M = 0.009$, $\beta_M = -0.008$; see Table 2.2.D2).

Table 2.2.D1

Performance and Hyperparameter Estimates of Nested Cross-Validated Elastic Nets Predicting (a) Narcissism and Intelligence Based on the Entire Cue Set, (b) Narcissistic Admiration and Rivalry Based on Deductively Derived Cues, (c) NPI-Measured Narcissism Based on Deductively Derived Cues

	Narcissism (entire cue set)				Intelligence (entire cue set)				Narcissistic admiration				Narcissistic rivalry				Narcissism (NPI)			
	Elastic net		Intercept-only		Elastic net		Intercept-only		Elastic net		Intercept-only		Elastic net		Intercept-only		Elastic net		Intercept-only	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
MSE	0.939	0.080	0.975	0.001	0.879	0.085	0.975	0.001	0.958	0.060	0.975	0.001	0.921	0.070	0.975	0.001	0.952	0.104	0.959	0.053
RMSE	0.968	0.040	0.988	0.000	0.937	0.045	0.988	0.000	0.978	0.031	0.988	0.000	0.959	0.037	0.988	0.000	0.974	0.056	0.979	0.028
MAE	0.772	0.052	0.793	0.041	0.740	0.051	0.782	0.035	0.790	0.049	0.799	0.036	0.766	0.050	0.793	0.042	0.795	0.043	0.806	0.030
r	.24	.15			.33	.13			.16	.18			.27	.15			.16	.21		
R^2	.05	.03			.11	.03			.03	.02			.04	.02			.03	.03		
$R^2_{\text{Adj.}}$	.00	.02			.04	.03			.00	.01			.01	.02			-.01	.02		
λ_{Min}	0.124	0.026			0.096	0.019			0.157	0.100			0.127	0.050			0.151	0.067		

Table 2.2.D2

Regression Coefficients of Nested Cross-Validated Elastic Nets Predicting (a) Narcissism and Intelligence Based on the Entire Cue Set, (b) Narcissistic Admiration and Rivalry Based on Deductively Derived Cues, (c) NPI-Measured Narcissism Based on Deductively Derived Cues

Cue	CV_{FI}	β_M	β_{SD}	β_{Full}
Narcissism (entire cue set)				
Profile picture: Smiling	10	-0.089	0.016	-0.112
Interests: Median of interests' followers	10	0.083	0.024	0.097
Gender	10	0.080	0.022	0.090
Accomplishments: Organizations	10	0.066	0.018	0.084
Additional pictures: Background picture	10	0.060	0.018	0.072
Skills: Public speaking	9	0.051	0.030	0.065
Volunteering: Altruistic volunteering	9	0.038	0.019	0.050
Profile picture: Badges	9	-0.036	0.023	-0.049
Profile picture	10	-0.031	0.020	-0.045
Additional pictures: Additional pictures/videos	6	-0.022	0.026	-0.046
Profile picture: Dressed up, trimmed appearance	9	0.020	0.012	0.031
Causes	6	-0.018	0.019	-0.034
Experience: Leadership positions	9	0.018	0.012	0.031
Other: Sport activities	9	0.018	0.015	0.034
Recommendations: Received recommendations	7	0.017	0.020	0.022
Interests: Median of schools' followers	9	0.015	0.010	0.018
Skills	7	0.014	0.017	0.018
Recommendations: Given recommendations	7	0.012	0.019	0.011
Other: Profile in English	8	0.010	0.009	0.016
Skills: Industry knowledge	5	0.007	0.010	0.014
Profile picture: Picture in color	5	0.007	0.009	0.011
Education: Average duration	4	-0.006	0.016	-0.012
Interests: Groups	3	-0.005	0.009	-0.005
Profile picture: Professional shot	4	0.004	0.009	0.011
Accomplishments: Courses	4	0.003	0.007	0.011
Education: Averaged marks	3	-0.003	0.007	-0.018
Education: Business studies	2	0.002	0.005	0.000
Education: Extensive description	1	-0.002	0.007	0.000
Education: Educational stations	3	0.002	0.003	0.000
Interests	1	-0.001	0.004	-0.001
Profile picture: Stylish/flashy/fashionable appearance	1	0.001	0.003	0.000
Interests: Median of groups' followers	1	0.000	0.001	0.001
Accomplishments	1	0.000	0.000	0.000
Intercept	10	0.000	0.000	0.000
Intelligence (entire cue set)				
Interests: Median of schools' followers	10	0.111	0.018	0.109
Skills: Interpersonal	10	-0.100	0.020	-0.097
Accomplishments	10	0.092	0.018	0.098
Profile picture: Picture above neckline	10	0.079	0.021	0.081
Gender	10	0.075	0.020	0.077
Interests: Median of interests' followers	10	-0.067	0.025	-0.077
Profile picture: Dressed up, trimmed appearance	10	-0.064	0.015	-0.064
Accomplishments: Honors/awards	10	0.062	0.013	0.062
Accomplishments: Publications	10	0.056	0.022	0.054
Skills: Other	10	0.055	0.015	0.058
Volunteering: Average duration	10	0.048	0.014	0.050
Interests: Groups	10	0.039	0.017	0.040
Profile picture: Picture in color	9	0.038	0.015	0.035
Accomplishments: Test scores	10	0.038	0.013	0.040
Education: Averaged marks	9	-0.029	0.022	-0.033
Additional pictures: Additional pictures/videos	9	-0.028	0.014	-0.032

Cue	CV_{FI}	β_M	β_{SD}	β_{Full}
Activities: Average activities per day	9	-0.025	0.018	-0.025
Interests: Companies	9	-0.024	0.017	-0.025
Interests	7	-0.013	0.014	-0.002
Profile card: Extensive profile card	4	-0.012	0.021	-0.003
Interests: Median of companies' followers	5	-0.012	0.021	0.000
Featured: Posts	6	-0.011	0.013	-0.003
Interests: Median of groups' followers	7	0.011	0.010	0.009
Education: Educational stations	6	0.011	0.015	0.008
Profile picture: Eye contact	8	0.011	0.009	0.005
Profile picture: Charming facial expression	6	-0.010	0.012	0.000
Volunteering: Volunteer experiences	5	0.010	0.019	0.007
Profile picture: Professional shot	2	0.008	0.017	0.000
Other: Profile in English	6	0.008	0.008	0.001
Profile picture	3	0.007	0.011	0.000
Experience: Leadership positions	3	0.007	0.018	0.000
About: Self-related words	3	0.006	0.013	0.000
Accomplishments: Projects	5	0.005	0.007	0.000
Recommendations: Received recommendations	1	0.005	0.015	0.000
Other: Profile length	3	0.005	0.008	0.000
Education: Marks	2	0.004	0.014	0.000
Additional pictures: Self-promotional background picture	2	0.003	0.013	0.000
Profile picture: Non-neutral background	2	0.003	0.007	0.000
Licenses and certifications	1	-0.003	0.009	0.000
Profile picture: Badges	1	0.002	0.006	0.000
Age	2	0.002	0.004	0.000
Education: Extensive description	2	0.002	0.004	0.000
Skills: Public speaking	1	0.001	0.005	0.000
Other: Sport activities	2	-0.001	0.003	0.000
Volunteering: Altruistic volunteering	4	0.001	0.002	0.000
Activities: Subscribers	1	-0.001	0.002	0.000
Profile card: Twitter	2	0.001	0.001	0.000
Profile picture: Professional/formal appearance	1	0.000	0.001	0.000
Experience: Average duration	1	0.000	0.001	0.000
Skills: Teamwork	1	0.000	0.000	0.000
Intercept	10	0.000	0.000	0.000
Narcissistic admiration				
Additional pictures: Background picture	8	0.069	0.040	0.100
Recommendations: Received recommendations	8	0.060	0.039	0.083
Volunteering: Altruistic volunteering	8	0.052	0.031	0.073
Accomplishments: Organizations	8	0.044	0.027	0.066
Interests: Median of interests' followers	8	0.044	0.025	0.066
Skills: Public speaking	8	0.037	0.025	0.060
Experience: Leadership positions	8	0.035	0.025	0.056
Profile picture: Dressed up, trimmed appearance	7	0.025	0.018	0.041
Gender	7	0.016	0.014	0.025
Skills	7	0.014	0.016	0.025
About: Extensive About section	4	-0.012	0.020	-0.024
Profile picture: Smiling	5	-0.011	0.013	-0.019
Profile picture	4	-0.010	0.018	-0.019
Profile card: Twitter	4	-0.008	0.014	-0.020
Additional pictures: Additional pictures/videos	4	-0.007	0.014	-0.023
Interests: Influencers	5	0.004	0.007	0.007
Interests	4	-0.004	0.006	-0.017
Skills: Interpersonal	4	0.003	0.004	0.001
Experience: Professional positions	1	-0.002	0.007	0.000
Profile picture: Glasses	1	-0.001	0.004	0.000
About: Self-related words	1	-0.001	0.003	0.000
Education: Business studies	1	0.000	0.001	0.000
Other: Sport activities	1	0.000	0.000	0.000

Cue	CV_{FI}	β_M	β_{SD}	β_{Full}
Intercept	10	0.000	0.000	0.000
Narcissistic rivalry				
Profile picture: Smiling	10	-0.106	0.016	-0.083
Gender	10	0.095	0.027	0.070
Interests: Median of interests' followers	10	0.070	0.021	0.033
Profile picture: Professional shot	8	0.039	0.031	0.000
Other: Sport activities	9	0.035	0.019	0.003
Profile picture: Charming facial expression	6	-0.029	0.033	0.000
Other: Profile in English	7	0.029	0.023	0.000
Skills: Public speaking	7	0.029	0.029	0.000
Profile picture	8	-0.026	0.024	0.000
Accomplishments: Organizations	7	0.024	0.018	0.000
Accomplishments: Courses	7	0.022	0.024	0.000
Featured: Posts	6	-0.017	0.019	0.000
Additional pictures: Additional pictures/videos	4	-0.011	0.022	0.000
Profile card: Name with title	4	-0.008	0.013	0.000
Profile picture: Stylish/flashy/fashionable appearance	3	0.005	0.010	0.000
Volunteering: Altruistic volunteering	2	0.004	0.008	0.000
Additional pictures: Background picture	3	0.003	0.006	0.000
Skills: Interpersonal	1	-0.002	0.007	0.000
Profile picture: Dressed up, trimmed appearance	2	0.002	0.005	0.000
Activities: Average activities per day	1	0.002	0.006	0.000
Volunteering: Average duration	1	-0.002	0.006	0.000
Activities: Subscribers	1	0.002	0.006	0.000
Education: Business studies	1	0.001	0.004	0.000
Skills: Endorsements	1	-0.001	0.004	0.000
Skills	2	0.001	0.003	0.000
Skills: Leadership	1	0.000	0.001	0.000
Interests	1	0.000	0.000	0.000
About	1	0.000	0.000	0.000
Interests: Influencers	1	0.000	0.000	0.000
Intercept	10	0.000	0.000	0.000
Narcissism (NPI)				
Profile picture: Charming facial expression	9	0.063	0.037	0.078
Additional pictures: Background picture	9	0.056	0.030	0.074
Volunteering: Altruistic volunteering	8	0.032	0.023	0.050
Interests: Influencers	8	0.031	0.025	0.045
Other: Sport activities	6	0.026	0.025	0.035
Activities: Subscribers	8	0.024	0.017	0.028
Skills: Public speaking	7	0.024	0.019	0.031
Profile picture: Professional/formal appearance	9	0.023	0.022	0.033
Education: Business studies	6	0.021	0.025	0.031
Profile picture: Dressed up, trimmed appearance	8	0.020	0.019	0.035
Gender	7	0.019	0.019	0.033
Experience: Leadership positions	7	0.017	0.015	0.024
Accomplishments: Organizations	6	0.014	0.018	0.021
Volunteering: Volunteer experiences	8	0.014	0.017	0.021
Profile picture: Professional shot	6	0.013	0.023	0.008
Profile picture: Glasses	6	-0.011	0.011	-0.027
Interests: Median of interests' followers	4	0.009	0.013	0.000
Profile picture: Smiling	3	-0.008	0.015	0.000
Profile picture	4	-0.006	0.010	-0.002
Accomplishments: Courses	6	0.006	0.008	0.007
Other: Profile in English	5	0.006	0.010	0.007
Featured: Posts	1	-0.002	0.005	0.000
Accomplishments	3	0.001	0.003	0.006
Volunteering: Average duration	2	0.001	0.004	0.000
Additional pictures: Self-promotional background picture	1	-0.001	0.002	0.000
Skills	1	0.001	0.002	0.000

Cue	CV_{FI}	β_M	β_{SD}	β_{Full}
Age	1	0.000	0.001	0.000
About	1	0.000	0.000	0.000
Intercept	10	0.000	0.000	0.000

Note. CV_{FI} = cross-validation fold incidence, that is, the number of outer folds the regression coefficient of a feature was $\neq 0$; β_M = regression coefficients averaged across outer folds; β_{SD} = standard deviation of regression coefficients across outer folds; β_{Full} = regression coefficients of elastic net trained on full data. Only cues are shown for that $CV_{FI} > 0$. Cues sorted by $|\beta_M|$. All values on *z*-scale.

Appendix 2.2 References

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3. Mapping Personality Traits' Leadership Impacts in Face-to-Face and Virtual Groups

3.1 Pathways From Narcissism to Leadership Emergence in Social Groups

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Abstract. Narcissists successfully emerge as leaders. However, the processes by which this occurs are mostly unknown. Following a dual-pathway approach and differentiating between agentic (narcissistic admiration) and antagonistic (narcissistic rivalry) narcissism, we investigated the behavioral processes underlying narcissists' leadership emergence in social groups. We applied data from a multimethodological laboratory study ($N = 311$) comprising 3 groups of variables: personality traits, expressed interaction behaviors, and interpersonal perceptions. Prior to the laboratory sessions, participants provided self-reported answers to various narcissism measures. Interpersonal perceptions were obtained from round-robin ratings after participants completed the Lost on the Moon task in small groups. Participants' behaviors during the group discussion were videotaped and coded by trained raters. Results supported the notion of a pathway from agentic narcissism to leadership (measured as target effects of being seen as a leader) determined by narcissistic admiration, dominant-expressive behavior, and being seen as assertive. To clarify narcissism's relationship to leadership emergence, the effects were (a) contrasted with narcissism's effects on popularity and (b) set in relation to process pathways leading from intelligence and physical attractiveness to leadership. The findings underscore the benefits of a behavioral pathway approach for unravelling the impact of narcissism on leadership emergence.

Keywords: Narcissism, leadership emergence, popularity, behavioral processes, interpersonal perception.

Open Science Statement: The data, codebook, R-script, Mplus-scripts and supplementary results are made transparent on the open science framework: https://osf.io/4hpuf/.

3.1.1 Introduction

The performance and satisfaction of groups that do not have formal leaders critically depends on the person who eventually emerges as the group's informal leader. Emergent leadership has become an important topic in organizational (Pescosolido, 2001, 2002), personality, and social psychological research (e.g., Ensari et al., 2011; Ogunfowora & Bourdage, 2014; Ong et al., 2016). The trends of self-managing work teams (S. Cohen, 1993; Lawler et al., 1995; Manz & Sims, 1993) and of decentralization in organizations (M. Y. Lee & Edmondson, 2017) foster the emergence of leaders from within work groups. Consequently, understanding why a particular person informally emerges as a leader and how this happens is becoming more important for an organization's prosperity. Also, individuals repeatedly come together in social groups outside the business context (e.g., study groups, sports teams) in which they interact to complete tasks, solve problems, and pursue goals (e.g., to prepare for an exam, train for a competition). Thus, interacting in groups is a fundamental part of people's daily social lives. A key personality trait that has consistently been found to predict leadership emergence in social groups is narcissism[20] (e.g., Grijalva et al., 2015).

Prior research on the relationship between narcissism and leadership emergence has not looked at the behavioral and perceptual processes that drive the effects of narcissism on leadership emergence (Brunell et al., 2008). Moreover, recent research has suggested that researchers should differentiate between at least two dimensions of grandiose narcissism (i.e., agentic and antagonistic aspects of narcissism) when aiming to understand how narcissism results in social consequences (e.g., Back, 2018). However, research has rarely considered narcissism's multidimensionality when examining narcissism's impact on leadership emergence (Grijalva et al., 2015). In the present study, we addressed these issues by testing a comprehensive path model on narcissists' leadership emergence in social groups. Building on the narcissistic admiration and rivalry concept (NARC; Back et al., 2013), we (a) disentangled the two narcissistic process pathways to leadership (i.e., agentic and antagonistic), (b) compared them with narcissism's effects on popularity (i.e., likeability), and (c) compared the pathways with effects of intelligence and physical attractiveness on leadership emergence.

3.1.2 Theoretical Background

3.1.2.1 Previous Research on Narcissism and Leadership Emergence.

[20] This paper focuses on grandiose narcissism representing a personality trait in the general population (Morf & Rhodewalt, 2001). Therefore, whenever the term *narcissism* is used, it refers to grandiose narcissism, and whenever the term *narcissists* is used, it refers to individuals who are relatively higher than most other people on the continuous dimension of grandiose narcissism.

3.1.2.1.1 Main Effects of Narcissism on Leadership Emergence. Grandiose narcissism is a form of entitled self-importance (Krizan & Herlache, 2018) that goes along with grandiosity, a need for admiration and dominance, vanity, arrogance, disregard for others, and a tendency to manipulate others (Back et al., 2013; Braun, 2017; Miller et al., 2011; Raskin & Terry, 1988). According to self-regulatory models, in order to enhance and maintain their views of a grandiose self, narcissists have an extraordinary need for admiration and external validation (Morf & Rhodewalt, 2001). Consequently, narcissists are expected to be highly motivated to seek out leadership positions as these go hand in hand with high social status (Gardner, 2007). Leadership positions provide narcissists with an ideal opportunity to exhibit their competencies and demonstrate their superiority (Campbell & Campbell, 2009). Thus, they might view a leadership position as a platform for self-promotion that will help them earn the admiration and glory they are convinced they deserve (Wallace & Baumeister, 2002). Accordingly, narcissism has shown positive associations with desires for power (Carroll, 1987; Raskin & Novacek, 1991; Rogoza et al., 2016), status (Zeigler-Hill et al., 2018), and leadership (Brunell et al., 2008; see also Benson et al., 2016). Narcissists also seem to be successful at attaining leadership positions: Taking a closer look at illustrious positions of leadership (e.g., president, CEO), narcissists appear to be prevalent in leadership roles (Deluga, 1997; Maccoby, 2000; Rosenthal & Pittinsky, 2006; Watts et al., 2013; see also Ahmetoglu et al., 2016; Wille et al., 2013, 2019). Indeed, narcissists have attained leadership and status in social groups in the short-term (Brunell et al., 2008; Carlson & DesJardins, 2015; Harms et al., 2011; Nevicka, De Hoogh, et al., 2011; Nevicka, Ten Velden, et al., 2011; Ong et al., 2016; Paunonen et al., 2006; see Grijalva et al., 2015, for meta-analytical evidence).

The association between narcissism and leadership emergence must not be mistaken for the association between narcissism and leadership effectiveness (see Grijalva et al., 2015). Leadership emergence and leadership effectiveness are conceptually distinct constructs (Lord et al., 1986) that become relevant at distinct temporal stages of group processes (Ong et al., 2016). Leadership emergence processes are characterized by uncertainty (Marinova et al. 2013) and describe being viewed as a leader by group members that have limited information about that individuals' performance (R. Hogan et al. 1994; Judge et al. 2002) at the beginning of group processes (Ong et al., 2016). Leader effectiveness processes describe the group leaders' actual task performance in the leadership position (R. Hogan et al. 1994; Judge et al. 2002; Stogdill, 1950) at later stages of group processes when groups already identified their leader, who then provides indicators of more or less effective leadership (Ong et al., 2016). The present study solely focuses on narcissism's association with leadership emergence.

3.1.2.1.2 Behavioral Mediators of the Relationship Between Narcissism and Leadership Emergence. According to process models of personality and social relationships (Back et al., 2011, 2018; Grosz et al., 2020; Nestler & Back, 2013), narcissism might only have an effect on leadership emergence if (a) an individual's narcissism is expressed in observable behaviors (behavioral expression), (b) these expressed behaviors are detected by interaction partners and used to form impressions (interpersonal perception), and (c) these social impressions are evaluated with regard to leadership emergence (evaluation). Even though the full mediation process linking narcissism to leadership emergence is unclear (Brunell et al., 2008), there is some preliminary evidence. Ong et al. (2016) found that peer-rated transformational leadership mediated the relationship between narcissism and peer-rated leadership emergence in early stages of group processes. Therefore, narcissists' expressed behaviors that are linked to charismatic and visionary components of transformational leadership (e.g., inspirational speech, creating a vision; see Deluga, 1997; Khoo & Burch, 2008) might account for the link between narcissism and leadership emergence. Cheng et al. (2013) differentiated between two pathways that could be followed to exert influence in social groups. They were found to be associated with two distinct underlying behavioral strategies: prestige and dominance. Both behavioral strategies have been found to be associated with narcissism (Cheng et al., 2010; Zeigler-Hill et al., 2018). Prestige includes demonstrating competence and a willingness to share knowledge as well as behaving in a charismatic, charming, expressive, and confident manner. These expressed behaviors are expected to lead to interpersonal impressions of being respected and admired. Dominance involves the use of aggressive behavior, manipulative tactics, and threat. These expressed behaviors are expected to lead to interpersonal impressions of being feared (Cheng et al., 2010, 2013; Cheng & Tracy, 2014; Maner & Case, 2016; Witkower et al., 2020). Indeed, preliminary evidence has shown that distinct sets of nonverbal behaviors are related to group members' perceptions of being admired and respected or being feared as well as group members' and external observers' ratings of social influence (Witkower et al., 2020). Moreover, individuals who were perceived as engaging in prestige and dominance by group members and by external observers (video-based ratings of group members as "respected" and "bossy and pushy") were found to exert social influence (Cheng et al., 2013).

3.1.2.1.3 Evidence for Distinct Relations of Agentic and Antagonistic Narcissism With Leadership Emergence. Modern conceptualizations treat grandiose narcissism as a multidimensional construct that encompasses agentic (e.g., grandiosity, self-assuredness, charmingness, assertiveness) and antagonistic (e.g., hostility, aggressiveness, arrogance,

exploitativeness) aspects (e.g., Back, 2018; Back et al., 2013; Brown et al., 2009; Krizan & Herlache, 2018; Miller et al., 2016; Tamborski et al., 2012; Wright & Edershile, 2018). This structure has been supported by several factor-analytic studies (e.g., Ackerman et al., 2011; Back et al., 2013; Crowe et al., 2019; Glover et al., 2012). Agentic and antagonistic narcissism have also shown distinct effects in adjacent social contexts, such as peer popularity (Küfner et al., 2013; Leckelt et al., 2015) and dating (Wurst et al., 2017; see Back, 2018, for an overview). By contrast, studies on narcissism and leadership emergence have yet to systematically differentiate between the effects of the agentic and antagonistic subdimensions of narcissism (Braun, 2017; Grijalva et al., 2015; Zeigler-Hill et al., 2018). Preliminary evidence of differentiated effects of agentic and antagonistic narcissism on leadership emergence has stemmed from studies that examined (a) facets of the Narcissistic Personality Inventory (NPI; i.e., Brunell et al., 2008; Carlson & DesJardins, 2015), (b) variables that are closely associated with agentic and antagonistic narcissism (i.e., Paunonen et al., 2006), and (c) personality traits that might (partly) account for the relationship between narcissism and leadership emergence (i.e., Brunell et al., 2008; Carlson & DesJardins, 2015; Grijalva et al., 2015).

3.1.2.2 A Dual-Pathway Approach Linking Narcissism to Leadership Emergence. The NARC (Back, 2018; Back et al., 2013) provides a framework that allows researchers to move beyond previous work on narcissism and leadership by (a) analyzing more complete process pathways including behavioral expression, interpersonal perception, and evaluation process stages and (b) disentangling the effects of the agentic and antagonistic aspects of narcissism (see also Back et al., 2018; Küfner et al., 2013). The NARC differentiates between two distinct interpersonal strategies that serve narcissists' overall goal of attaining and maintaining a grandiose self: narcissistic self-promotion and narcissistic self-defense. The tendency to engage in assertive self-promotion translates into agentic dynamics (narcissistic admiration; e.g., dominant/self-assured and expressive behavior) that tend to evoke indicators of social potency, particularly in short-term-acquaintance contexts. By contrast, the tendency to engage in antagonistic self-defense translates into antagonistic dynamics (narcissistic rivalry; e.g., arrogant and aggressive behavior, other-derogation) that tend to evoke indicators of social conflict.

3.1.2.2.1 Pathway From Agentic Narcissism to Leadership Emergence. On the basis of the NARC (Back et al., 2018), we expected that narcissistic admiration would have a positive effect via dominant-expressive behavior and being perceived as assertive by interaction partners on leadership emergence. As narcissistic admiration is the default strategy (Back, 2018; Grapsas et al., 2018; Wetzel et al., 2016), admiration should be expressed in

dominant-expressive behaviors, particularly in a task-oriented getting-acquainted situation that provides narcissists with an opportunity to demonstrate their grandiosity (Back et al., 2018; Küfner et al., 2013; Leckelt et al., 2015). Dominant-expressive behaviors should then yield perceptions of assertiveness that should be evaluated positively with regard to leadership emergence, as both perceptions of assertiveness and perceptions of leadership emergence concern interpersonal agency (Abele et al., 2008; Abele & Wojciszke, 2007; R. Hogan, 1982; Wojciszke et al., 2009).

Regarding behavioral dynamics, this notion is supported by the conceptual resemblance of the agentic narcissism pathway with the prestige pathway as both encompass expressive, confident, and charming behaviors—all of which are assumed to foster social status (Cheng et al., 2010, 2013). Indeed, narcissistic admiration was found to be primarily associated with reports of engaging in prestige strategies but less so with reports of engaging in dominance strategies (Zeigler-Hill et al., 2018).

Regarding perceptual dynamics, our framework fits well with implicit leadership theories (ILTs) that suggest that leaders are selected on the basis of how well they are perceived to fit with an inner image of the prototypical leader (Foti et al., 1982; Lord et al., 1984, 1986; Shondrick et al., 2010). In particular, agentic narcissism corresponds with agentic leader attributes such as extraversion (e.g., Back et al., 2013; Bradlee & Emmons, 1992; K. Lee & Ashton, 2005), (sociable) dominance[21] (e.g., Bradlee & Emmons, 1992; Raskin & Terry, 1988), confidence (e.g., Back et al., 2010; Campbell et al., 2004; Paulhus, 1998), and charisma (e.g., Back et al., 2010, 2013; Ong et al., 2016)—characteristics that have been found to predict leadership emergence (Ensari et al., 2011; Judge et al., 2002; Lord et al., 1986; Ong et al., 2016).

Finally, research on narcissism facets has provided additional indirect evidence for a positive effect of agentic narcissism on leadership emergence. Variables strongly associated with agentic narcissism (egotism, self-esteem) were found to predict peer ratings of which peers were seen as natural leaders in a sample of military cadets registered in the same training program (Paunonen et al., 2006). Also, the agentic NPI subfactors (Emmons, 1984)—leadership/authority (L/A) and self-absorption/self-admiration (S/S)—were found to predict

[21] Dominance encompasses agentic and antagonistic aspects (Kalma et al., 1993; see also Mazur, 1985). Dominance as referred to in the current section refers to sociable dominance, encompassing agentic aspects of dominance, such as high self-esteem, confidence, and taking responsibility, rather than aggressive dominance, encompassing antagonistic aspects of dominance, such as acting aggressively to control others with threat (Kalma et al., 1993; see also Cheng et al., 2013; Ridgeway, 1987). Whereas sociable dominance is similar to the agentic narcissism pathway, aggressive dominance is similar to the antagonistic narcissism pathway.

initial peer ratings of high status in small groups of unacquainted undergraduates (Carlson & DesJardins, 2015).

3.1.2.2.2 Pathway From Antagonistic Narcissism to Leadership Emergence. On the basis of the NARC (Back et al., 2018), we expected that narcissistic rivalry would have a significantly smaller positive or even negative effect via arrogant-aggressive behavior and being perceived as untrustworthy by interaction partners on leadership emergence than narcissistic admiration. Particularly in getting-acquainted situations, narcissists might engage less often in arrogant-aggressive behaviors as social disapproval is unlikely to occur (Back, 2018; Grapsas et al., 2018; Küfner et al., 2013; Leckelt et al., 2015). Also, antagonistic behaviors might be difficult to detect such that they should only weakly yield impressions of untrustworthiness (e.g., Roulin et al., 2015). Finally, perceptions of untrustworthiness might be evaluated negatively with regard to leadership emergence because they have demonstrated a strong correspondence with social evaluations (e.g., N. H. Anderson, 1968; Dumas et al., 2002). However, given that perceptions of trustworthiness concern interpersonal communion, whereas perceptions of leadership emergence concern interpersonal agency, impressions of untrustworthiness might be less influential (Abele et al., 2008; Abele & Wojciszke, 2007; R. Hogan, 1982; Wojciszke et al., 2009).

On the other hand, regarding behavioral dynamics, because the antagonistic narcissism pathway conceptually resembles the dominance pathway (both encompass aggressive behaviors), which has been found to foster social status (Cheng et al., 2010, 2013), antagonistic narcissism should have a positive impact on leadership emergence. Indeed, narcissistic rivalry was found to be primarily associated with reports of engaging in dominance strategies but less so with reports of engaging in prestige strategies (Zeigler-Hill et al., 2018). However, this finding was not consistent with findings that aggressively behaving confederates did not exhibit much influence within small groups, were perceived less favorably, and elicited resistance behaviors (Ridgeway, 1987; Ridgeway & Diekema, 1989). On the other hand, the aggressive confederate was still perceived as having a higher status and leadership ability than a submissive confederate (Ridgeway, 1987).

Regarding perceptual dynamics, ILTs are in line with a negative impact of antagonistic narcissism on leadership emergence. Sensitivity (e.g., warm, helpful; Epitropaki & Martin, 2004; Offermann et al., 1994) represents a desired leader attribute and should be negatively associated with antagonistic narcissism. Tyranny (e.g., manipulative, conceited; Epitropaki & Martin, 2004; Offermann et al., 1994) represents an undesired leader attribute and should be positively associated with antagonistic narcissism. However, constructs related to sensitivity

(e.g., agreeableness) have been found to be unimportant for leadership emergence (e.g., C. Anderson et al., 2001, 2008; C. Anderson & Cowan, 2014; Ensari et al., 2011; Judge et al., 2002; Taggar et al., 1999). Constructs related to tyranny (e.g., aggressiveness, antagonism) have been found to (a) have a negative impact on (e.g., Ogunfowora & Bourdage, 2014), (b) be unrelated to (e.g., Limon & La France, 2005), and (c) have a positive impact on leadership emergence (Ensari et al., 2011; Lord et al., 1986).

Research on the facets of narcissism has contributed to the mixed results. On the one hand, antagonistic aspects of narcissism may have contributed to self- and peer ratings of leadership emergence in small leaderless group discussions (Brunell et al., 2008). On the other hand, emergent leaders in a sample of military cadets suppressed variables that were strongly associated with antagonistic narcissism (manipulativeness, impression management; Paunonen et al., 2006). Also, the antagonistic NPI subfactor entitlement/exploitativeness (E/E; Emmons, 1984) was a unique predictor of the lower status of undergraduate students who regularly participated in small group discussions (Carlson & DesJardins, 2015).

3.1.2.3 Contrasting Effects on Leadership Emergence With Those on Popularity. To allow for specific insights, it is important to test for whether effects of narcissism on leadership emergence can be explained by its effects on being liked (i.e., popularity) or whether there are distinct, leadership-specific effects. We expected differentiated effects given that leadership emergence and popularity are distinct social outcomes (Carlson & DesJardins, 2015; Hollander & Webb, 1955; Theodorson, 1957; Wherry & Fryer, 1949) located in different places in the interpersonal sphere (Bakan, 1966; R. Hogan, 1982; Hopwood, 2018; Kiesler, 1983; Wiggins, 1991; Wojciszke et al., 2009). Specifically, leadership emergence is an agentic quality that is related to "getting ahead," whereas popularity/being liked is more a communal quality that is related to "getting along." Also, leadership emergence is a hierarchical construct with zero-sum dynamics (i.e., not every group member can emerge as a leader), whereas likeability is not (i.e., every group member can be well-liked; C. Anderson et al., 2015; Dufner et al., 2016). Therefore, the agentic narcissism pathway might be more decisive for leadership emergence as assertiveness represents an agentic quality (Abele et al., 2008; Abele & Wojciszke, 2007; see also J. Hogan & Holland, 2003). By contrast, the antagonistic narcissism pathway might be less likely to obstruct leadership emergence as trustworthiness represents a communal quality (Abele et al., 2008; Abele & Wojciszke, 2007). Indeed, whereas preliminary evidence of the impact of antagonistic narcissism on leadership emergence has been ambiguous, studies have consistently found a negative impact of narcissistic rivalry on popularity (Küfner et al., 2013; Lange et al., 2016; Leckelt et al., 2015; Leckelt, Geukes, et al., 2019; see Back et

al., 2018, for an overview). In line with this, the dominance pathway, which resembles the antagonistic narcissism pathway, was found to have a positive impact on social influence but a negative impact on liking (Cheng et al., 2013).

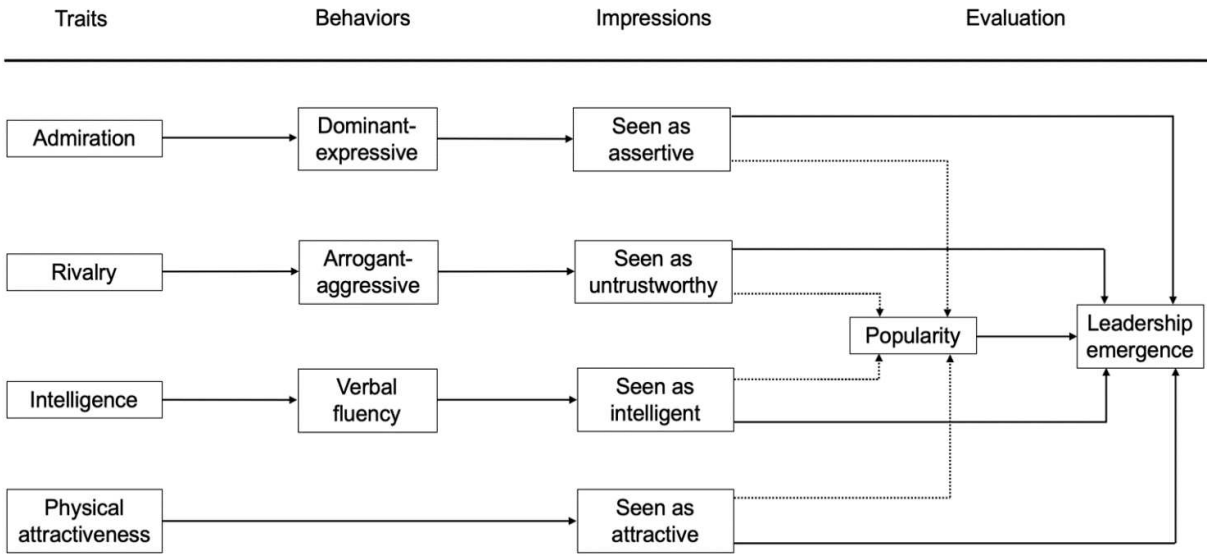
3.1.2.4 Additional Intelligence and Physical Attractiveness Pathways. Adding the intelligence and physical attractiveness pathways allowed us to analyze whether the effects of narcissism on leadership emergence would remain meaningful beyond additional attributes of prototypical leaders (Lord et al., 1984; Offermann et al., 1994) that have consistently been found to predict leadership emergence (Ensari et al., 2011; Hochschild Jr. & Borch, 2011; Judge et al., 2004; Lord et al., 1986; Poutvaara, 2014). Even though narcissism was found to be unrelated to intelligence (O'Boyle et al., 2013), narcissists tend to be seen as intelligent in group discussions (Paulhus, 1998), which may be due to agentic narcissism (Back et al., 2013) and which might to some extent explain why they emerge as leaders (see also Rubin et al., 2002). Narcissism was found to be positively related to observer-rated attractiveness (Holtzman & Strube, 2010), which may be due to agentic narcissism (Back et al., 2013; Dufner et al., 2013; Weber et al., 2019) and which might be another reason for why they emerge as leaders.

3.1.2.5 The Present Study. With this study, we aimed to shed light on how narcissists emerge as leaders in social groups. Building on the NARC (Back et al., 2013), we took a dual-pathway approach (Küfner et al., 2013) to address two main open issues in research on narcissism and leadership emergence. First, we conceptualized grandiose narcissism as a multidimensional construct, and we differentiated between agentic and antagonistic aspects. Second, we employed a multimethodological and process-oriented approach for understanding the social mechanisms underlying the narcissism-leadership emergence relation. Specifically, we went beyond previous research by integrating three groups of variables into the comprehensive behavioral pathway model depicted in Figure 3.1.1: stable personality traits, expressed behaviors (coded by six trained raters), and interpersonal perceptions (actual perceptions of interaction partners in a realistic interaction setting). For this purpose, we applied data from a large multimethodological data set, the Personality Interaction Laboratory Study (PILS; Geukes et al., 2019).[22]

[22] For a list of all publications based on the data set used in the current study, see the Overview of Previous PILS Publications at https://osf.io/4hpuf/. Similar process models were examined in (a) Leckelt et al. (2015), who investigated effects of narcissism on peer popularity over time, and (b) Rau et al. (2019), who investigated effects of seeing others as low on agency on being seen as high on agency. In comparison with Leckelt et al. (2015), we (a) focused on leadership emergence, which represents a social construct distinct from popularity and achieved by different means (Carlson & DesJardins, 2015; Hollander & Webb, 1955; Theodorson, 1957; Wherry & Fryer, 1949), and thus, we extended the results from general social contexts to business contexts. We also (b) examined the robustness of the narcissism pathways by considering additional pathways to leadership emergence. Finally, we (c) focused on the Lost on the Moon task (Bottger, 1984; Robins & Beer, 2001) as a typical representative of

Figure 3.1.1

A Comprehensive Behavioral Pathway Approach to Narcissistic Leadership Emergence in Social Groups



To clarify unique relations with leadership emergence, we contrasted the effects of the two narcissism pathways on leadership emergence with their effects on popularity. To explore the robustness and relative relevance of the narcissism pathways, we set the narcissism pathways in relation to intelligence and physical attractiveness pathways to leadership emergence. We expected the agentic narcissism pathway to exert a positive influence on leadership emergence; that is, we expected the indirect effect (IE) of admiration on being seen as a leader to be positive (Hypothesis 1). We expected the agentic narcissism pathway to exert a stronger influence on leadership emergence than the antagonistic narcissism pathway; that is, we expected the absolute value of the IE of admiration on being seen as a leader to be stronger than the absolute value of the IE of rivalry on being seen as a leader (Hypothesis 2). We expected the agentic narcissism pathway to exert a more positive influence on leadership emergence compared with its influence on popularity; that is, we expected the IE of admiration on being seen as a leader to be more positive than the IE of admiration on being liked (Hypothesis 3). We expected the antagonistic narcissism pathway to exert a less negative influence on leadership emergence compared with its influence on popularity; that is, we expected the IE of rivalry on being seen as a leader to be less negative than the IE of rivalry on

leaderless group discussions (Brunell et al., 2008; Cheng et al., 2013), that are commonly applied in real-life assessment centers. In comparison with Rau et al. (2019) our focus was considerably different as they did not examine narcissism.

being liked (Hypothesis 4). None of our hypotheses and exploratory questions were preregistered.

3.1.3 Method

3.1.3.1 Sample. The sample consisted of 311 university students from various majors mainly recruited via email lists, advertising posters, and lecture announcements at the Johannes Gutenberg University in Mainz, Germany. Participants were free to choose whether they would receive monetary compensation or course credit. Fourteen participants did not provide complete personality and demographic data, resulting in 297 participants (162 women) who filled out the online questionnaire and attended at least one laboratory session. The average age in this sample was 23.81 (SD = 3.92), ranging from 18 to 39. The first/second laboratory session was attended by 311/305 participants (171/169 women). The average level of participants' prior acquaintance was low (M = 1.33, SD = 0.95; on the item "I know this person" on a scale ranging from 1 = *does not apply at all* to 6 = *applies perfectly*). All participants provided written consent to participate in the study and to be recorded during the laboratory sessions.

Because the data was not specifically collected to test the present hypotheses, no power analysis prior to data collection was conducted. As the dataset has been successfully applied in studies computing similar models (Leckelt et al. 2015, Rau et al. 2019), it likely provides sufficient power to detect the effects we were interested in. Moreover, our sample was bigger than samples of most studies with real group interactions and behavioral measurements (e.g., Cheng et al., 2013; Küfner et al., 2013; Witkower et al., 2020). However, to gain a more precise understanding of the power in the present study, we used Schoemann et al.'s (2017) online tool to calculate the power for the IE of admiration on being seen as a leader via dominant-expressive behavior and being seen as assertive (Hypothesis 1). The tool computes Monte Carlo power analysis simulations and tests IEs with bootstrapped confidence intervals (CIs). We computed the model with two serial mediators, 5,000 replications, 20,000 Monte Carlo draws per replication, and a confidence level of 95% (random seed = 1234). We entered n = 283 conservatively considering only complete cases. We entered correlations drawn from previous studies ($r_{\text{admiration, dominant-expressive behavior}}$ = .41, $r_{\text{admiration, seen as assertive}}$ = .34, Back et al., 2013; $r_{\text{admiration, leadership emergence}}$= .12, Grijalva et al., 2015; $r_{\text{dominant-expressive behavior, seen as assertive}}$ = .42, Leckelt, Geukes et al., 2019; $r_{\text{dominant-expressive behavior, leadership emergence}}$ = .18, Witkower et al., 2020; $r_{\text{seen as assertive, leadership emergence}}$ = .88, Cheng et al., 2013). We assumed standardized variables. The computed power was 1.00.

3.1.3.2 Procedure. All procedures used in the PILS study were approved by the review board of the University of Mainz (title: "The longitudinal course of narcissists' reputations: A

developmental social interaction approach"; no protocol number) and were in line with the recommendations of the German research foundation (DFG) and the German psychological society (DGPs). First, participants were asked to complete an online questionnaire for collecting demographic information and self-reported personality traits. Thereafter, participants attended three laboratory sessions that each took place 1 week apart and lasted for about one hour. For the laboratory sessions, the sample was divided into 54 groups of four to six participants ($M = 5.76$) with 37 same-sex (21 female) and 17 mixed-sex groups. The laboratory sessions took place in a video laboratory. Participants were seated around an oval table in the middle of the room. At the beginning of the sessions and after each task, the group members provided self-ratings and round-robin ratings of each other via netbooks placed in front of them. In addition to individual cameras and microphones that recorded each participant separately, two dome cameras were installed to record the overall group setting.

The laboratory sessions were designed to investigate group interactions from zero to short-term acquaintance. Participants completed three tasks in the first session (Tasks A, B, and C) and two tasks each in Session 2 (Tasks D and E) and Session 3 (Tasks F and G). At the end of Session 1, participants completed cognitive ability measures and participated in a photo shoot under standardized conditions. For the present study, only Task A (Reading Aloud task) and Task D (Lost on the Moon task) were of direct interest. For the Reading Aloud task, each participant read a sheet with a different version of a composition of texts (e.g., a poem, a weather report) out loud. Thereafter, participants provided a brief self-introduction (Task B) followed by a detailed self-introduction (Task C). For the Lost on the Moon task (Bottger, 1984; Robins & Beer, 2001), group members were told to imagine that they were participating in a space race after experiencing a harsh landing on the moon that damaged their space shuttle and most of their equipment. Only 15 items had survived the crash intact. Participants first individually selected and ranked 12 of the 15 items that they thought would be most helpful for getting to the mother ship and then discussed their solutions in the group.[23] We focused on the Lost on the Moon task because (a) it has been successfully applied

[23] Participants were split into 28 competitive groups and 26 cooperative groups. After they individually selected and ranked 12 of the 15 items, depending on the task condition, participants were instructed either (a) to discuss the group members' individual solutions regarding their importance for the success of each individual and to trade items with the other group members to obtain the best selection of items for themselves (competitive condition) or (b) to discuss the importance of 12 of the 15 items for the group's success and to determine a joint rank order (cooperative condition). The variable group condition was included in the data set but not considered any further because it was not within the scope of the present article. However, we conducted exploratory multiple-group analyses to test whether the effect of admiration on leadership emergence and of rivalry on leadership emergence, respectively, differed between competitive and cooperative groups. Chi-square difference testing of the model with constraints versus the model without constraints showed no difference in the effect of admiration on

to investigate leadership emergence and status attainment in group settings (e.g., Cheng et al., 2010; DesJardins et al., 2015). (b) It was the first task in the second laboratory session and was thus located somewhere in the transition zone between zero-acquaintance and short-term acquaintance (see Leckelt et al., 2015). This should have ensured that individuals had only limited information about their group members' performance so that our findings would be related to leadership emergence and not to leadership effectiveness (see Judge et al., 2002; Marinova et al., 2013; Ong et al., 2016). (c) It requires group discussions, which are particularly suitable for investigating the narcissism pathways. This is the case because such discussions provide the opportunity to be admired by others so that the agentic narcissism pathway can be triggered but also to be criticized and outperformed by others so that the antagonistic narcissism pathway can be triggered (Küfner et al., 2013). For a detailed description of the procedure applied in the larger project the data stemmed from, see the Codebook at https://osf.io/4hpuf/.

3.1.3.3 Measures.

3.1.3.3.1 Narcissism. Narcissistic admiration (e.g., "I am great"; α = .82) and rivalry (e.g., "Other people are worth nothing"; α = .78) was measured with the 18-item Narcissistic Admiration and Rivalry Questionnaire (NARQ; Back et al., 2013) using 6-point scales ranging from 1 (*do not agree at all*) to 6 (*agree completely*).

3.1.3.3.2 Intelligence. A 15-item short version (Denissen et al., 2011) of Raven's Advanced Progressive Matrices (Raven et al., 1962) was used to measure participants' fluid intelligence (α = .71). The German multiple-choice vocabulary test B (Mehrfachwahl-Wortschatz-Test B, MWTB; Lehrl, 2005) was used to measure participants' crystallized intelligence (α = .63).[24] A numeric computation span task (Oberauer et al., 2000) was used to assess participants' working memory capacity (WMC). Subscores for processing information (α = .70) and storing information (α = .71) were substantially correlated (r = .33, p < .001). Therefore, they were z-standardized and aggregated into an overall working memory capacity score. To obtain a comprehensive indicator of participants' intelligence, we aggregated the z-standardized scores from all three intelligence measures ($r_{\text{Raven, MWTB}}$ = .17, p = .002; $r_{\text{Raven, WMC}}$ = .19, p < .001; $r_{\text{MWTB, WMC}}$ = .16, p = .004).[25]

leadership emergence, $\chi^2(1) = 0.04$, p = .84, and of rivalry on leadership emergence, $\chi^2(1) = 2.76$, p = .10, respectively, between the competitive and cooperative groups.

[24] Due to a programming error, Item 36 was not implemented.

[25] The intercorrelations between the facets of intelligence were quite low. This might be due to (a) the relatively short measurements and (b) range restrictions because of a student sample. Future replications should use comprehensive measurements in heterogeneous samples.

3.1.3.3.3 Physical Attractiveness. Full-body photographs (upright format) and portrait photographs (landscape format) of each participant were taken under standardized conditions and with a neutral facial expression. Six trained coders rated participants' overall physical attractiveness on the basis of the full-body photographs (ICC [2,k] = .82) and the physical attractiveness of participants' faces on the basis of the portrait photographs (ICC [2,k] = .81). Scales ranged from 1 (*not at all attractive*) to 10 (*very attractive*). Both indicators were substantially correlated ($r = .91$, $p < .001$) and aggregated into an overall physical attractiveness score.

3.1.3.3.4 Coded Behaviors. Behaviors were coded on the meso-level, which is positioned between global label ratings (macro-level) and the counting of micro-behaviors (micro-level) because the meso-level allows ratings to be reliable and psychologically meaningful at the same time (Funder et al., 2000). Ratings were made on 6-point scales ranging from 1 (*not at all*) to 6 (*very strongly*). Six trained coders[26] rated verbal fluency on the basis of the audio footage obtained in the Reading Aloud task ("speaks fluently: speaks fluently; pronunciation matches the content; makes reasonable breaks"; ICC [2,k] = .76). Another six trained coders rated dominant/self-assured behavior ("shows dominant behavior: dominates the social interactions; takes the leading role; exhibits dominant facial expressions and gestures; behaves self-confidently and convincingly"; ICC [2,k] = .92), expressive behavior ("shows expressive behavior: exhibits expressive facial expressions and gestures; is outgoing; shows positive emotions; speaks a lot"; ICC [2,k] = .90), arrogant behavior ("shows arrogant, pretentious behavior: exhibits arrogant facial expressions and gestures; overemphasizes his/her own performance/ability; behaves in an arrogant and conceited way"; ICC [2,k] = .84), and aggressive behavior ("shows aggressive behavior: affects the interaction in an aggressive way; makes aggressive, unsocial comments; shows angry, aggressive facial expressions and gestures; shows annoyed and irritated reactions"; ICC [2,k] = .83), based on the video footage obtained in the Lost on the Moon task. Dominant/self-assured and expressive behavior ($r = .93$, $p < .001$) as well as arrogant and aggressive behavior ($r = .93$, $p < .001$) were strongly related. Thus, we *z*-standardized and aggregated them into measures of dominant-expressive behavior and arrogant-aggressive behavior.

[26] All behavioral coders were blind to the purpose of the study and were given extensive training to develop a shared understanding and make use of the full range of the scale. Behavioral coding was based on rating sheets that were optimized for the specific interaction task participants were observed in. In addition to providing labels for the behaviors that needed to be coded, the rating sheets included explanations and examples of associated behaviors.

3.1.3.3.5 Interpersonal Impressions. Interpersonal impressions stemmed from participants' round-robin ratings after the Lost on the Moon task. Items were answered on 6-point scales ranging from 1 (*does not apply at all*) to 6 (*applies perfectly*). Participants rated each other on perceived assertiveness ("This person is assertive"), trustworthiness ("This person is trustworthy"), intelligence ("This person is intelligent"), and physical attractiveness ("This person is physically attractive"). We computed target effects on the basis of the social relations model (Back & Kenny, 2010; Kenny, 1994) with the TripleR package (version 1.2.1; Schönbrodt et al., 2012) in R (version 3.5.2; R Core Team, 2018) to capture individual differences in being seen as assertive, trustworthy, intelligent, and attractive. Partner effect reliability was .74 for being seen as assertive, .22 for being seen as trustworthy, .54 for being seen as intelligent, and .74 for being seen as attractive.[27]

3.1.3.3.6 Leadership and Popularity. Leadership emergence ("I can well imagine this person as a leader") and popularity ("I like this person") were measured in a round-robin design after the Lost on the Moon task on 6-point scales. We computed target effects. Partner effect reliability was .66 for leadership emergence and .40 for popularity. For a detailed description of all measures applied in the larger project the data stemmed from, see the Codebook at https://osf.io/4hpuf/.

3.1.3.4 Analytical Approach. First, we calculated bivariate correlations for all variables. To account for the nesting of participants in groups, we used group-mean-centered traits, behavioral ratings, and target effects. We used the correlations to derive (a) general associations between variables, (b) initial support for the predicted pathways, and (c) indications for cross-paths that should be considered in the following analyses.

Subsequently, we computed four multiple mediator models (MMMs; Preacher & Hayes, 2008) building on one another to test the proposed pathways in a stepwise manner: (a) beginning with the agentic and antagonistic narcissism pathways, (b) additionally entering popularity as a second interpersonal evaluation, (c) introducing the intelligence and physical attractiveness pathways, and (d) ending up with a comprehensive model integrating all pathways. To account for the nesting of participants within groups, we used

[27] Note that social relations model (Back & Kenny, 2010; Kenny, 1994) reliabilities (a) cannot be directly compared to standard internal consistency coefficients, (b) are typically very low for judgments with small amounts of target variance (although this variance can be meaningfully and replicably related to other variables), (c) are not used to justify that one can continue calculating with individual differences, but that a significant and at least small proportion of variance falls on the component, and (d) are often not reported at all (see Bonito & Kenny, 2010).

group-mean-centered variables. To attain standardized path coefficients and IEs, we *z*-standardized all group-mean-centered variables before we computed the MMMs.

We used the statistical program R and the interface RStudio (version 1.0.136; RStudio Team, 2016) for descriptive analyses, to compute bivariate correlations, and to prepare the data for Mplus. To test for differences between bivariate correlations, we computed Williams' (1959) *t* (see Hittner et al., 2003) and J. Cohen's (1988) *q* as corresponding effect size. We specified the MMMs with Mplus Version 8 (Muthén & Muthén, 2017). To test for differences between the path coefficients, we computed *z*-tests. We used a nonparametric bootstrapping approach implemented in Mplus to compute 95% CIs for the IEs. The number of bootstrap samples was 10,000. To test for differences between IEs, we used bootstrapping. As we formulated one-sided hypotheses for these comparisons, we computed 90% CIs.

We provide supplementary results for all reported models in which we used (a) alternative operationalizations of narcissism by applying the NPI (see Appendix 3.1.A)[28] and (b) an alternative analytical approach, namely, multilevel structural equation models (ML-SEMs; e.g., Preacher et al., 2010; Appendix 3.1.B)[29]. Further, we provide results for the intermediate stages of the reported models (see Appendix 3.1.C). The data and statistical code for all main and supplementary analyses can be found at https://osf.io/4hpuf/.

[28] The NARQ is designed to differentiate between agentic and antagonistic narcissism and thus, was most suitable for examining distinct behavioral and perceptual pathways linking narcissism's subdimensions to leadership emergence building on the NARC. However, we also measured narcissism with the NPI (Raskin & Terry, 1988; Schütz et al., 2004) as it has long been the most commonly used measure of nonclinical narcissism (Tamborski & Brown, 2011). We computed each model with three alternative operationalizations of narcissism, that is, each model with (a) admiration and L/A (α = .70; Ackerman et al., 2011) aggregated to agentic narcissism, and rivalry and E/E (α = .36; Ackerman et al., 2011) aggregated to antagonistic narcissism, (b) the overall NPI-score (α = .80) as operationalization of global narcissism, and (c) L/A as operationalization of agentic narcissism and E/E as operationalization of antagonistic narcissism. Differences in significances of the IEs of the models using alternative operationalizations of narcissism can be traced back to alternatively operationalized narcissism being expressed differently in dominant-expressive and arrogant-aggressive behavior (see Appendix 3.1.A for the detailed results). The agentic and antagonistic narcissism dimension only distinctively triggered the agentic and antagonistic behavioral pathway when using the NARQ, which underlines the utility of the NARC as a recent multidimensional conceptualization of narcissism when examining narcissism's social consequences.

[29] Computing MMMs with group-mean-centered variables was appropriate as we were only interested in within-group individual differences and not in between-group differences (leadership emergence concerns differences within groups; see Judge et al., 2002). Also, group-mean-centering of variables prior to modeling is a standard approach that usually leads to the same results as the multilevel approach. Further, several of the variables included in our models had intraclass correlation coefficients (ICCs) below .05 which might cause problems with convergence and unstable or biased estimations of the IEs when using ML-SEMs. In such cases, group-mean-centering should be preferred to multilevel approaches (Preacher et al., 2010). Therefore, we chose to report the MMMs with group-mean-centered variables. However, to demonstrate the robustness of the present findings, we also run Model 1-4 as ML-SEMs. The path coefficients differed marginally when applying the alternative statistical approach (mean difference across all standardized path coefficients for Model 1-4: 0.016, *SD* = 0.014, range = 0.000-0.047). However, some IEs turned non-significant. Nevertheless, the ML-SEMs support the general pattern found in the MMMs. Thus, the inferences drawn do not alter when the alternative statistical approach is applied. For a detailed description of the computational implementation and results of the ML-SEMs see Appendix 3.1.B.

3.1.4 Results

3.1.4.1 Descriptive Statistics and Bivariate Correlations. Descriptive statistics and intercorrelations of the measures we used are displayed in Table 3.1.1 (see Appendix 3.1.D for a table with all measures on the different levels of aggregation). The bivariate correlations provided initial insights into the proposed pathways to leadership emergence. All component variables of the agentic narcissism pathway were positively correlated with each other and with leadership emergence. The same was true for the intelligence and physical attractiveness pathways. Results for the antagonistic narcissism pathway were more ambiguous. Rivalry was not correlated with being seen as untrustworthy or with being seen as a leader. Arrogant-aggressive behavior was positively correlated with being seen as leader, whereas being seen as untrustworthy was negatively correlated with being seen as a leader.

To gain initial insights into the importance of the narcissism pathways regarding leadership emergence and popularity, we compared the correlations of the corresponding interpersonal impressions with being seen as a leader and being liked. In line with our expectation that the agentic narcissism pathway would exert a more positive influence on leadership emergence compared with popularity, being seen as assertive was more strongly positively correlated with being seen as a leader than it was with being liked, $\Delta r = 0.56$, $t(292) = 18.05$, $p < .001$, $q = 1.04$. Conversely, in line with our expectation that the antagonistic narcissism pathway would exert a less negative influence on leadership emergence compared with popularity, being seen as untrustworthy had a smaller negative correlation with being seen as a leader than it did with being liked, $\Delta r = -0.38$, $t(292) = -8.17$, $p < .001$, $q = 0.51$.

Finally, the bivariate correlations provided indications for adding two cross-paths between the narcissism pathways (from admiration to arrogant-aggressive behavior and from arrogant-aggressive behavior to being seen as assertive) and one cross-path between the intelligence and attractiveness pathways (from verbal fluency to being seen as attractive) to the MMMs. Adding these cross-paths enabled us to explore more complex effects of narcissism on leadership emergence.

Table 3.1.1

Descriptive Statistics and Bivariate Correlations of the Measures Used in the Multiple Mediator Models

	n	*M*	*SD*	*Min*	*Max*	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Admiration	297	3.17	0.78	1.11	6.00	-	**.29**	.06	.10	**.12**	**.12**	.08	**.22**	.01	**.12**	**.14**	**.14**	.08
2. Rivalry	297	2.33	0.74	1.00	4.00		-	-.08	-.06	.05	**.13**	**-.12**	-.06	.10	-.05	-.09	-.08	-.11
3. Intelligence	311	0.00	0.65	-3.09	1.59			-	-.02	**.26**	**.16**	**.43**	**.19**	-.10	**.21**	-.01	**.19**	.10
4. Physical attractiveness	277	4.73	1.24	1.25	7.92				-	.00	.03	.07	**.16**	-.09	.06	**.72**	**.22**	**.24**
5. Dominant-expressive behavior	305	3.02	1.11	1.00	5.75					-	**.79**	**.19**	**.70**	.02	**.36**	**.17**	**.61**	.09
6. Arrogant-aggressive behavior	305	2.07	0.90	1.00	5.50						-	**.12**	**.53**	**.23**	**.19**	.10	**.42**	**-.12**
7. Verbal fluency	304	3.97	0.73	1.67	5.83							-	**.21**	-.03	**.12**	**.17**	**.23**	**.13**
8. Being seen as assertive	295	3.86	0.79	1.37	5.86								-	**-.18**	**.58**	**.37**	**.88**	**.32**
9. Being seen as untrustworthy	295	2.85	0.54	1.54	5.02									-	**-.46**	**-.29**	**-.29**	**-.67**
10. Being seen as intelligent	295	4.39	0.56	2.43	5.62										-	**.31**	**.60**	**.44**
11. Being seen as attractive	295	3.58	0.81	1.23	5.43											-	**.44**	**.53**
12. Being seen as a leader	295	3.71	0.77	1.58	5.75												-	**.45**
13. Being liked	294	4.36	0.57	2.43	5.88													-

Note. Means, standard deviations, and ranges were calculated on raw scores except for intelligence, which was aggregated using *z*-standardized data due to the use of different measurement units in the scales that needed to be summarized. Correlations were calculated on group-mean-centered scores to control for participants being nested in groups.

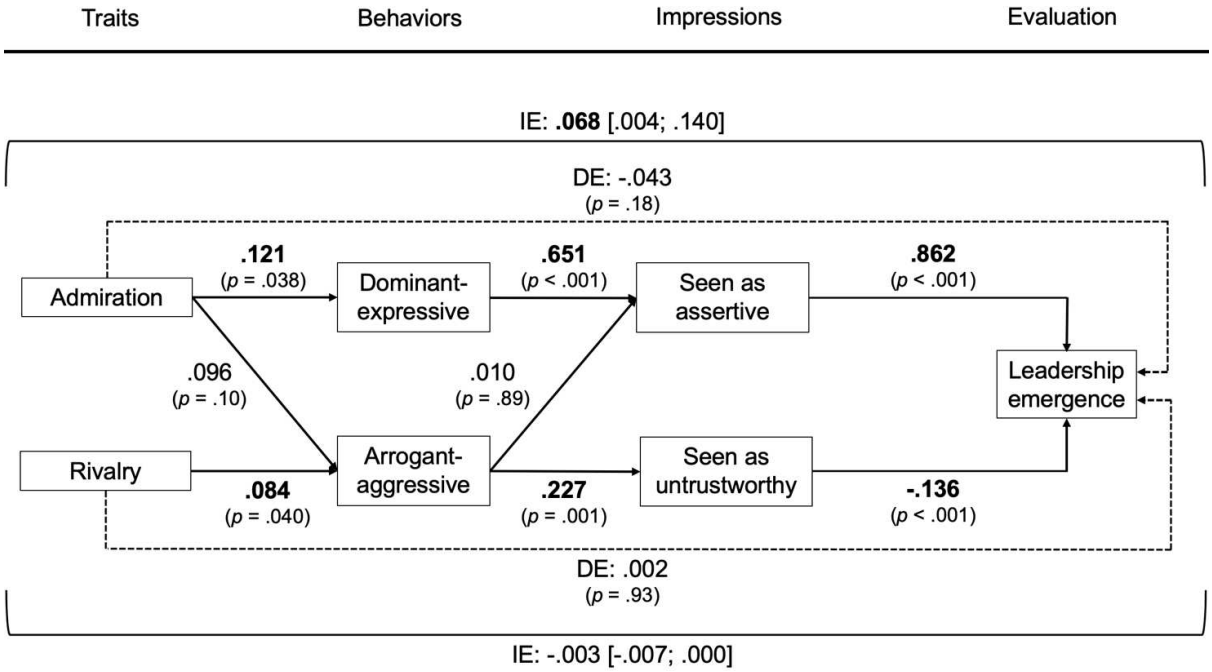
Correlations in bold were significant at the $p \leq .05$ level.

3.1.4.2 Model Results.

3.1.4.2.1 Model 1: Pathways From Narcissism to Leadership Emergence. The first model (Figure 3.1.2) contains the pathways from agentic and antagonistic narcissism to leadership emergence. As expected, the agentic narcissism pathway exerted a positive influence on leadership emergence: The IE of admiration on being seen as a leader was positive. The antagonistic narcissism pathway did not exert an influence on leadership emergence: The IE of rivalry on being seen as a leader was not significant.

Figure 3.1.2

Results for Model 1: Path Model From Narcissistic Admiration and Rivalry to Leadership Emergence in Social Groups



Note. Personality traits, expressed behaviors, and interpersonal impressions were allowed to covary among each other (paths are not displayed for the sake of clarity). Results are presented as standardized path coefficients. The 95% confidence intervals of the standardized indirect effects are displayed in brackets. DE = Direct effect. IE = Indirect effect.
Standardized path coefficients, IEs and DEs in bold were significant at the $p \leq .05$ level.

As expected, the agentic narcissism pathway exerted a stronger influence on leadership emergence than the antagonistic narcissism pathway: The absolute value of the IE of admiration on being seen as a leader was stronger than the absolute value of the IE of rivalry on being seen as a leader ($\Delta\beta = .065$, 90% CI [.011, .124]). This can be retraced by comparing the corresponding coefficients for each pathway. Admiration was descriptively but not significantly more strongly expressed in dominant-expressive behavior than rivalry was expressed in

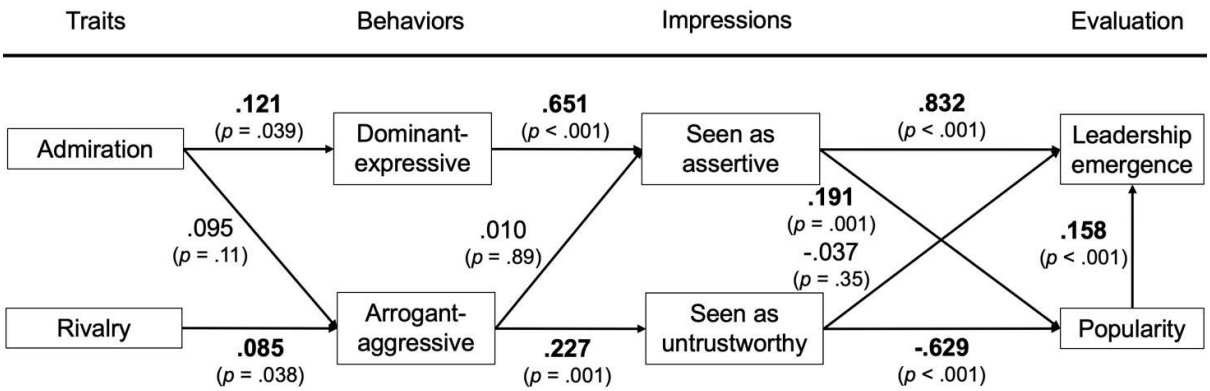
arrogant-aggressive behavior ($\Delta\beta = .037$, $z = 0.52$, $p = .60$). Dominant-expressive behavior was more strongly reflected in being seen as assertive than arrogant-aggressive behavior was reflected in being seen as untrustworthy ($\Delta\beta = .423$, $z = 4.75$, $p < .001$). Finally, being seen as assertive was more strongly related to being seen as a leader than being seen as untrustworthy was ($\Delta\beta = .725$, $z = 15.22$, $p < .001$).

Even though the bivariate correlations indicated two cross-paths, one from admiration to arrogant-aggressive behavior and the other from arrogant-aggressive behavior to being seen as assertive, neither of the cross-paths was significant. Hence, neither the explored IE of admiration via arrogant-aggressive behavior and being seen as untrustworthy on being seen as a leader ($\beta = -.003$,95% CI [-.008, .001]) nor the IE of admiration via arrogant-aggressive behavior and being seen as assertive on being seen as a leader ($\beta = .001$, 95% CI [-.013, .019]) was significant.

3.1.4.2.2 Model 2: Pathways From Narcissism to Leadership Emergence and Popularity. The second model (Figure 3.1.3) also included popularity as an additional interpersonal evaluation. DEs and IEs from the agentic and antagonistic narcissism pathways to leadership emergence and popularity, respectively, are shown in Table 3.1.2. The agentic narcissism pathway still exerted a positive influence on leadership emergence: The IE of admiration on being seen as a leader was almost unchanged compared with Model 1. The path coefficient from being seen as assertive to being seen as a leader was barely affected by the inclusion of popularity. The antagonistic narcissism pathway did not exert an influence on leadership emergence. As expected, the agentic narcissism pathway exerted a stronger influence on leadership emergence than the antagonistic narcissism pathway: The absolute value of the IE of admiration on being seen as a leader was stronger than the absolute value of the IE of rivalry on being seen as a leader ($\Delta\beta = .065$, 90% CI [.012 .122]).

Figure 3.1.3

Results for Model 2: Path Model from Narcissistic Admiration and Rivalry to Leadership Emergence and Popularity in Social Groups



Note. Personality traits, expressed behaviors, and interpersonal impressions were allowed to covary among each other (paths are not displayed for the sake of clarity). Results are presented as standardized path coefficients. Standardized path coefficients in bold were significant at the $p \leq .05$ level.

Table 3.1.2

Direct and Indirect Effects in Model 2

	Leadership emergence					Popularity				
				95% CI					95% CI	
	DE	p_{DE}	IE	LL_{IE}	UL_{IE}	DE	p_{DE}	IE	LL_{IE}	UL_{IE}
Admiration	-.053	.080	**.065**	.004	.135	.063	.22	**.015**	.001	.037
Rivalry	.012	.65	-.001	-.003	.001	-.055	.25	-.012	-.030	.000

Note. DE = Direct effect. IE = Indirect effect. CI = Confidence interval. LL = Lower limit. UL = Upper limit. DEs and IEs in bold were significant at the $p \leq .05$ level.

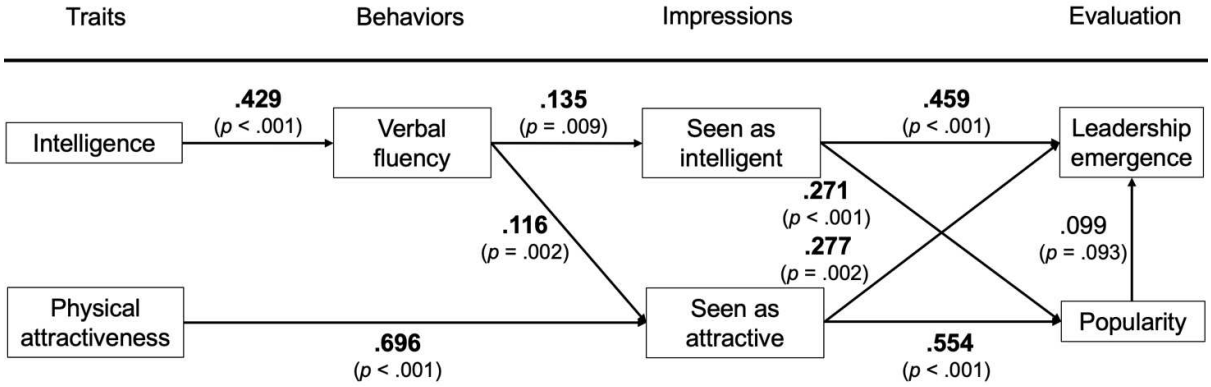
Including popularity allowed us to compare the effects of the pathways from agentic and antagonistic narcissism to leadership emergence and popularity. As expected, the agentic narcissism pathway exerted a more positive influence on leadership emergence than it did on popularity: The IE of admiration on being seen as a leader was more positive than on being liked ($\Delta\beta = 0.050$, 90% CI [0.010, 0.095]). Being seen as assertive influenced being seen as a leader more positively than it influenced being liked ($\Delta\beta = 0.640$, $z = 10.19$, $p < .001$). As expected, the antagonistic narcissism pathway exerted a less negative influence on leadership emergence than it did on popularity: The IE of rivalry on being seen as a leader was less negative than the IE of rivalry on being liked ($\Delta\beta = 0.011$, 90% CI [0.002, 0.025]). This difference was significant when testing one-sided but only marginally significant when testing two-sided (95% CI [0.000, 0.028]). Since we have not formally pre-registered our hypotheses, this finding should be interpreted with increased caution. Being seen as untrustworthy

influenced being seen as a leader less negatively than it influenced being liked ($\Delta\beta = 0.592$, $z = 8.07$, $p < .001$).

3.1.4.2.3 Model 3: Pathways From Intelligence and Physical Attractiveness to Leadership Emergence and Popularity. The third model (Figure 3.1.4) introduced intelligence and physical attractiveness as pathways to leadership emergence. Intelligence and physical attractiveness showed significant IEs on leadership emergence (see Table 3.1.3) underlining the utility of adding these pathways to Model 2 to explore the robustness of the narcissism pathways.

Figure 3.1.4

Results for Model 3: Path Model for Intelligence and Physical Attractiveness as Additional Pathways to Leadership Emergence and Popularity in Social Groups



Note. Interpersonal impressions were allowed to covary among each other (paths are not displayed for the sake of clarity). Results are presented as standardized path coefficients.
Standardized path coefficients in bold were significant at the $p \leq .05$ level.

Table 3.1.3

Direct and Indirect Effects in Model 3

	Leadership emergence					Popularity				
				95% CI					95% CI	
	DE	p_{DE}	IE	LL_{IE}	UL_{IE}	DE	p_{DE}	IE	LL_{IE}	UL_{IE}
Intelligence	.087	.078	**.027**	.006	.052	.046	.42	**.016**	.003	.032
Physical attractiveness	-.038	.61	**.193**	.069	.317	**-.159**	.015	**.386**	.289	.480

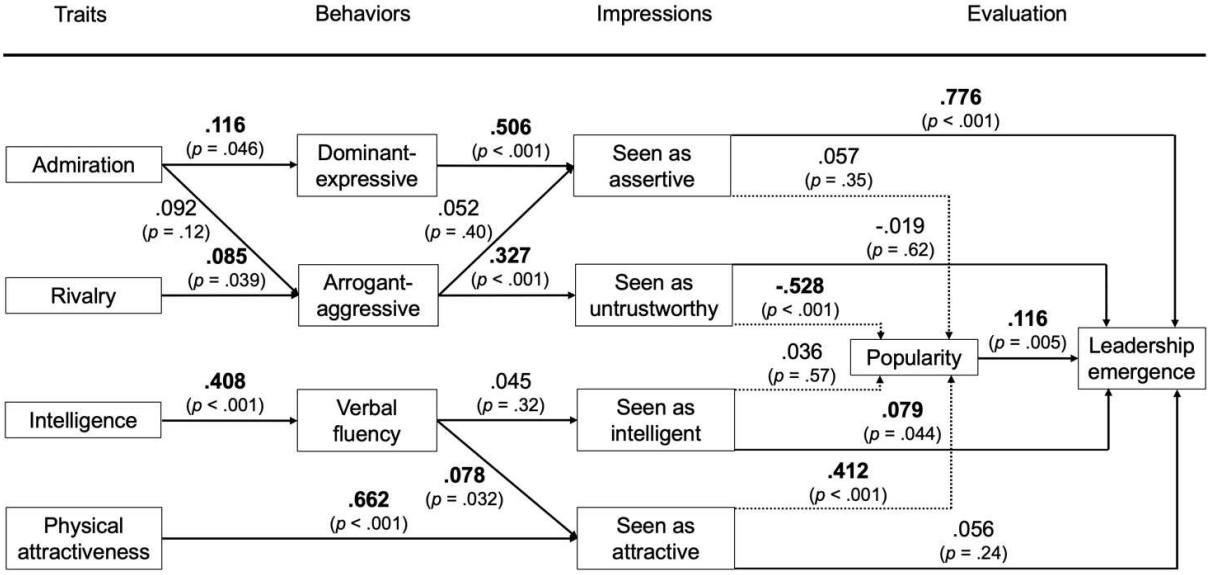
Note. DE = Direct effect. IE = Indirect effect. CI = Confidence interval. LL = Lower limit. UL = Upper limit.
DEs and IEs in bold were significant at the $p \leq .05$ level.

3.1.4.2.4 Model 4: Pathways From Narcissism, Intelligence, and Physical Attractiveness to Leadership Emergence and Popularity. The fourth model (Figure 3.1.5) contains the pathways from agentic and antagonistic narcissism to leadership emergence and popularity and presents them in relation to the pathways from intelligence and physical

attractiveness. The DEs and IEs of the pathways from agentic and antagonistic narcissism and the pathways from intelligence and physical attractiveness to leadership emergence and popularity, respectively, are shown in Table 3.1.4.

Figure 3.1.5

Results for Model 4: Comprehensive Path Model of Narcissistic Admiration and Rivalry and the Additional Pathways, Intelligence and Physical Attractiveness, to Leadership Emergence and Popularity in Social Groups



Note. Personality traits, expressed behaviors, and interpersonal impressions were allowed to covary among each other (paths are not displayed for the sake of clarity). Results are presented as standardized path coefficients. Standardized path coefficients in bold were significant at the $p \leq .05$ level.

Table 3.1.4

Direct and Indirect Effects in Model 4

	Leadership emergence					Popularity				
				95% CI					95% CI	
	DE	p_{DE}	IE	LL_{IE}	UL_{IE}	DE	p_{DE}	IE	LL_{IE}	UL_{IE}
Admiration	**-.060**	.043	**.046**	.001	.097	.032	.52	.003	-.004	.013
Rivalry	.016	.54	-.001	-.003	.002	-.030	.51	**-.015**	-.031	-.001
Intelligence	.018	.55	.001	-.002	.005	.024	.62	.001	-.002	.006
Physical attractiveness	.026	.53	.037	-.026	.099	-.111	.058	**.272**	.188	.358

Note. DE = Direct effect. IE = Indirect effect. CI = Confidence interval. LL = Lower limit. UL = Upper limit. DEs and IEs in bold were significant at the $p \leq .05$ level.

The agentic narcissism pathway exerted a positive influence on leadership emergence. By contrast, the antagonistic narcissism pathway and the intelligence and physical attractiveness pathways did not have significant IEs on being seen as a leader. Corresponding

to Models 1 and 2, the agentic narcissism pathway exerted a stronger influence on leadership emergence than the antagonistic narcissism pathway: The absolute value of the IE of admiration on being seen as a leader was stronger than the absolute value of the IE of rivalry on being seen as a leader ($\Delta\beta = .045$, 90% CI [.008 .087]). This difference was significant when testing one-sided but only marginally significant when testing two-sided (95% CI [.000, .096]). Since we have not formally pre-registered our hypotheses, this finding should be interpreted with increased caution. Next to being seen as assertive, being seen as intelligent was the only interpersonal impression predicting being seen as a leader. The impact of being seen as assertive was stronger than the impact of being seen as intelligent ($\Delta\beta = .697$, $z = 10.51$, $p < .001$).

We explored two alternative pathways from admiration to being seen as a leader to determine whether the narcissism pathways as specified in the NARC (Back et al., 2013) uniquely drive narcissism's effects on leadership emergence. We found positive correlations between dominant-expressive behavior and being seen as intelligent and between dominant-expressive behavior and being seen as attractive (see Table 3.1.1). Indeed, when we added the cross-paths from dominant-expressive behavior to being seen as intelligent ($\beta = .282$, $p < .001$) and from dominant-expressive behavior to being seen as attractive ($\beta = .130$, $p = .003$) to Model 4, both became significant. However, the IEs of admiration via dominant-expressive behavior and being seen as intelligent to being seen as a leader ($\beta = .003$, 95% CI [.000 .007]) and of admiration via dominant-expressive behavior and being seen as attractive to being seen as a leader ($\beta = .001$, 95% CI [-.001 .004]) were not significant.

Comparing the strengths of the influences of the pathways from agentic and antagonistic narcissism, respectively, to leadership emergence and popularity, we found the same pattern as in Model 2. The agentic narcissism pathway exerted a stronger positive influence on leadership emergence than it did on popularity: The IE of admiration on being seen as a leader was more strongly positive than the IE of admiration on being liked ($\Delta\beta = 0.042$, 90% CI [0.008, 0.084]). The antagonistic narcissism pathway exerted a less negative influence on leadership emergence than it did on popularity: The IE of rivalry on being seen as a leader was less negative than the IE of rivalry on being liked ($\Delta\beta = 0.014$, 90% CI [0.003, 0.027]).

3.1.5 Discussion

We applied the NARC (Back et al., 2013) and the dual-pathway approach (Küfner et al., 2013) as a process-based framework to specify two distinct pathways that linked narcissism to leadership emergence. This allowed us, for the first time, to identify the underlying behavioral processes and interpersonal impressions that explain how narcissists emerge as

leaders and to thereby differentiate between recent conceptualizations of agentic and antagonistic narcissism. We applied data from a large multimethodological data set encompassing personality traits, expressed behaviors in a realistic interaction setting, and interpersonal impressions measured as round-robin ratings and combined these variables in comprehensive, process-oriented models. This approach enabled us to demonstrate (a) how narcissists emerge as leaders in social groups, (b) how different aspects of narcissism have diverging impacts on leadership emergence and popularity, and (c) the robustness of the narcissism pathways.

3.1.5.1 How Do Narcissists Emerge as Leaders? As hypothesized, agentic narcissism (which encompasses the self-enhancing aspects of narcissism) was positively related to leadership emergence. This finding corresponds to previous findings of positive associations between the more agentic facets of narcissism and leadership emergence (Brunell et al., 2008; Carlson & DesJardins, 2015; Paunonen et al., 2006). Here, we zoomed in on the underlying interpersonal processes and provided an explanation: Participants high on narcissistic admiration behaved in a dominant-expressive manner; therefore, they were seen as assertive, which in turn predicted evaluations of being seen as a leader. Thus, this agentic narcissism pathway seems to encompass behaviors and interpersonal impressions that fit people's views about the prototypical leader (Foti et al., 1982; Lord et al., 1986, 1984; Offermann et al., 1994; Shondrick et al., 2010).

The antagonistic narcissism pathway (which encompasses the other-derogating aspects of narcissism), by contrast, did not exert a meaningful influence on leadership emergence, and the influence of the agentic narcissism pathway on leadership emergence was substantially stronger. Even though narcissistic rivalry was expressed in arrogant-aggressive behavior that predicted being seen as untrustworthy, which in turn was negatively related to leadership emergence, the separate effects were too weak for the entire pathway to be influential. This finding corresponds to the lack of clear evidence of effects of antagonistic narcissism on leadership emergence. Studies on the relations between the antagonistic facets of narcissism and leadership emergence have found diverging results (Brunell et al., 2008; Carlson & DesJardins, 2015; Paunonen et al., 2006). Constructs related to rivalry (e.g., disagreeableness) have been shown to be unrelated to leadership emergence (e.g., Ensari et al., 2011; Judge et al., 2002; Taggar et al., 1999). However, the lack of support for a positive effect of antagonistic narcissism is not in line with the dominance pathway (e.g., Cheng et al., 2013).

3.1.5.2 Contrasting Effects With Popularity. In line with interpersonal theory and agency and communion frameworks (Bakan, 1966; Dufner et al., 2016; R. Hogan, 1982;

Hopwood, 2018; Kiesler, 1983; Wiggins, 1991; Wojciszke et al., 2009), the agentic narcissism pathway exerted a more positive influence on leadership emergence than it did on popularity, and the antagonistic narcissism pathway exerted a less negative influence on leadership emergence than it did on popularity. This differentiated pattern of effects could be traced back to (a) assertiveness perceptions being more important for leadership and (b) trustworthiness perceptions being more important for popularity. Thus, leadership and popularity are distinct indicators of social value that are attained in different ways: Group members systematically value different characteristics (i.e., assertiveness vs. trustworthiness) when deciding who should become their leader versus who they like. This matches Carlson and Desjardins' (2015) finding that narcissists initially attain status in social groups despite not being particularly well-liked. Our findings suggest that this is likely due to the two distinct narcissism pathways that are differently linked to emerging as a leader and being liked.

3.1.5.3 Robustness of the Narcissism Pathways. Considering other powerful predictors of leadership emergence (i.e., popularity, intelligence, and physical attractiveness), not only did the agentic narcissism pathway remain a meaningful predictor of leadership emergence, but it also appeared to be the most robust one. This finding is noteworthy in view of the substantial amount of literature emphasizing the importance of intelligence (e.g., Ensari et al., 2011; Judge et al., 2004; Lord et al., 1986) and physical attractiveness (e.g., Hochschild & Borch, 2011; Poutvaara, 2014) for leadership emergence, connections that were also suggested by ILTs (Offermann et al., 1994). Thus, the agentic narcissism pathway appears to be a robust and substantial path to leadership emergence (see also Grosz et al., 2020).

3.1.5.4 Implications for Understanding Grandiose Narcissism. Our findings go along with the emerging consensus on a multidimensional conceptualization of grandiose narcissism encompassing agentic and antagonistic aspects (Back, 2018; Back et al., 2013; Brown et al., 2009; Krizan & Herlache, 2018; Miller et al., 2016), which have been shown to have diverging effects on a broad spectrum of social outcomes, such as interpersonal liking (Küfner et al., 2013; Lange et al., 2016; Leckelt et al., 2015; Leckelt, Geukes, et al., 2019), dating outcomes (Wurst et al., 2017), and financial and occupational success (Leckelt, Richter, Schröder, et al., 2019; Leckelt, Richter, Wetzel, et al., 2019). Our results extend this research by showing that a detailed examination of the behavioral, interpersonal perception, and evaluation processes helps provide a better understanding of the relationship between narcissism and leadership emergence. Our results also provide further evidence for the validity of the NARC (Back et al., 2013). Admiration uniquely triggered the agentic narcissism pathway, whereas rivalry uniquely triggered the antagonistic narcissism pathway. None of the

alternative pathways we explored via cross-paths between the examined pathways were significant in determining leadership emergence. Thus, it was uniquely the agentic narcissism pathway as specified in the NARC that predicted leadership emergence.

3.1.5.5 Implications for Understanding Leadership Emergence in Social Groups. We also identified general processes for successful leadership emergence in social groups. Four interpersonal impressions predicted leadership emergence (i.e., being seen as assertive, untrustworthy, intelligent, or attractive) with being seen as assertive (and to a smaller extent being seen as intelligent) as the most important and robust precursor of leadership emergence. We do not claim that individuals need to be narcissistic in order to evoke such perceptions and emerge as leaders. There are other personality traits (e.g., extraversion) that elicit dominant-expressive behavior and thus foster impressions of assertiveness. Analogously, there are several traits and corresponding expressed behaviors that yield impressions of intelligence. Indeed, even though we found that being seen as intelligent was a unique predictor of leadership emergence, the intelligence pathway was not meaningful in the context of the other pathways. Consequently, it might be more important to appear intelligent than to actually be intelligent in order to emerge as leader (see Rubin et al., 2002).

These general findings are highly relevant as they allowed us to identify discrepancies between variables that facilitate the ability to emerge versus to perform effectively as a leader, which might be used to improve processes of leadership emergence by shifting the focus to variables that are crucial for leadership effectiveness. For instance, research has suggested a curvilinear relationship between assertiveness and leadership effectiveness (Ames & Flynn, 2007). Thus, whereas being seen as highly assertive was best for emerging as a leader, a moderate level of assertiveness might be best for performing effectively as a leader. Likewise, whereas we found that being seen as untrustworthy was not a good predictor of leadership emergence, research has suggested that trust is important for leadership effectiveness (Ferrin & Dirks, 2002).

3.1.5.6 Limitations and Future Directions. First, the role of the level of acquaintance in a given social context should be considered more closely when examining the effect of narcissism on leadership emergence jointly with its effect on leadership effectiveness (see Ong et al., 2016). According to the contextual reinforcement model (CRM; Campbell & Campbell, 2009), narcissism is often associated with positive social consequences in the short-term and with negative social consequences in the long-term. In the domains of peer popularity and romantic relationships, Leckelt et al. (2015) and Wurst et al. (2017), respectively, found that narcissistic admiration and rivalry explained this timely pattern (see also Back et al., 2018).

Admiration tends to dominate in social contexts that prevail in the early stages of social relationships (e.g., one-sided self-presentations), leading primarily to positive social consequences, such as being liked (Back et al., 2010; Küfner et al., 2013; Leckelt et al., 2015; Paulhus, 1998) and initial romantic attraction (Wurst et al., 2017). As time passes, however, rivalry becomes more important because it dominates in the social contexts that prevail in the later stages of social relationships (e.g., intimate interactions), leading to more negative social consequences, such as being disliked (Küfner et al., 2013; Leckelt et al., 2015; Paulhus, 1998) and problems in romantic relationships (Wurst et al., 2017). It would be interesting to investigate how exactly our pattern of findings might change in the advanced stages of group processes in which group members already provide behavioral indicators of more or less effective leadership, potentially affecting who is selected as a leader in the end. Indeed, research has provided initial indications that antagonistic narcissism might have a negative impact on leadership emergence in the later stages of group processes (see Carlson & DesJardins, 2015; Paunonen et al., 2006).

Second, operationalizing leadership emergence as being seen as a leader by group members ("I can well imagine this person as a leader") might be especially applicable to situations in which group members jointly decide who should become the leader of their group. Individuals may then vote for the group member who is perceived to possess characteristics that reflect those of the prototypical leader (Foti et al., 1982; Lord et al., 1984, 1986; Offermann et al., 1994; Shondrick et al., 2010). However, in situations in which leaders emerge less on the basis of group consensus but rather by exerting influence over the group, operationalizations of leadership emergence that focus on actually exerted influence (e.g., "This person led the group") might be more important. Here, it might even be the case that the antagonistic narcissism pathway contributes to leadership emergence in the same way that behaving in an arrogant-aggressive manner can lead to exhibiting influence in social groups (see Cheng & Tracy, 2014; Cheng et al., 2010, 2013; Maner & Case, 2016; Witkower et al., 2020). This might (partly) explain the diverging results in which the antagonistic narcissism pathway did not predict leadership emergence in the present study and the dominance pathway positively predicted leadership emergence (e.g., Cheng et al., 2013). Future studies might thus use peer ratings that assess (a) perceived suitability as a leader and (b) perceived exerted influence and complement these measures with more objective measures (e.g., visual attention; see Cheng et al., 2013; Maner et al., 2008).

Third, future research should compartmentalize and add behaviors and interpersonal impressions. Compartmentalizing behaviors using a bottom-up approach might reveal which

specific verbal (e.g., commanding/combative comments), paraverbal (e.g., dominant/ aggressive tone), and nonverbal (e.g., dominant pointing gestures, staring others down) behavioral indicators are particularly important for the link between narcissism and leadership emergence. To address such questions, (a) more heterogenous samples might be recruited because certain behaviors have been suggested to be expressed more strongly in heterogenous groups (e.g., dominant behaviors; Chatman & Flynn, 2001), and (b) situations that trigger behavioral differences might be examined (Tett & Guterman, 2000; e.g., experimental manipulations that induce ego threat might enhance antagonistic behaviors; see Bushman & Baumeister, 2002; Heatherton & Vohs, 2000; Horton & Sedikides, 2009; Kernis & Sun, 1994). Compartmentalizing (e.g., trustworthiness into its subdimensions ability, benevolence, and integrity; see Mayer et al., 1995) and adding interpersonal impressions (e.g., fear; see Cheng et al., 2010, 2013; tough-mindedness, cold-heartedness) seems particularly promising for clarifying the influence of the antagonistic narcissism pathway by capturing additional variance.

Fourth, it would be interesting to examine whether the present results generalize to real-life groups across contexts (e.g., work and study groups, sports teams) in which there is a great deal at stake (e.g., financial bonuses, grades, athletic success). Group members might (a) express behaviors differently (e.g., employees might be highly motivated to contribute to their work group) and (b) evaluate interpersonal impressions differently (e.g., employees who often work together on important long-running projects might value trustworthiness; see Ferrin & Dirks, 2002). Also, group dynamics might vary with group size; for instance, in larger groups, interruptions might occur more often and increase the potential for conflict (Hare, 1981), thus triggering the antagonistic narcissism pathway. Complementing the detailed observation of specific interaction tasks (e.g., video-taped interactions) with more continuous assessments of interaction dynamics across time (e.g., experience-sampled interaction partner reports; Harari et al., 2016; see also Leckelt et al., 2019) would be another promising approach that could be applied to better understand narcissistic leadership emergence across social groups and contexts (see also Wrzus & Mehl, 2015).

Finally, future studies might investigate contextual moderators of the narcissism pathways to clarify the influence of the antagonistic narcissism pathway. Antagonistic narcissism might have a more positive effect on leadership emergence in contexts in which (a) competitiveness is emphasized[30], (b) antagonistic behaviors are instrumental for the group's

[30] In the present study participants were randomly assigned to competitive versus cooperative groups (see footnote 23). Even though an explorative multiple-group analysis showed no significant difference of the effect of

success, and (c) inducing fear is possible. According to ILTs, people may adapt their leader prototypes on the basis of the context (Lord et al., 2001). Thus, in competitive contexts that call for toughness and strength, leader attributes such as tyranny might be valued, whereas sensitivity might be less valued (DesJardins et al., 2015). According to functionalist theories and the micropolitics model (C. Anderson & Cowan, 2014; C. Anderson & Kennedy, 2012), individuals will attain status if they are perceived as contributing to the group (Willer, 2009). With regard to intragroup constellations, narcissists might direct their aggressiveness toward low contributors (Böckler et al., 2017), eradicate social loafing behavior, and in doing so contribute to the group (Boyd & Richerson, 1992). With regard to intergroup situations, in the presence of intergroup competition, dominant-aggressive leaders were found to prioritize their own group's success (Maner & Case, 2016), antagonistic behaviors were found to be used to defend ingroup interests (Laustsen & Petersen, 2017), and deviant-extreme leaders were found to be preferred (Chang et al., 2015). According to the dominance-prestige account (Henrich & Gil-White, 2001), aggressive behaviors might contribute to leadership emergence by inducing fear (Cheng et al., 2010, 2013; Cheng & Tracy, 2014), which should be effective in contexts in which the aggressor holds threat potential (e.g., withdrawal of resources).

3.1.5.7 Conclusion. In the present study, we zoomed in on the behavioral, perceptual, and evaluative processes underlying narcissistic leadership emergence. The present research provides clear evidence for differentiated effects of agentic and antagonistic narcissism. Whereas agentic narcissism positively predicted leadership emergence via dominant-expressive behaviors and being seen as assertive, antagonistic narcissism did not predict leadership emergence. These effects were distinct from effects on popularity and held when the intelligence and physical attractiveness pathways were also included. Applying a two-dimensional process-based understanding of grandiose narcissism seems to be a fruitful avenue for future research on leadership emergence.

rivalry on leadership emergence in competitive versus cooperative groups, the correlation between rivalry and leadership emergence was more positive in competitive groups (r = .02, p =.78) than in cooperative groups (r = -.17, p =.049). This might be an initial indicator for a more positive effect of the antagonistic narcissism pathway when competitiveness is emphasized and should be followed up by future research that is specifically designed to unravel the enigmatic role antagonistic narcissism plays for leadership emergence.

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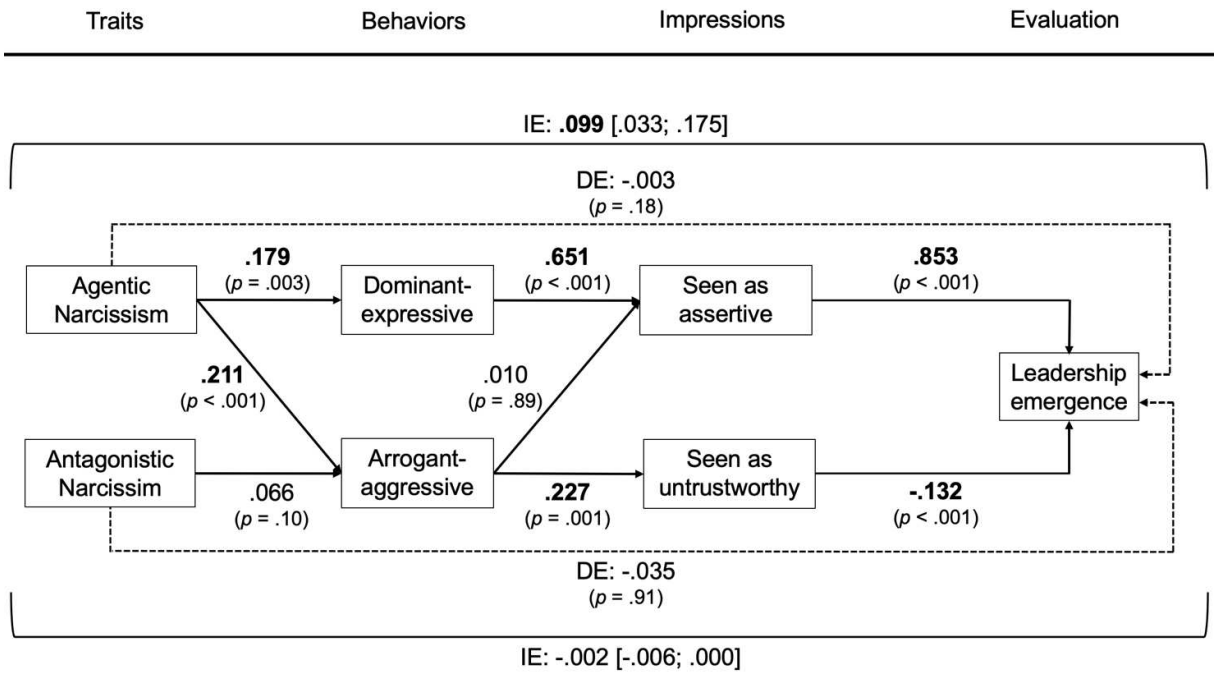
Appendix 3.1.A

In addition to the models reported in the Results of the manuscript, we computed each model with three alternative operationalizations of narcissism, that is, each model with (a) admiration and L/A aggregated to agentic narcissism, and rivalry and E/E aggregated to antagonistic narcissism (Figure 3.1.A1, 3.1.A4, 3.1.A7; Table 3.1.A1, 3.1.A4), (b) the overall NPI-score as operationalization of global narcissism (Figure 3.1.A2, 3.1.A5, 3.1.A8; Table 3.1.A2, 3.1.A5), and (c) L/A as operationalization of agentic narcissism and E/E as operationalization of antagonistic narcissism (Figure 3.1.A3, 3.1.A6, 3.1.A9; Table 3.1.A3, 3.1.A6). In the aggregated models, aggregated agentic narcissism was expressed in dominant-expressive behavior as well as arrogant-aggressive behavior, whereas admiration was uniquely expressed in dominant-expressive behavior. Aggregated antagonistic narcissism was not expressed in arrogant-aggressive behavior, whereas rivalry was uniquely expressed in arrogant-aggressive behavior. We found the same pattern when comparing L/A and E/E as operationalizations of agentic and antagonistic narcissism with the reported models in the Results of the manuscript using admiration and rivalry. Regarding the models using the NPI as operationalization of global narcissism, global narcissism was expressed in dominant-expressive as well as arrogant-aggressive behavior. Differences in significances of the IEs of the models using alternative operationalizations of narcissism compared to the models in the Results can be traced back to the outlined differences of alternatively operationalized narcissism being expressed differently in dominant-expressive and arrogant-aggressive behavior.

Figure 3.1.A1

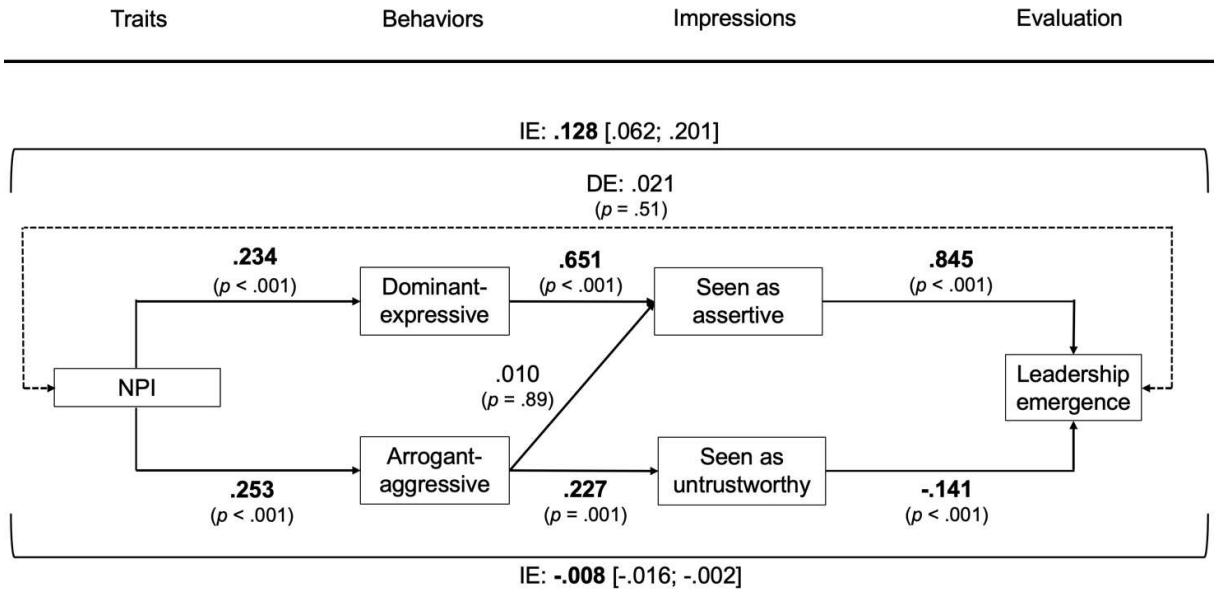
Results for Model 1 With Agentic Narcissism (Aggregation of Admiration and Leadership/Authority) and Antagonistic Narcissism (Aggregation of Rivalry and Entitlement/Exploitativeness) as Traits Instead of Admiration and Rivalry



Note. Personality traits, expressed behaviors, and interpersonal impressions were allowed to covary among each other (paths are not displayed for the sake of clarity). Results are presented as standardized path coefficients. The 95% confidence intervals of the standardized indirect effects are displayed in brackets. DE = Direct effect. IE = Indirect effect.
Standardized path coefficients, IEs and DEs in bold were significant at the $p \leq .05$ level.

Figure 3.1.A2

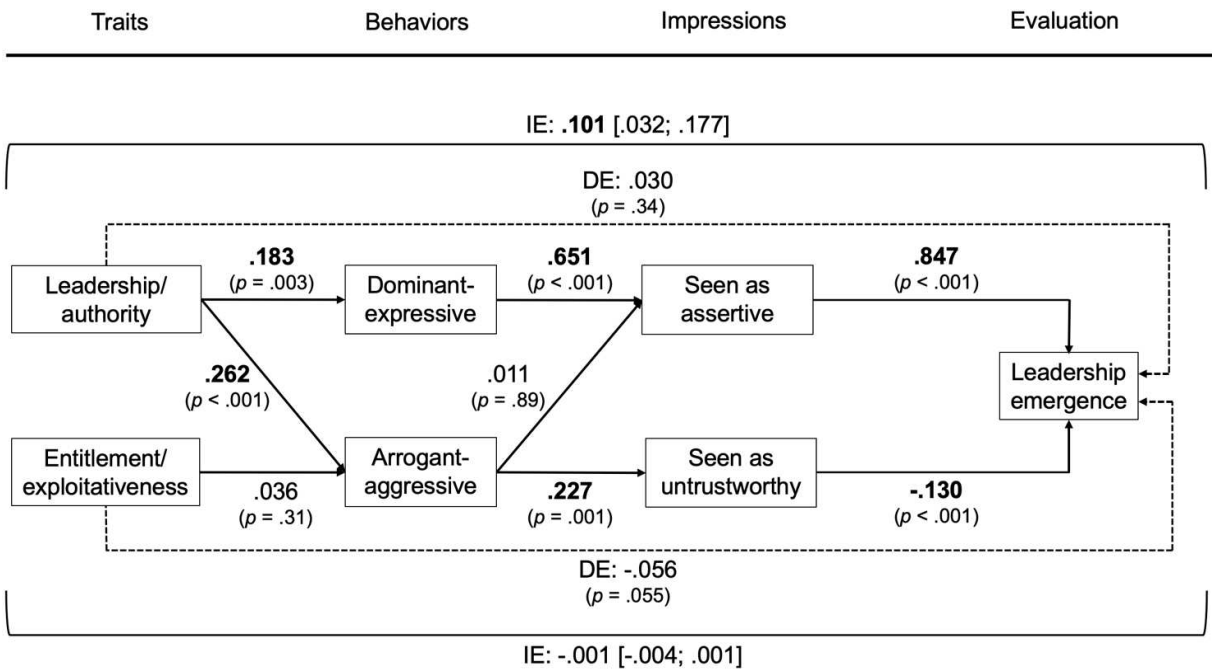
Results for Model 1 With Global Narcissism Measured With the Narcissistic Personality Inventory (NPI) as Trait Instead of Admiration and Rivalry



Note. Expressed behaviors and interpersonal impressions were allowed to covary among each other (paths are not displayed for the sake of clarity). Results are presented as standardized path coefficients. The 95% confidence intervals of the standardized indirect effects are displayed in brackets. DE = Direct effect. IE = Indirect effect. Standardized path coefficients, IEs and DEs in bold were significant at the $p \leq .05$ level.

Figure 3.1.A3

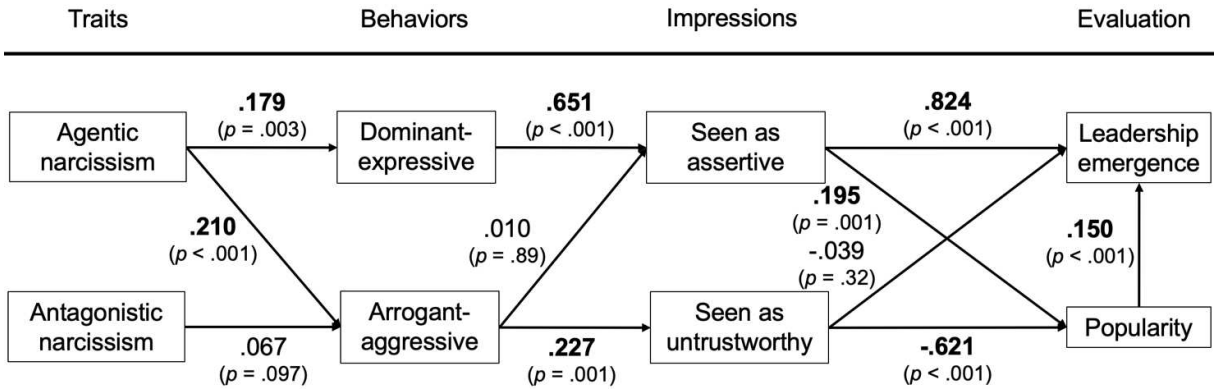
Results for Model 1 With Leadership/Authority and Entitlement/Exploitativeness as Traits Instead of Admiration and Rivalry



Note. Personality traits, expressed behaviors, and interpersonal impressions were allowed to covary among each other (paths are not displayed for the sake of clarity). Results are presented as standardized path coefficients. The 95% confidence intervals of the standardized indirect effects are displayed in brackets. DE = Direct effect. IE = Indirect effect.
Standardized path coefficients, IEs and DEs in bold were significant at the $p \leq .05$ level.

Figure 3.1.A4

Results for Model 2 With Agentic Narcissism (Aggregation of Admiration and Leadership/Authority) and Antagonistic Narcissism (Aggregation of Rivalry and Entitlement/Exploitativeness) as Traits Instead of Admiration and Rivalry



Note. Personality traits, expressed behaviors, and interpersonal impressions were allowed to covary among each other (paths are not displayed for the sake of clarity). Results are presented as standardized path coefficients. Standardized path coefficients in bold were significant at the $p \leq .05$ level.

Table 3.1.A1

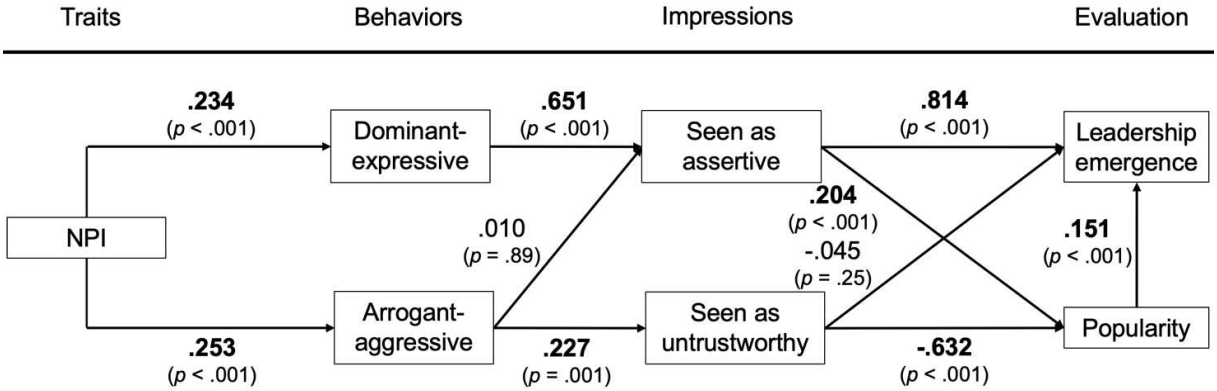
Direct and Indirect Effects in Model 2 With Agentic Narcissism (Aggregation of Admiration and Leadership/Authority) and Antagonistic Narcissism (Aggregation of Rivalry and Entitlement/Exploitativeness) as Traits Instead of Admiration and Rivalry

	Leadership emergence					Popularity				
				95% CI					95% CI	
	DE	p_{DE}	IE	LL_{IE}	UL_{IE}	DE	p_{DE}	IE	LL_{IE}	UL_{IE}
Agentic narcissism	-.011	.72	**.096**	.031	.168	.046	.32	**.023**	.006	.048
Antagonistic narcissism	-.023	.37	-.001	-.003	.001	-.076	.12	-.009	-.026	.001

Note. DE = Direct effect. IE = Indirect effect. CI = Confidence interval. LL = Lower limit. UL = Upper limit. DEs and IEs in bold were significant at the $p \leq .05$ level.

Figure 3.1.A5

Results for Model 2 With Global Narcissism Measured With the Narcissistic Personality Inventory (NPI) as Trait Instead of Admiration and Rivalry



Note. Expressed behaviors and interpersonal impressions were allowed to covary among each other (paths are not displayed for the sake of clarity). Results are presented as standardized path coefficients.
Standardized path coefficients in bold were significant at the $p \leq .05$ level.

Table 3.1.A2

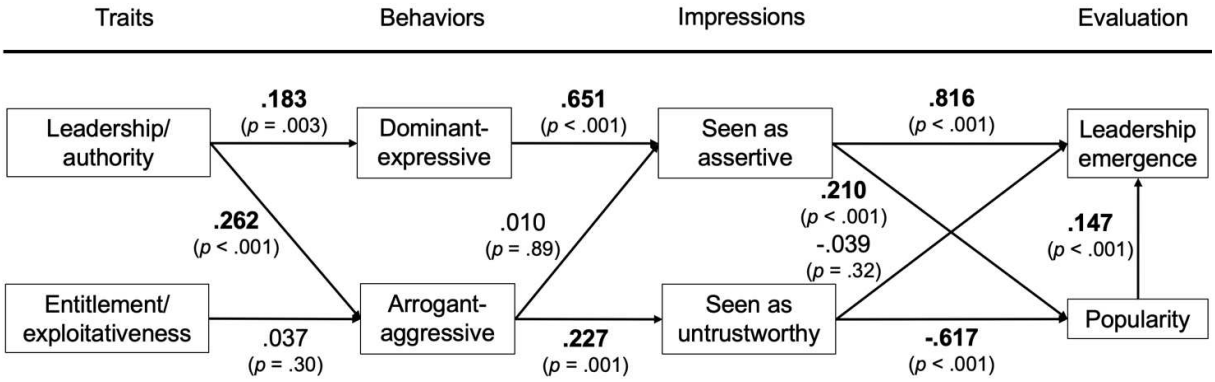
Direct and Indirect Effects in Model 2 With Global Narcissism Measured With the Narcissistic Personality Inventory (NPI) as Trait Instead of Admiration and Rivalry

	Leadership emergence					Popularity				
				95% CI					95% CI	
	DE	p_{DE}	IE	LL_{IE}	UL_{IE}	DE	p_{DE}	IE	LL_{IE}	UL_{IE}
NPI	.019	.55	-	-	-	.015	.75	-	-	-
Agentic pathway	-		**.124**	.059	.194	-		**.031**	.011	.058
Antagonistic pathway	-		-.003	-.009	.002	-		**-.036**	-.066	-.012

Note. DE = Direct effect. IE = Indirect effect. CI = Confidence interval. LL = Lower limit. UL = Upper limit.
DEs and IEs in bold were significant at the $p \leq .05$ level.

Figure 3.1.A6

Results for Model 2 With Leadership/Authority and Entitlement/Exploitativeness as Traits Instead of Admiration and Rivalry



Note. Personality traits, expressed behaviors, and interpersonal impressions were allowed to covary among each other (paths are not displayed for the sake of clarity). Results are presented as standardized path coefficients. Standardized path coefficients in bold were significant at the $p \leq .05$ level.

Table 3.1.A3

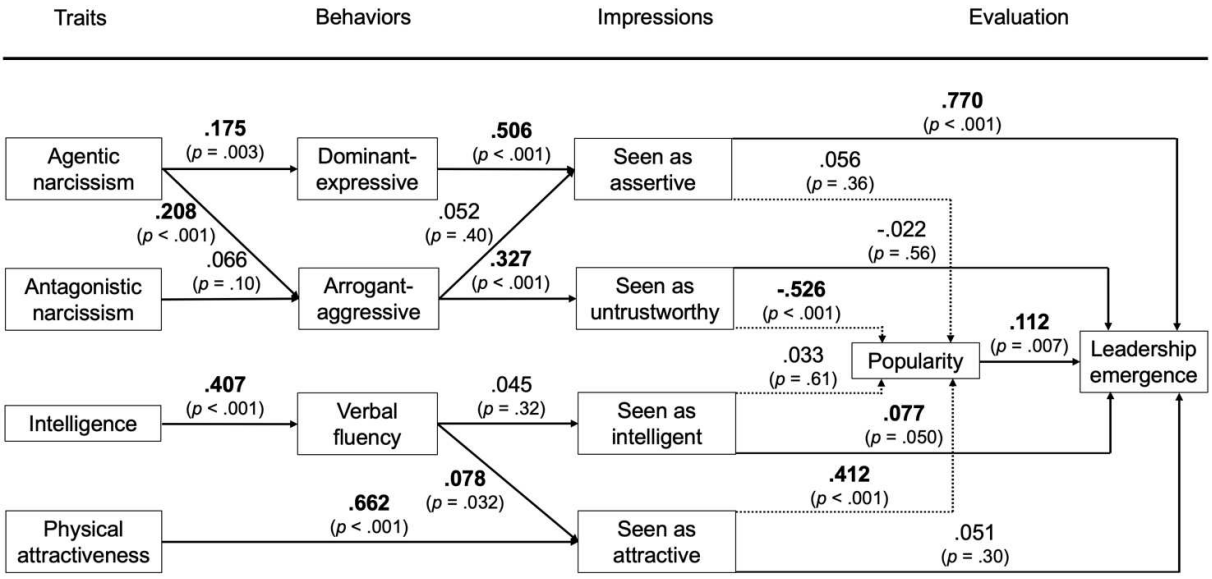
Direct and Indirect Effects in Model 2 With Leadership/Authority and Entitlement/ Exploitativeness as Traits Instead of Admiration and Rivalry

	Leadership emergence					Popularity				
				95% CI					95% CI	
	DE	p_{DE}	IE	LL_{IE}	UL_{IE}	DE	p_{DE}	IE	LL_{IE}	UL_{IE}
Leadership/ authority	.029	.33	**.097**	.030	.171	.005	.92	**.025**	.007	.051
Entitlement/ exploitativeness	-.046	.11	.000	-.002	.001	-.068	.15	-.005	-.018	.004

Note. DE = Direct effect. IE = Indirect effect. CI = Confidence interval. LL = Lower limit. UL = Upper limit. DEs and IEs in bold were significant at the $p \leq .05$ level.

Figure 3.1.A7

Results for Model 4 With Agentic Narcissism (Aggregation of Admiration and Leadership/Authority) and Antagonistic Narcissism (Aggregation of Rivalry and Entitlement/Exploitativeness) as Traits Instead of Admiration and Rivalry



Note. Personality traits, expressed behaviors, and interpersonal impressions were allowed to covary among each other (paths are not displayed for the sake of clarity). Results are presented as standardized path coefficients. Standardized path coefficients in bold were significant at the $p \leq .05$ level.

Table 3.1.A4

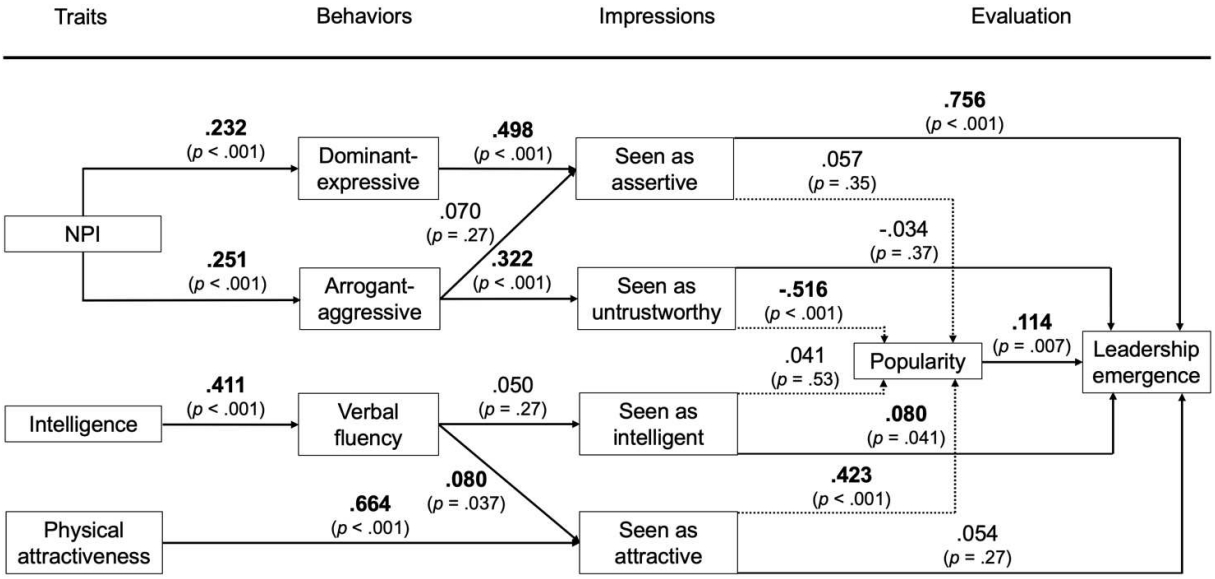
Direct and Indirect Effects in Model 4 With Agentic Narcissism (Aggregation of Admiration and Leadership/Authority) and Antagonistic Narcissism (Aggregation of Rivalry and Entitlement/Exploitativeness) as Traits Instead of Admiration and Rivalry

	Leadership emergence					Popularity				
				95% CI					95% CI	
	DE	p_{DE}	IE	LL_{IE}	UL_{IE}	DE	p_{DE}	IE	LL_{IE}	UL_{IE}
Agentic narcissism	-.012	.69	**.068**	.021	.123	.039	.39	.005	-.006	.018
Antagonistic narcissism	-.016	.55	.000	-.003	.001	-.041	.38	-.011	-.027	.002
Intelligence	.014	.64	.001	-.002	.005	.028	.56	.001	-.002	.006
Physical attractiveness	.025	.57	.034	-.031	.096	-.110	.060	**.272**	.190	.359

Note. DE = Direct effect. IE = Indirect effect. CI = Confidence interval. LL = Lower limit. UL = Upper limit. DEs and IEs in bold were significant at the $p \leq .05$ level.

Figure 3.1.A8

Results for Model 4 With Global Narcissism Measured With the Narcissistic Personality Inventory (NPI) as Trait Instead of Admiration and Rivalry



Note. Expressed behaviors and interpersonal impressions were allowed to covary among each other (paths are not displayed for the sake of clarity). Results are presented as standardized path coefficients.
Standardized path coefficients in bold were significant at the $p \leq .05$ level.

Table 3.1.A5

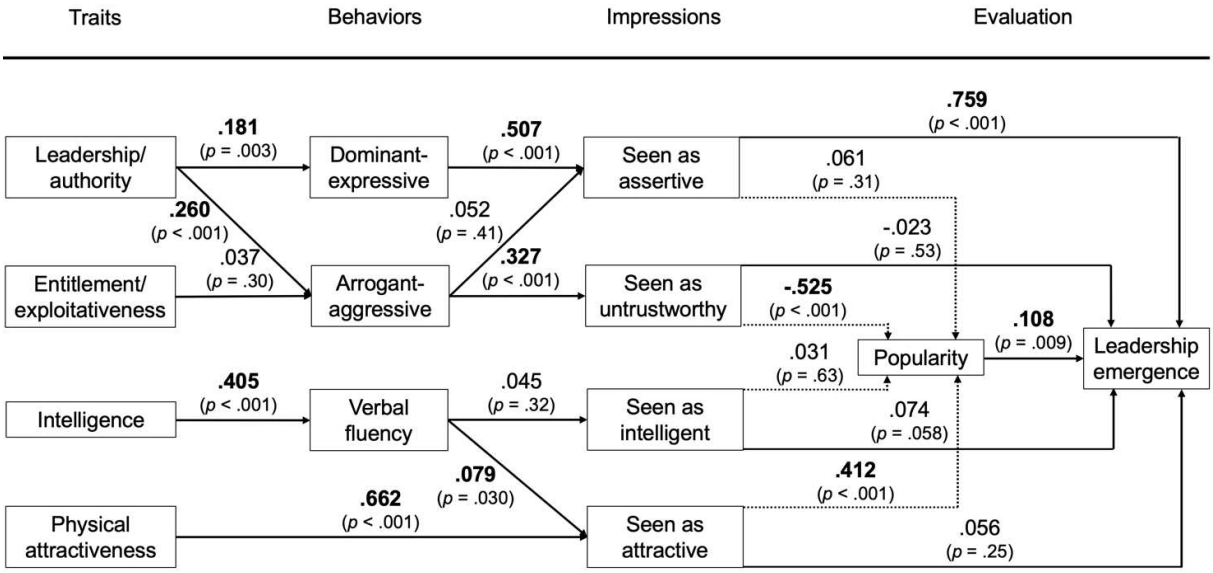
Direct and Indirect Effects in Model 4 With Global Narcissism Measured With the Narcissistic Personality Inventory (NPI) as Trait Instead of Admiration and Rivalry

	Leadership emergence					Popularity				
				95% CI					95% CI	
	DE	p_{DE}	IE	LL_{IE}	UL_{IE}	DE	p_{DE}	IE	LL_{IE}	UL_{IE}
NPI	.020	.52	-	-	-	.001	.98	-	-	-
Agentic pathway	-	-	**.087**	.039	.141	-	-	.007	-.008	.022
Antagonistic pathway	-	-	-.003	-.010	.003	-	-	**-.042**	-.069	-.019
Intelligence	.028	.37	.002	-.002	.006	.030	.55	.001	-.002	.006
Physical attractiveness	.020	.65	.036	-.029	.099	-.112	.056	**.281**	.194	.367

Note. DE = Direct effect. IE = Indirect effect. CI = Confidence interval. LL = Lower limit. UL = Upper limit.
DEs and IEs in bold were significant at the $p \leq .05$ level.

Figure 3.1.A9

Results for Model 4 With Leadership/Authority and Entitlement/Exploitativeness as Traits Instead of Admiration and Rivalry



Note. Personality traits, expressed behaviors, and interpersonal impressions were allowed to covary among each other (paths are not displayed for the sake of clarity). Results are presented as standardized path coefficients. Standardized path coefficients in bold were significant at the $p \leq .05$ level.

Table 3.1.A6

Direct and Indirect Effects in Model 4 With Leadership/Authority and Entitlement/ Exploitativeness as Traits Instead of Admiration and Rivalry

	Leadership emergence					Popularity				
				95% CI					95% CI	
	DE	p_{DE}	IE	LL_{IE}	UL_{IE}	DE	p_{DE}	IE	LL_{IE}	UL_{IE}
Leadership/ authority	.036	.22	**.069**	.020	.125	.028	.51	.006	-.005	.020
Entitlement/ exploitativeness	-.036	.20	.000	-.002	.001	-.035	.42	-.006	-.020	.006
Intelligence	.020	.51	.001	-.002	.005	.031	.51	.001	-.002	.006
Physical attractiveness	.021	.63	.037	-.027	.099	-.107	.063	**.273**	.190	.359

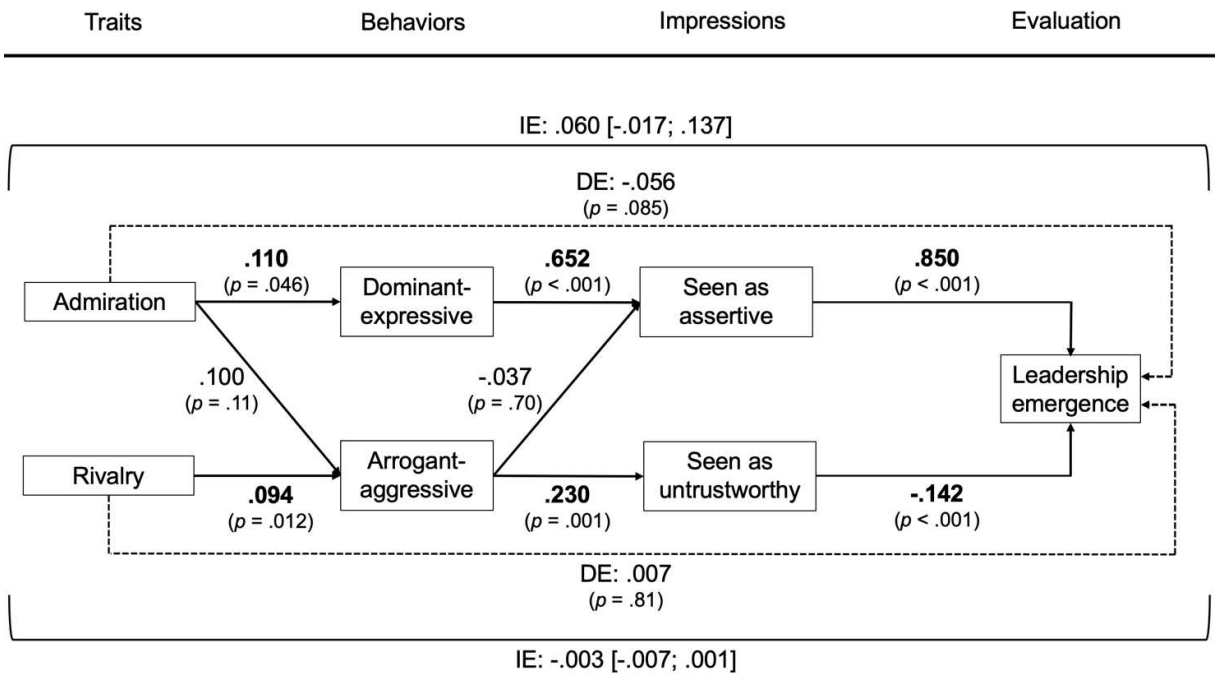
Note. DE = Direct effect. IE = Indirect effect. CI = Confidence interval. LL = Lower limit. UL = Upper limit. DEs and IEs in bold were significant at the $p \leq .05$ level.

Appendix 3.1.B

Because ML-SEMs explicitly address the nesting of participants in groups, we used raw scores of all variables. We specified ML-SEMs with random intercepts and fixed slopes in Mplus. We used a nonparametric bootstrapping approach taking the nested data structure into account (Goldstein, 2011) to determine the significance of the IEs. For this purpose, we used R to determine 1,000 bootstrap samples of group members with replacement from any group. We used the package MplusAutomation (version 0.7-3; Hallquist & Wiley, 2018) to enable Mplus to estimate the model parameters for each sample. We then used the distributions of the estimates to compute 95% CIs for the IEs in R. Comparing the results of the MMMs reported in the Results of the manuscript and the ML-SEMs, for Model 1 (Figure 3.1.B1) we found the biggest absolute difference in the path coefficients for the cross-path from arrogant-aggressive behavior to being seen as assertive ($\Delta\beta = 0.047$). All path coefficients of the agentic narcissism pathway differed marginally, however, the IE of admiration on being seen a leader became non-significant (.060 [-.017; .137]). For Model 2 (Figure 3.1.B2, Table 3.1.B1) we found the biggest absolute difference in the path coefficients for the path from being seen as untrustworthy to being liked ($\Delta\beta = 0.047$). All path coefficients of the agentic narcissism pathway differed marginally, however, the IE of admiration on being seen as a leader (.057 [-.014; .127]) and the IE of admiration on being liked (.012 [-.006; .030]) became non-significant. For Model 3 (Figure 3.1.B3, Table 3.1.B2) we found the biggest absolute difference in the path coefficients for the path from verbal fluency to being seen as intelligent ($\Delta\beta = 0.040$). All path coefficients of the intelligence pathway differed marginally, however, the IE of intelligence on being seen as a leader (.017 [-.008; .042]) and the IE of intelligence on being liked (.010 [-.003; .024]) became non-significant. For Model 4 (Figure 3.1.B4, Table 3.1.B3) we found the biggest absolute difference in the path coefficients for the path from being seen as untrustworthy to being liked ($\Delta\beta = 0.045$). The path coefficients from admiration to dominant-expressive behavior, from verbal fluency to being seen as attractive, and from being seen as intelligent to being seen as a leader turned non-significant. All path coefficients of the agentic narcissism pathway differed marginally, however, the IE of admiration on being seen as a leader became non-significant (.041 [-.009; .091]). Likewise, the IE of rivalry on being liked became non-significant (-.014 [-.028; .000]).

Figure 3.1.B1

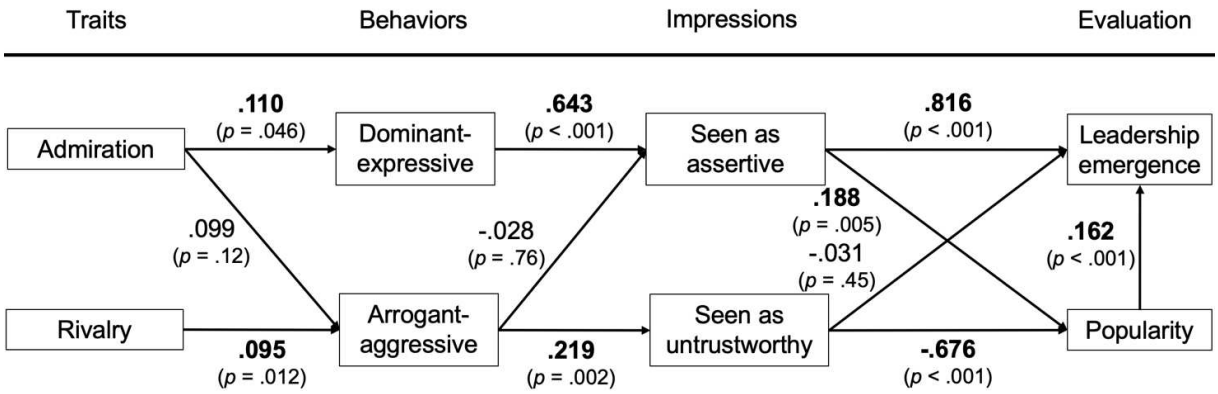
Results for Model 1 Computed as Multilevel Structural Equation Model



Note. Personality traits, expressed behaviors, and interpersonal impressions were allowed to covary among each other (paths are not displayed for the sake of clarity). Results are presented as standardized path coefficients. The 95% confidence intervals of the standardized indirect effects are displayed in brackets. DE = Direct effect. IE = Indirect effect.
Standardized path coefficients, IEs and DEs in bold were significant at the $p \leq .05$ level.

Figure 3.1.B2

Results for Model 2 Computed as Multilevel Structural Equation Model



Note. Personality traits, expressed behaviors, and interpersonal impressions were allowed to covary among each other (paths are not displayed for the sake of clarity). Results are presented as standardized path coefficients. Standardized path coefficients in bold were significant at the $p \leq .05$ level.

Table 3.1.B1

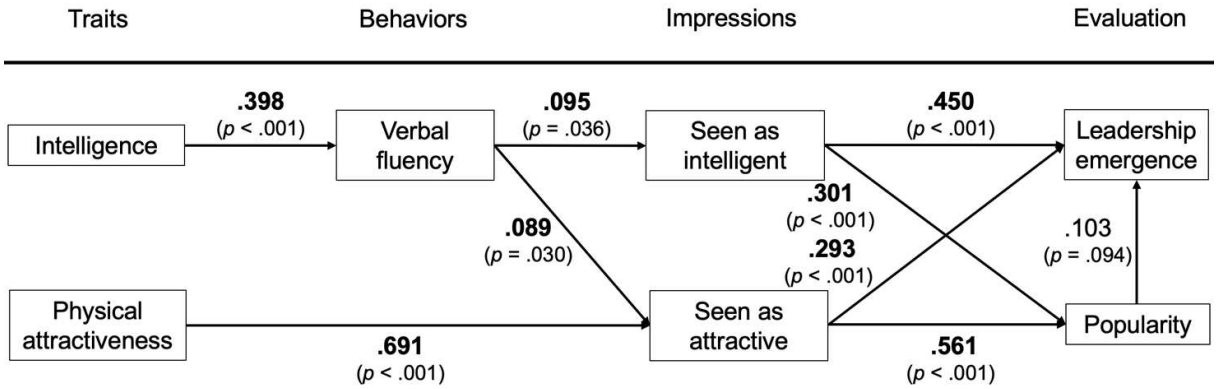
Direct and Indirect Effects in Model 2 Computed as Multilevel Structural Equation Model

	Leadership emergence					Popularity				
				95% CI					95% CI	
	DE	p_{DE}	IE	LL_{IE}	UL_{IE}	DE	p_{DE}	IE	LL_{IE}	UL_{IE}
Admiration	**-.062**	.038	.057	-.014	.127	.039	.51	.012	-.006	.030
Rivalry	.015	.60	-.001	-.003	.001	-.047	.37	-.013	-.028	.002

Note. DE = Direct effect. IE = Indirect effect. CI = Confidence interval. LL = Lower limit. UL = Upper limit. None of the DEs and IEs was significant at the $p \leq .05$ level.

Figure 3.1.B3

Results for Model 3 Computed as Multilevel Structural Equation Model



Note. Interpersonal impressions were allowed to covary among each other (paths are not displayed for the sake of clarity). Results are presented as standardized path coefficients.
Standardized path coefficients in bold were significant at the $p \leq .05$ level.

Table 3.1.B2

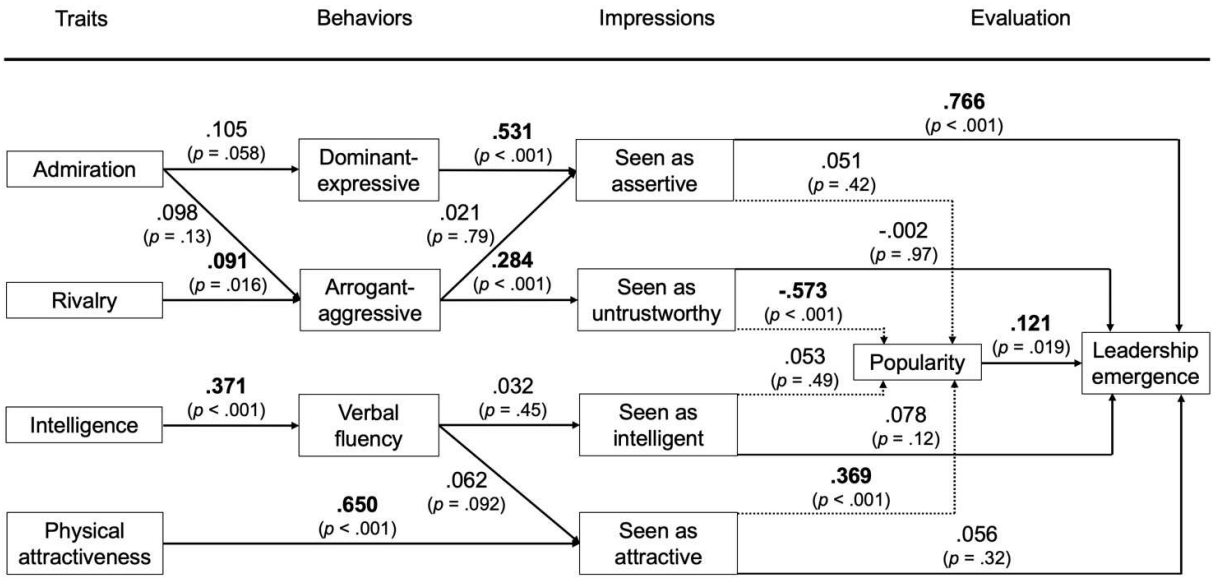
Direct and Indirect Effects in Model 3 Computed as Multilevel Structural Equation Model

	Leadership emergence					Popularity				
				95% CI					95% CI	
	DE	p_{DE}	IE	LL_{IE}	UL_{IE}	DE	p_{DE}	IE	LL_{IE}	UL_{IE}
Intelligence	.059	.54	.017	-.008	.042	.027	.69	.010	-.003	.024
Physical attractiveness	-.022	.81	**.208**	.069	.346	**-.157**	.021	**.351**	.261	.440

Note. DE = Direct effect. IE = Indirect effect. CI = Confidence interval. LL = Lower limit. UL = Upper limit.
DEs and IEs in bold were significant at the $p \leq .05$ level.

Figure 3.1.B4

Results for Model 4 Computed as Multilevel Structural Equation Model



Note. Personality traits, expressed behaviors, and interpersonal impressions were allowed to covary among each other (paths are not displayed for the sake of clarity). Results are presented as standardized path coefficients. Standardized path coefficients in bold were significant at the $p \leq .05$ level.

Table 3.1.B3

Direct and Indirect Effects in Model 4 Computed as Multilevel Structural Equation Model

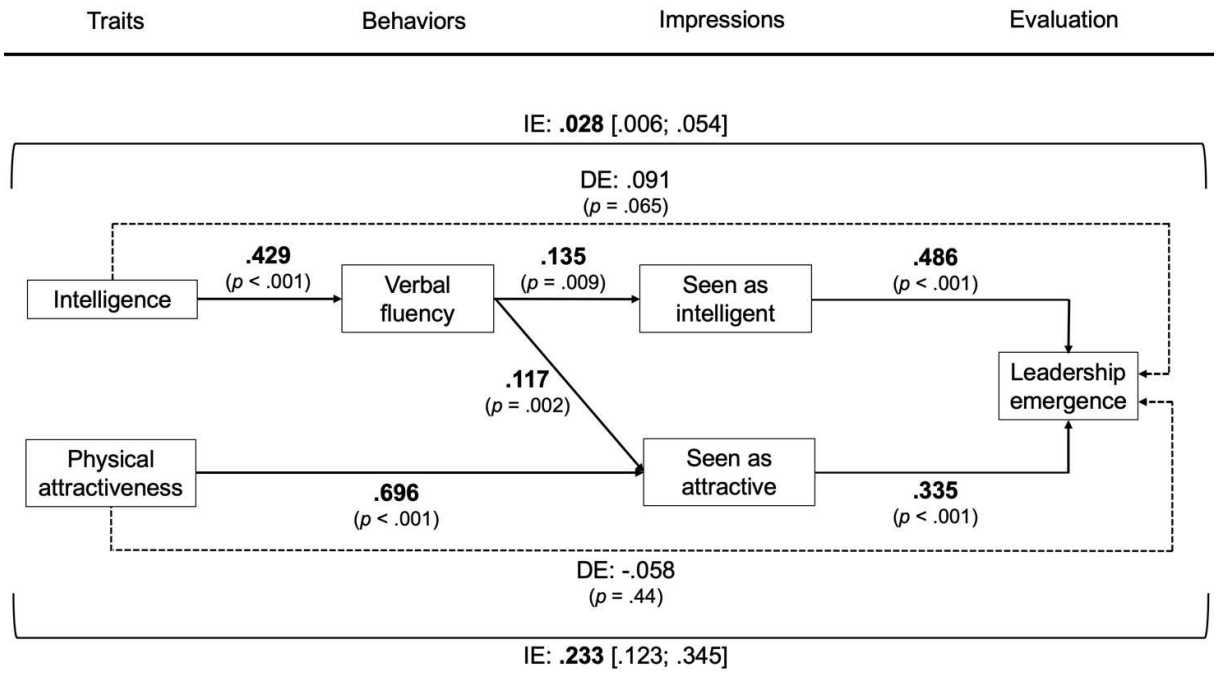
	Leadership emergence					Popularity				
				95% CI					95% CI	
	DE	p_{DE}	IE	LL_{IE}	UL_{IE}	DE	p_{DE}	IE	LL_{IE}	UL_{IE}
Admiration	**-.071**	.021	.041	-.009	.091	.014	.78	.003	-.005	.011
Rivalry	.021	.45	.000	-.003	.003	-.024	.58	-.014	-.028	.000
Intelligence	.006	.87	.001	-.002	.004	.006	.89	.001	-.002	.005
Physical attractiveness	.044	.36	.035	-.036	.107	-.097	.14	**.227**	.149	.306

Note. DE = Direct effect. IE = Indirect effect. CI = Confidence interval. LL = Lower limit. UL = Upper limit. DEs and IEs in bold were significant at the $p \leq .05$ level.

Appendix 3.1.C

Figure 3.1.C1

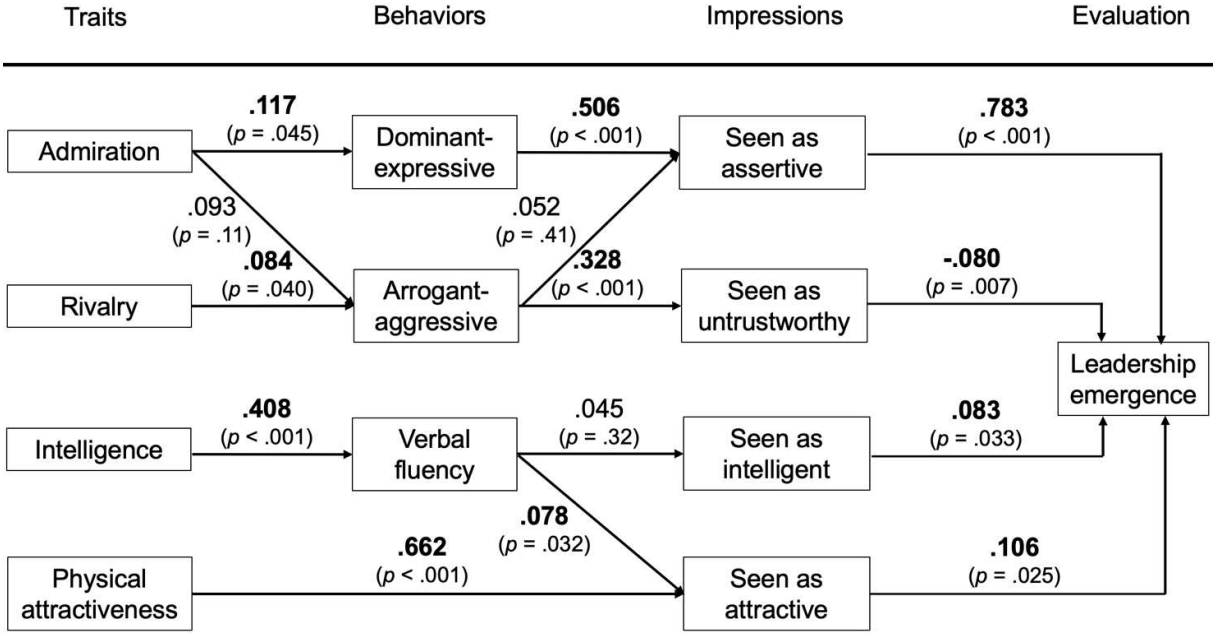
Results for Model 5: Path Model for Intelligence and Physical Attractiveness as Additional Pathways to Leadership Emergence in Social Groups



Note. Interpersonal impressions were allowed to covary among each other (paths are not displayed for the sake of clarity). Results are presented as standardized path coefficients. The 95% confidence intervals of the standardized indirect effects are displayed in brackets. DE = Direct effect. IE = Indirect effect.
Standardized path coefficients, IEs and DEs in bold were significant at the $p \leq .05$ level.

Figure 3.1.C2

Results for Model 6: Path Model of Narcissistic Admiration and Rivalry and the Additional Pathways, Intelligence and Physical Attractiveness, to Leadership Emergence in Social Groups



Note. Personality traits, expressed behaviors, and interpersonal impressions were allowed to covary among each other (paths are not displayed for the sake of clarity). Results are presented as standardized path coefficients. Standardized path coefficients, IEs and DEs in bold were significant at the $p \leq .05$ level.

Table 3.1.C

Direct and Indirect Effects in Model 6

	Leadership emergence				
				95% CI	
	DE	p_{DE}	IE	LL_{IE}	UL_{IE}
Admiration	-.056	.068	**.046**	.001	.098
Rivalry	.012	.64	-.002	-.005	.000
Intelligence	.021	.48	.002	-.002	.005
Physical attractiveness	.011	.80	**.070**	.007	.129

Note. DE = Direct effect. IE = Indirect effect. CI = Confidence interval. LL = Lower limit. UL = Upper limit. DEs and IEs in bold were significant at the $p \leq .05$ level.

Appendix 3.1.D

Table 3.1.D

Descriptive Statistics and Bivariate Correlations of All Measures Used

	n	*M*	*SD*	*Min*	*Max*	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
1. Admiration	297	3.17	0.78	1.11	6.00	-	**.29**	**.85**	**.28**	**.62**	**.43**	**.18**	.06	.11	-.06	**.12**	**.15**	.05	.10
2. Rivalry	297	2.33	0.74	1.00	4.00		-	**.26**	**.83**	**.32**	**.15**	**.39**	-.08	-.04	-.10	-.03	.02	-.06	-.06
3. Agentic narcissism	297	0.00	0.86	-2.13	3.01			-	**.29**	**.82**	**.85**	**.22**	.04	.11	-.11	.07	.09	.04	.08
4. Antagonistic narcissism	297	0.00	0.85	-1.52	2.29				-	**.43**	**.21**	**.84**	-.02	-.02	.00	-.02	.02	-.05	-.07
5. NPI	297	14.33	6.03	0	36					-	**.76**	**.40**	.03	.11	-.10	.03	.04	.02	**.17**
6. Leadership/authority	297	4.04	2.48	0	11						-	**.20**	.00	.08	**-.11**	.00	.01	.02	.04
7. Entitlement/ exploitativeness	297	1.33	1.08	0	4							-	.04	.00	.10	-.02	.01	-.03	-.05
8. Intelligence	311	0.00	0.65	-3.09	1.59								-	**.69**	**.70**	**.64**	**.51**	**.56**	-.02
9. Raven	309	8.14	3.09	0	15									-	**.17**	**.19**	**.14**	**.19**	**.14**
10. MWTB	310	29.74	2.78	19	36										-	**.16**	.10	**.18**	**-.16**
11. WMC	310	0.01	0.80	-3.09	1.28											-	**.81**	**.82**	.01
12. WMC_solved	302	51.17	5.93	23	60												-	**.33**	-.06
13. WMC_span	310	5.19	2.27	0	8													-	.07
14. Physical attractiveness	277	4.73	1.24	1.25	7.92														-
15. Overall attractiveness	277	5.11	1.30	1.50	8.33	.11	-.03	.09	-.05	**.18**	.04	-.05	-.03	.12	**-.17**	.03	-.01	.05	**.91**
16. Attractiveness face	277	4.35	1.43	1.00	8.00	.07	-.08	.06	-.08	**.12**	.03	-.05	.00	**.14**	**-.12**	-.02	-.09	.07	**.91**
17. Dominant-expressive behavior	305	3.02	1.11	1.00	5.75	**.12**	.05	**.18**	.09	**.24**	**.18**	.09	**.26**	**.19**	**.18**	**.14**	.07	**.16**	.00
18. Dominant behavior	305	2.87	1.13	1.00	6.00	**.13**	.06	**.19**	.09	**.23**	**.20**	.08	**.26**	**.20**	**.17**	**.15**	.09	**.17**	-.02
19. Expressive behavior	305	3.16	1.13	1.00	6.00	.11	.04	**.16**	.08	**.23**	**.16**	.09	**.24**	**.17**	**.18**	**.12**	.05	**.15**	.01
20. Arrogant-aggressive behavior	305	2.07	0.90	1.00	5.50	**.12**	**.13**	**.23**	**.15**	**.25**	**.27**	**.13**	**.16**	**.15**	.09	.08	.05	.09	.03
21. Arrogant behavior	305	2.22	0.99	1.00	5.67	**.14**	**.13**	**.24**	**.15**	**.25**	**.26**	**.12**	**.16**	**.15**	.10	.08	.05	.10	.04
22. Aggressive behavior	305	1.92	0.85	1.00	5.33	.10	.11	**.21**	**.15**	**.24**	**.26**	**.13**	**.14**	**.14**	.08	.07	.06	.07	.02
23. Verbal fluency	304	3.97	0.73	1.67	5.83	.08	**-.12**	.06	-.03	.07	.02	.07	**.43**	**.17**	**.46**	**.21**	.10	.01	.07
24. Being seen as assertive	295	3.86	0.79	1.37	5.86	**.22**	-.06	**.27**	-.03	**.30**	**.24**	.00	**.19**	**.17**	.11	.10	.05	**.13**	**.16**
25. Being seen as untrustworthy	295	2.85	0.54	1.54	5.02	.01	.10	.02	**.17**	.05	.02	**.19**	-.10	-.09	-.09	.01	.00	-.03	-.09
26. Being seen as intelligent	295	4.39	0.56	2.43	5.62	**.12**	-.05	**.12**	**-.13**	.06	.08	**-.16**	**.21**	**.17**	**.12**	**.14**	.11	**.12**	.06
27. Being seen as attractive	295	3.58	0.81	1.23	5.43	**.14**	-.09	.09	**-.14**	**.17**	.01	**-.14**	-.01	**.12**	-.07	-.07	-.11	-.01	**.72**
28. Being seen as a leader	295	3.71	0.77	1.58	5.75	**.14**	-.08	**.22**	-.09	**.27**	**.22**	-.07	**.19**	**.18**	**.13**	.06	-.02	**.12**	**.22**
29. Being liked	294	4.36	0.57	2.43	5.88	.08	-.11	.07	**-.18**	.05	.03	**-.18**	.10	**.13**	.05	.01	-.01	.03	**.24**

	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.
15. Overall attractiveness	-	**.66**	-.02	-.03	-.01	.01	.02	.01	.03	**.15**	-.07	.03	**.66**	**.20**	**.17**
16. Attractiveness face		-	.01	.00	.02	.04	.05	.02	.11	**.14**	-.09	.08	**.65**	**.20**	**.27**
17. Dominant-expressive behavior			-	**.98**	**.98**	**.79**	**.79**	**.77**	**.19**	**.70**	.02	**.36**	**.17**	**.61**	.09
18. Dominant behavior				-	**.93**	**.83**	**.82**	**.80**	**.18**	**.69**	.06	**.36**	**.14**	**.60**	.05
19. Expressive behavior					-	**.73**	**.73**	**.71**	**.19**	**.68**	-.03	**.34**	**.19**	**.59**	**.13**
20. Arrogant-aggressive behavior						-	**.99**	**.98**	**.12**	**.53**	**.23**	**.19**	.10	**.42**	**-.12**
21. Arrogant behavior							-	**.93**	**.12**	**.54**	**.22**	**.20**	.11	**.43**	-.11
22. Aggressive behavior								-	.11	**.50**	**.24**	**.17**	.08	**.40**	**-.12**
23. Verbal fluency									-	**.21**	-.03	**.12**	**.17**	**.23**	**.13**
24. Being seen as assertive										-	**-.18**	**.58**	**.37**	**.88**	**.32**
25. Being seen as untrustworthy											-	**-.46**	**-.29**	**-.29**	**-.67**
26. Being seen as intelligent												-	**.31**	**.60**	**.44**
27. Being seen as attractive													-	**.44**	**.53**
28. Being seen as a leader														-	**.45**
29. Being liked															-

Note. Means, standard deviations, and ranges were calculated on raw scores except for agentic narcissism, antagonistic narcissism, intelligence, and WMC which were aggregated using *z*-standardized data due to the use of different measurement units in the scales that needed to be summarized. Correlations were calculated on group-mean-centered scores to control for participants being nested in groups. Agentic narcissism = aggregation of admiration and leadership/authority. Antagonistic narcissism = aggregation of rivalry and entitlement/exploitativeness. NPI = Narcissistic Personality Inventory. MWTB = Mehrfachwahl-Wortschatz-Test B. WMC = Working Memory Capacity.

Correlations in bold were significant at the $p \leq .05$ level.

Appendix 3.1 References

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3.2 Differential Impacts of Behavioral Pathways Linking Personality to Leadership Outcomes

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Abstract. This study uses process models of personality to examine the behavioral pathways that explain personality traits' divergent relation to leadership outcomes in social groups. We applied data from an online group interaction study (N = 364) alternately assigning participants as leaders conducting brief group tasks. We used 4 types of variables to build the behavioral pathways in multiple mediator models: (a) Self-reported personality traits (extraversion, agreeableness, emotional stability), (b) video and audio recordings of expressed behaviors coded by 6 trained raters (task-focus, member-focus, resilient), (c) mutual interpersonal impressions (assertive, trustworthy, calm), and (d) mutual evaluations of leadership emergence and leadership effectiveness. We find that the examined personality traits differently relate to the 2 leadership outcomes via the behavioral pathways: Extraversion was more important to leadership emergence due to impressions of assertiveness evoked by task-focused behavior being stronger valued. Agreeableness/emotional stability were more important to leadership effectiveness due to impressions of trustworthiness/calmness evoked by member-focused/resilient behavior being stronger valued. The findings highlight the benefits of a behavioral pathway approach to comprehend the effects of personality traits on distinct leadership outcomes so that leaders are not selected based on who takes the lead, but who leads effectively.

Keywords. Personality, leadership, behavioral processes.

3.2.1 Introduction

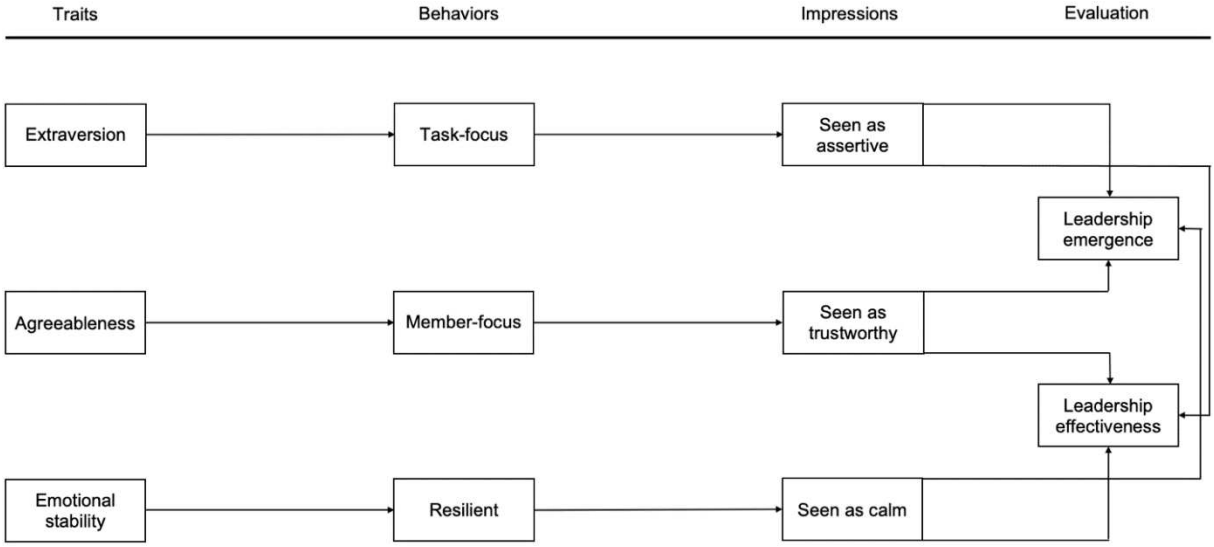
The performance and satisfaction of (work) groups crucially depend on the person who raises as a group leader and how effectively they lead the group (e.g., Pescosolido, 2001). Thereby, an individual's personality is a decisive predictor of both leadership emergence and leadership effectiveness in social groups. Furthermore, previous research has shown that personality traits often relate differently to leadership emergence versus leadership effectiveness. For example, extraversion has been found to be more decisive for leadership emergence, whereas agreeableness has been found to be more decisive for leadership effectiveness (Judge et al., 2002). This means that the person who naturally arises as a group leader due to their personality might in fact not be the most suitable person to lead the group in an effective manner.

Whereas an extensive body of research demonstrates that personality traits affect leadership emergence and effectiveness and that these effects can be distinct, we do not yet understand the processes that might explain the (divergent) link between personality traits and leadership outcomes in social groups (Antonakis et al., 2012; Zaccaro et al., 2018). We open this black box between personality traits and leadership outcomes to explain the underlying causal mechanism by marrying leadership process models with process models of personality. Following process models of personality (e.g., Back et al., 2011; Grosz et al., 2020; Nestler & Back, 2013) expressed behaviors take the key role to explain the link between latent personality traits and social outcomes such as leadership emergence and effectiveness: Distal, non-directly observable personality traits must be expressed in more proximal, directly observable behaviors (behavioral expression). The expressed behaviors must then be perceived and formed to impressions by group members (interpersonal perception), which finally may be evaluated regarding leadership criteria (evaluation). In this study, we focus on three clearly distinguishable key behavioral factors (task-focus, member-focus, resilient) identified in behavioral personality science and the leadership literature that may evoke leadership-relevant interpersonal impressions (assertive, trustworthy, calm) that in turn might be differently evaluated with regard to leadership emergence versus leadership effectiveness. This way, we aim to provide a behavioral-perceptual explanatory model unraveling the divergent main effects of matching personality traits (extraversion, agreeableness, emotional stability) on leadership emergence and effectiveness (see Figure 3.2.1). For this purpose, we apply multimethodological data of four types of variables (self-reported personality traits, video recorded and coded expressed behaviors, target effects of interpersonal impressions, target

effects of leadership evaluations) from an online group interaction study ($N = 364$) alternately assigning participants as leaders of small groups solving a problem.

Figure 3.2.1

A Behavioral Pathway Approach Linking Personality to Leadership Outcomes



The present study contributes to the leadership literature by addressing repeated calls for leadership research taking a process-driven approach to explain the "why" and "how" of the link between personality traits and leadership outcomes (e.g., Antonakis et al., 2012; A. B. Blake et al., 2022; DeRue et al., 2011; J. Hu et al., 2019; Judge et al., 2002; Zaccaro et al., 2018). In particular, we draw on process models of personality (e.g., Back et al., 2011; Grosz et al., 2020; Nestler & Back, 2013) and offer a behavioral pathway approach comprising expressed behaviors and evoked interpersonal impressions as a central explaining mechanism behind personality-leadership links. Thereby, we demonstrate that the effect of personality traits on leadership outcomes operates indirectly via expressed behaviors and interpersonal impressions. Further, we show that these behavioral pathways offer an explanation to why personality traits affect leadership emergence and effectiveness distinctively as the interpersonal impressions can be evaluated differently regarding the two leadership outcomes. Thus, taking a behavioral pathway approach appears to be a fruitful avenue to unravel the divergent main effects of personality traits on different leadership criteria by comparing the critical behavioral-perceptual processes preceding evaluations of leadership emergence and effectiveness (Marinova et al., 2012).

The present study also comes with practical implications concerning real-life organizations' leader selection and development procedures (e.g., leaderless group discussions in assessment centers; informal leadership emergence processes in leaderless work teams). A detailed understanding of the behavioral-perceptual processes explaining the divergent links between personality traits and leadership emergence versus effectiveness facilitates to focus on the specific proximal behaviors and impressions predicting leadership effectiveness rather than leadership emergence. This may help to reduce biases of selecting and developing leaders based on their apparent leaderlike personality and corresponding behaviors and evoked impressions (e.g., a strong focus on assertiveness), and rather focus on the personality traits, behaviors, and impressions that truly foster effective group leadership (e.g., also considering interpersonal warmth and calmness). Furthermore, a detailed understanding of the involved processes in personality-leadership links enhances the potential for practical applications by improving the generalizability of such findings and the identification of moderating contextual factors (e.g., Fischer et al., 2017).

3.2.2 Theoretical Background

3.2.2.1 Main Effects of Personality Traits on Leadership Outcomes. The main effects of personality traits on leadership criteria have been studied for a long time (e.g., Bass, 1990; Lord et al., 1984). A crucial advancement of research on the relationship between personality and leadership has been the differentiation between two broad categorizations of leadership criteria that represent conceptually distinct constructs: Perceptions of leadership emergence and perceptions of leadership effectiveness (e.g., Judge et al., 2002; Lord et al., 1986). Leadership emergence refers to perceptions of an individual becoming influential in a group, and thus, refers to processes of individuals appearing leaderlike, assuming responsibility, and taking the leadership role in groups (Badura et al., 2022; Hanna et al., 2021). In comparison, leadership effectiveness refers to an individual's actual performance in the leadership role, and thus, refers to processes of individuals effectively directing their group towards achieving their goals and satisfaction (e.g., DeRue et al., 2011; Judge et al., 2002). This conceptual distinction is also of practical importance because whereas organizations and teams should be most interested in identifying the person who leads effectively, this might interfere with the person who actually takes the lead.

Indeed, an extant body of research found personality traits to be differently related to perceptions of leadership emergence versus leadership effectiveness. More specifically, extraversion (characterized by attributes such as gregariousness, assertiveness, dominance, and activity) has been shown to be the personality trait that is most consistently associated with

leadership emergence (Ensari et al., 2011) and related constructs such as status attainment (e.g., Anderson et al., 2001; DesJardins et al., 2015; Grosz et al., 2020). Whereas extraversion has also been shown to predict leadership effectiveness (DeRue et al., 2011), extraversion seems to be even more important to leadership emergence compared to leadership effectiveness (Judge et al., 2002). In contrast, whereas agreeableness (characterized by attributes such as trust, altruism, compliance, and modesty) has been shown to be relatively unimportant to leadership emergence (Badura et al., 2022; Ensari et al., 2011; Judge et al., 2002) and status attainment (e.g., Anderson et al., 2001), agreeableness has been shown to be decisive for leadership effectiveness (DeRue et al., 2011; Judge et al., 2002; see also Hoffman et al., 2011, for meta-analytical evidence of a positive association between the related construct honesty/integrity and leadership effectiveness). In a similar vein, emotional stability (the opposite pole of neuroticism; characterized by attributes such as calmness, resilience, positive emotionality, and relaxedness) showed rather inconsistent and low associations with leadership emergence (Badura et al., 2022; Ensari et al., 2011; cf. Judge et al., 2002) and status attainment (e.g., Anderson et al., 2001), but was consistently found to be important for leadership effectiveness (DeRue et al., 2011; Hoffman et al., 2011; Judge et al., 2002).

3.2.2.2 A Behavioral Pathway Approach Linking Personality to Leadership Outcomes. According to process models of personality (e.g., Back et al., 2011; Grosz et al., 2020; Nestler & Back, 2013), expressed behaviors that evoke interpersonal impressions take the key role to explain the mechanisms linking personality traits to social outcomes, such as leadership emergence and effectiveness. More specifically, personality traits are distinct, latent constructs that are not directly observable in interpersonal interactions. Thus, personality traits cannot affect social outcomes directly but only indirectly. Thereby, the necessary prerequisite for an impact on social outcomes is that personality traits must be expressed in more proximal observable behavior (behavioral expression). Further, the sufficient prerequisite is that these expressed behaviors are then observed and formed to even more proximal impressions by interaction partners (interpersonal perception), which, in turn, are evaluated regarding social outcomes, such as leadership emergence and effectiveness (evaluation). For example, Härtel et al. (2021) recently utilized a behavioral pathway approach to investigate how the personality trait narcissism (entitled self-importance) is linked with leadership emergence in social groups. Here, narcissists' extraverted, agentic components were expressed through dominant-expressive behaviors, yielding impressions of being seen as assertive, positively impacting narcissists' leadership emergence. Taking such a behavioral pathway approach also seems to be a promising approach to explain the effect of big five personality traits

(extraversion, agreeableness, emotional stability) on leadership emergence and effectiveness. Here, process models of personality can serve as leadership process models examining behaviors and impressions as the causal chain between distal determinants (i.e., personality traits) and leadership outcomes of leadership emergence and effectiveness.

There is vast consensus throughout behavioral personality science (R. Hogan, 1996; Wiggins, 1979) that there are two fundamental behavioral dimensions that form the basis for describing behaviors in interpersonal situations (i.e., interpersonal behaviors can be seen as a specific combination of these two dimensions): Agency (getting ahead, dominance, competence, assertiveness) referring to task functioning and goal achievement versus communion (getting along, warmth, trustworthiness) referring to functioning in social relations (e.g., Bakan, 1966; J. Hogan & Holland, 2003; Hopwood, 2018; Kiesler, 1983; Wiggins, 1991; Wojciszke et al., 2009). These behavioral dimensions have also emerged as fundamental behavioral dimensions in the leadership literature labeled as task-focus (task-orientation, initiating structure, production-centered) corresponding with agency and member-focus (member-orientation, consideration, employee-centered) corresponding with communion (Bass, 1990; R. R. Blake et al., 1962; Fleishman, 1953; Stogdill & Coons, 1957; Yukl, 2012). Task- and member-focus have been shown to be key proximal behavioral dimensions predicting leadership outcomes (e.g., Burke et al., 2006; DeRue et al., 2011; Fisher & Edwards, 1988) and repeatedly suggested as promising mediators between personality traits and leadership outcomes (e.g., Judge et al., 2004, 2009). Thereby, task-focus has been shown to match the personality trait of extraversion and member-focus has been shown to match the personality trait of agreeableness (e.g., Barford et al., 2015; Barrick et al., 2002; Leising & Bleidorn, 2011). More recently, behavioral personality science has identified a third distinct observable (especially in social stressful situations) domain of interpersonal behaviors that corresponds with the personality trait of emotional stability. This domain encompasses resilient behaviors such as coping well with stress, handling emotions, and responding in a relaxed way (Leising & Bleidorn, 2011) that should also be relevant in organizational contexts (Breil et al., 2021, 2022).

Expressed behaviors evoke interpersonal impressions that are evaluated with regard to leadership outcomes. Being seen as assertive, trustworthy, and calm should function as essential perceptual mediators that explain the link between expressed interpersonal behaviors, that is, task-focus, member-focus, and resilient behavior, respectively, and leadership outcomes. Being seen as assertive represents an interpersonal impression at the core of agency (Abele et al., 2008; Abele & Wojciszke, 2007), that should be central for leadership outcomes (e.g., Ames &

Flynn, 2007; Lord et al., 1984). Assertiveness has already been considered in previous research examining agentic pathways linking personality traits with leadership outcomes (e.g., Härtel et al., 2021; J. Hu et al., 2019). Being seen as trustworthy represents an interpersonal impression at the core of communion (Abele & Wojciszke, 2007), that should be central for leadership outcomes (e.g., Ferrin & Dirks, 2002; R. Hogan & Kaiser, 2005; Lord et al., 1984; Wolff et al., 2002). Trust has already been considered in previous research examining communal pathways linking personality traits with leadership outcomes (Härtel et al., 2021; Marinova et al., 2012). Being seen as calm might be construed as the central interpersonal impression evoked by resilient interpersonal behaviors (Breil et al., 2022; Leising & Bleidorn, 2011). Whereas calmness is not yet well embedded in the leadership literature, there are initial hints that calmness might be important to leadership outcomes, especially in crisis-driven and virtual contexts (Klus & Müller, 2021).

- Hypothesis 1a: Extraversion has an indirect effect on leadership outcomes that is mediated by task-focused behavior and interpersonal impressions of being seen as assertive.
- Hypothesis 1b: Agreeableness has an indirect effect on leadership outcomes that is mediated by member-focused behavior and interpersonal impressions of being seen as trustworthy.
- Hypothesis 1c: Emotional stability has an indirect effect on leadership outcomes that is mediated by resilient behavior and interpersonal impressions of being seen as calm.

3.2.2.3 Distinct Effects of Behavioral Pathways Linking Personality With Leadership Emergence and Effectiveness. Behavioral pathways might be the key to understanding why personality traits show distinct effects on leadership emergence and leadership effectiveness as demonstrated by previous research. Namely, extraversion is connected to both leadership outcomes (e.g., DeRue et al., 2011; Ensari et al., 2011) but seems to be even more important for leadership emergence (Judge et al., 2002). On the other hand, agreeableness and emotional stability have a strong positive association with leadership effectiveness (DeRue et al., 2011), whereas being less important for leadership emergence (Badura et al., 2022; Ensari et al., 2011; Judge et al., 2002). Behavioral pathways linking personality and leadership outcomes through expressed behaviors and evoked impressions can help to unravel these divergent main effects. For instance, the behavioral pathways proposed by Härtel et al. (2021) helped explaining the distinct main effects of narcissism on leadership emergence and popularity. Whereas narcissists' agentic side has a positive impact on leadership

emergence via dominant-expressive behaviors yielding impressions of being seen as assertive, narcissists' antagonistic side negatively affects their popularity via arrogant-aggressive behaviors yielding impressions of being seen as untrustworthy.

Within the behavioral pathways proposed above, the interpersonal impressions are particularly important to shed light on the perceptual processes distinctively linking behaviors to leadership outcomes because they represent the final link of the causal mediation chain between personality traits and leadership outcomes. Thus, interpersonal impressions may ultimately explain why personality traits exhibit different main effects on distinct leadership outcomes: The same evoked interpersonal impressions may be differently evaluated by interaction partners regarding perceptions of leadership emergence versus effectiveness. Hence, we combine previous findings of distinct main effects of personality traits on leadership emergence versus effectiveness with the behavioral pathways developed above to formulate the following three hypotheses:

- Hypothesis 2a: The indirect behavioral pathway of extraversion, task-focused behavior, and being seen as assertive is more positively related to evaluations of leadership emergence than to evaluations of leadership effectiveness.
- Hypothesis 2b: The indirect behavioral pathway of agreeableness, member-focused behavior, and being seen as trustworthy is more positively related to evaluations of leadership effectiveness than to evaluations of leadership emergence.
- Hypothesis 2c: The indirect behavioral pathway of emotional stability, resilient behavior, and being seen as calm is more positively related to evaluations of leadership effectiveness than to evaluations of leadership emergence.

3.2.3 Method

3.2.3.1 Sample. The sample consisted of 364 participants mainly recruited via social media postings, e-mail newsletters, advertising posters, and lecture announcements at two German Universities. Participants received monetary compensation composed of a fixed share of 21€ and a variable share of up to 9€. University students could choose to replace the fixed share of the monetary compensation with course credit. In addition, all participants could choose to receive feedback on how well they adopted the leader instructions during the experiment.

The average age in our sample was 24.03 (SD = 4.00) with most participants (86.81%) being students from various subjects. All 364 participants (215 women) of the final sample provided complete self-reported personality traits and attended the online Zoom meeting. This sample is larger than usual samples of similar studies investigating group interactions by

computing mediation models between personality traits, behavioral measures, and social consequences (e.g., Cheng et al., 2013; Härtel et al., 2021; Küfner et al., 2013; Leckelt et al., 2015; Witkower et al., 2020).

3.2.3.2 Procedure. All procedures used in this study were in line with the recommendations of the German Research Foundation (DFG) and the German Psychological Society (DGPs). The study consisted of two parts. First, participants completed an online questionnaire collecting demographic information and self-reported personality traits. Then, participants attended an online Zoom meeting lasting 2-3 hours. For the online Zoom meetings, the sample was divided into 79 groups of four to five participants ($M = 4.61$). A group size of four to five is desirable because it is consistent with the size of effective working groups (Stangor, 2015), facilitates the identification of leaders (Hare, 1976), and enables all group members to participate in the discussion (Hare, 1981). Participants used their own technical equipment, namely a computer with a webcam and microphone. In each session, we assessed two groups simultaneously.

The online Zoom meetings started with all participants of the two respective groups. Participants were assigned gender-neutral code names (Van Fleet & Atwater, 1997). At the beginning of the meeting, we standardized the Zoom settings and ensured that all participants could see each other. Participants were then asked to introduce themselves in two to three sentences. Next, participants were randomly assigned to their respective groups, and the two groups were transferred to separate break-out sessions, each with its own experimenter. During the Zoom meeting, participants simultaneously filled out an online questionnaire that provided instructions[31] and assessed perception ratings on interpersonal impressions and leadership evaluations after each round.

Corresponding to the number of group members participants completed four or five rounds of variations of the Lost on the Moon task (Hall & Watson, 1970; see also Bottger, 1984; Robins & Beer, 2001), so that each participant took over the role of the group leader once, whereby the task order was randomized. While leadership emergence has often been investigated in leaderless groups, it can also occur and has been researched in contexts with

[31] The instructions differed slightly between four conditions, namely "competitive" versus "non-competitive" and "authoritarian" versus "participative". In the competitive condition, the variable payoff depended on the group's performance (i.e., solution quality and decision speed) relative to the other group in the same session, whereas the payoff in the non-competitive condition depended solely on the group's own performance. In the authoritarian condition, leaders were instructed to utilize an authoritarian-directive leadership style and to establish a steep hierarchy, while leaders in the participative condition were instructed to utilize a participative-inclusive leadership style and to establish a flat hierarchy. The different conditions are not further considered as they are not within the scope of the present article.

formal leadership roles (Badura et al., 2022). In the Lost on the Moon task, group members are instructed to imagine that they were crash-landed on the moon and asked to rank 15 items according to their importance for the survival of the group. The other variations of the task create similar settings, where the group members imagine themselves as survivors of plane crashes in the desert or an arctic environment, lost at sea after a maritime accident on the Atlantic Ocean, or colonists in the 18th century plagued by drought and disease. In each round, participants first had 5 minutes to rank the 15 items individually, and then up to 15 minutes to discuss their solutions in the group. The group member who was assigned the role of the group leader was made responsible for guiding the group discussion and submitting the final group ranking. Thereby, group leaders were instructed to share their screen displaying a template to rank the items. At the beginning of each group discussion, the experimenter ensured that all group members could see both the leader's shared screen and video, as well as the videos of all other group members. After the leader submitted the group ranking at the end of the group discussion, all group members evaluated the leader for this round, whereby the leader responded to the same items as self-evaluations.

3.2.3.3 Measures

3.2.3.3.1 Personality. We measured extraversion (e.g., "I am someone who is outgoing, sociable."; α = .87), agreeableness (e.g., "I am someone who is polite, courteous to others."; α = .82), and emotional stability (e.g., "I am someone who is relaxed, handles stress well."; α = .89) as self-reports based on the Big Five Inventory-2 (BFI-2, Soto & John, 2017) in its German translation by Danner et al. (2019). All three personality traits were assessed with twelve items each using 5-point scales ranging from 1 (*do not agree at all*) to 6 (*agree completely*).

3.2.3.3.2 Behavioral Ratings. The behavioral ratings of task-focus, member-focus, and resilient behavior were based on the video and audio recordings during the group discussions in the Zoom meeting. The video footage included (a) the self-directed webcam recording of the leader, who was the target person of the ratings, (b) the shared screen of the leader displaying the template for the group ranking, and (c) the self-directed webcam recordings of the other group members. Six[32] raters (four women), blind to the purpose of the study, independently watched the recordings[33] in individually randomized orders and made their ratings after

[32] For two groups, one rater did not rate the respective group because of a personal connection to one of the participants. Hence, two groups (nine leaders) were rated by five instead of six raters.
[33] Three recordings included only the audio track of the leader without visual material because two participants had technical issues with their webcam and one participant withdraw their consent to analyze the visual material.

watching each recording. The behavioral ratings were conducted on 6-point scales ranging from 1 (*not at all*) to 6 (*very strongly*).

All raters received comprehensive training to establish a shared understanding of the behaviors to be rated and to make use of the full scale range ensuring reliable and valid assessments. The training was based on the recommendations of Grünberg et al. (2018) comprising four steps. First, the authors analyzed the recordings and identified five leaders scoring low, neutral, and high on the behavioral rating scales. Second, raters attended an initial training session comprising a lecture on the behaviors to be rated and rater biases. After this first training session, participants independently watched the five sample recordings and rated the behaviors. Third, these behavioral ratings were compared with the behavioral ratings of the authors and (dis)agreement was discussed in a second training session. Fourth, sample recordings were watched together as a team to align the behavioral ratings.

Behaviors were rated on the meso-level (circumscribed behavioral expressions), which is positioned between global label ratings (macro-level) and the counting of micro-behaviors (micro-level), because the meso-level allows ratings to be reliable and psychologically meaningful (Funder et al., 2000). Raters received rating sheets with the behavioral labels of the behavioral dimensions to be rated. To ensure that raters gained a comprehensive understanding of the behavioral dimensions, we additionally listed explanations and examples of associated behaviors for each dimension that were tailored to the specific interaction task. In particular, we listed a set of exemplary behaviors illustrating the typical behavior of low scorers (i.e., behavior to be rated with "1") and high scorers (i.e., behavior to be rated with "6"). Here, we also incorporated behaviors at the micro-level (e.g., "smiles"; "makes responsive sounds while others talk such as 'mhm'") to combine the advantages of holistically processed behavioral information and the perception of specific behavioral acts (Funder et al., 2000; Furr & Funder, 2009; Grünberg et al., 2018). For the formulation of the rating items, we leaned on examples of *The Münster Behavior Coding-System* (M-BeCoSy; Grünberg et al., 2018).

We divided task- and member-focus into three behavioral subdimensions covering more specific behaviors that recurrently have been identified as core elements of the superordinate behavioral constructs of task- and member-focus (i.e., Bass, 1990; Burke et al., 2006; Stogdill, 1963; Stogdill & Coons, 1957; Yukl, 2008, 2012a; Yukl et al., 2002, 2009).[34] The three

[34] We excluded behavioral components irrelevant to our specific social interaction task. For instance, behavioral components such as determining resource and staffing requirements for task-focus and developing/coaching (e.g., offering advice and opportunities for skill development) for member-focus were omitted, as these aspects are irrelevant in our setting of a brief group discussion.

subdimensions of task-focus were (1) "directs the group to its goals" (ICC [2,k] = .83), (2) "establishes structure" (ICC [2,k] = .78), and (3) "enforces efficiency" (ICC [2,k] = .91). The three subdimensions of member-focus were (1) "supports/acts considerately" (ICC [2,k] = .88), (2) "recognizes" (ICC [2,k] = .84), and (3) "empowers" (ICC [2,k] = .91). The ratings of the six behavioral subdimensions were ex-post aggregated to more global ratings of task-focus (α = .87) and member-focus (α = .93). In contrast to task- and member-focus, we did not derive distinct behavioral subdimensions for resilient behavior, as it was only relatively recently suggested as an additional fundamental dimension of interpersonal behavior (Leising & Bleidorn, 2011) and less is known about its internal dimensional structure. Instead, we rated it more holistically as a broader behavioral construct (ICC [2,k] = .63) comprising behaviors such as "taking a relaxed position", "showing calm facial expression", and "controlling one's emotions" (Breil et al., 2021).

3.2.3.3.3 Interpersonal Impressions. After each round, the other group members reported their interpersonal impressions on the respective group leader. Perceived assertiveness ("This person is assertive."), trustworthiness ("This person is trustworthy.") and calmness ("This person is calm.") were rated on 6-point scales ranging from 1 (*does not apply at all*) to 6 (*applies perfectly*). We computed target effects on the basis of the social relations model (Back & Kenny, 2010; Kenny, 1994) to capture individual differences in being seen as assertive, trustworthy and calm. Target effects were computed in *R* using the *TripleR* package (Schönbrodt et al., 2012). Partner effect reliability (Bonito & Kenny, 2010) was .68 for impressions of assertiveness, .47 for impressions of trustworthiness, and .49 for impressions of calmness.

3.2.3.3.4 Leadership Evaluations. Along with the interpersonal impression ratings, the other group members reported their leadership evaluations on the respective group leader after each round. Leadership emergence and leadership effectiveness were measured with eight items each on 6-point scales ranging from 1 (*does not apply at all*) to 6 (*applies perfectly*). For leadership emergence, the items captured the key aspects of appearing leaderlike (e.g., "I can well imagine this person as a leader."), assuming responsibility (e.g., "This person takes on responsibility."), and taking the leadership role (e.g., "This person assumes leadership duties in the group."). For leadership effectiveness, the items captured the process of effectively directing the group towards achieving their goals (e.g., "This person fosters the achievement of group goals through their leadership behavior.") and satisfaction with the leadership (e.g., "This person provides satisfaction through their leadership behavior.") as the decisive aspects of an individual's performance as a leader, as well as more direct assessments of this performance

(e.g., “This person is an effective leader.”). We computed target effects for these leadership evaluations. The partner effect reliabilities of the eight items for leadership emergence lay between .58 and .71. The partner effect reliabilities for the eight items for leadership effectiveness lay between .52 and .65. Then, we aggregated the target effects for evaluations of leadership emergence ($\alpha = .96$) and evaluations of leadership effectiveness ($\alpha = .97$), respectively.

3.2.3.4 Analytical Approach. In a first step, we calculated bivariate correlations between all variables to derive general associations between variables, initial support for the predicted pathways, and indications for cross-paths. We used group-mean-centered values of personality traits, behavioral ratings, and target effects of interpersonal impressions and leader evaluations to account for the hierarchical structure of our data with participants nested in groups. Subsequently, we tested the proposed pathways (see Figure 3.2.1) and the proposed hypotheses by computing a multiple mediator model (MMM; Preacher & Hayes, 2008) based on the group-mean-centered data, while also considering cross-paths indicated by the correlation analysis. We conducted the data preparation, as well as the descriptive analysis and the correlation analysis, in R, whereas we used *Mplus* to specify the MMM. We used a nonparametric bootstrapping approach implemented in Mplus to compute 95% confidence intervals (CIs) for the indirect effects (IEs) to check whether the 95% CIs of the behavioral pathways linking personality with leadership outcomes preclude zero. To test for differences between IEs and specific path coefficients, we also used bootstrapping to check whether the corresponding 95% CIs of these differences preclude zero. The number of bootstrap samples was 10,000.

3.2.4 Results

3.2.4.1 Descriptive Statistics and Bivariate Correlations. Table 3.2.1 provides descriptive statistics and intercorrelations of all measures used in our analysis. The bivariate correlations provided initial insights into the proposed pathways between personality traits and leadership outcomes. For the extraversion pathway, all component variables (i.e., extraversion, task-focused behavior, and being seen as assertive) were positively correlated with each other and with both leadership emergence and leadership effectiveness. Hence, the bivariate correlations support the expected effect of the extraversion pathway as well as the individual connections between its component variables as proposed in Hypothesis 1a. For the agreeableness pathway, the correlations between all component variables (i.e., agreeableness, member-focused behavior, and being seen as trustworthy) were positive. Being seen as trustworthy was positively correlated with leadership emergence and effectiveness, which

provides initial evidence in favor of Hypothesis 1b. For the emotional stability pathway, whereas not all component variables (i.e., emotional stability, resilient behavior, and being seen as calm) were significantly correlated with each other, the postulated connections as proposed in the pathway all showed significant correlations. Namely, emotional stability was correlated with resilient behavior, which was correlated with being seen as calm. Further, regarding the final link to leadership outcomes, being seen as calm was positively correlated with leadership effectiveness. Taken together, these correlations provide initial support for the pathway from emotional stability to leadership outcomes as proposed in Hypothesis 1c.

Table 3.2.1

Descriptive Statistics and Bivariate Correlations

	n[a]	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11
1. Extraversion	364	3.38	0.64	-	.05	**.35**	**.22**	-.02	-.02	**.20**	-.02	.00	**.23**	**.21**
2. Agreeableness	364	3.81	0.53		-	**.27**	-.04	**.15**	.04	-.05	**.11**	.00	.01	.04
3. Emotional stability	364	3.28	0.69			-	**.15**	-.05	**.12**	**.13**	-.05	-.02	**.16**	**.12**
4. Task-focused behavior	363	3.46	1.09				-	-.01	**.14**	**.55**	**.15**	**-.15**	**.58**	**.51**
5. Member-focused behavior	363	3.57	1.20					-	**.46**	-.04	**.36**	**.26**	.09	**.26**
6. Resilient behavior	363	3.61	0.94						-	.04	**.18**	**.23**	.07	**.19**
7. Being seen as assertive	360	4.10	0.80							-	**.31**	-.01	**.87**	**.70**
8. Being seen as trustworthy	360	4.48	0.68								-	**.49**	**.42**	**.62**
9. Being seen as calm	360	4.57	0.69									-	.08	**.31**
10. Leadership emergence	360	4.02	0.71										-	**.86**
11. Leadership effectiveness	360	4.06	0.74											-

Note. Means and standard deviations were calculated on raw scores. Correlations were calculated on group-mean-centered scores to account for nesting in groups.

[a] Few participants dropped out due to technical difficulties during the online Zoom meeting resulting in some missing observations of behaviors, interpersonal impressions, and leadership evaluations.

Correlations printed in bold were significant at the $p < .05$ level.

Furthermore, the bivariate correlations provided indications for additional cross-paths between the three pathways that should be considered in the MMM. Specifically, we added cross-paths to the MMM between emotional stability and task-focused behavior, between task-focused behavior and being seen as trustworthy/being seen as calm, between member-focused behavior and being seen as calm, and between resilient behavior and being seen as trustworthy.

3.2.4.2 Model Results. Figure 3.2.2 presents the results of our MMM including the three postulated pathways linking personality traits with leadership outcomes as well as the cross-paths identified in the correlation analysis. The model-fit indices (RMSEA = .090; SRMR = .035; CFI = .963; TLI = .913) suggested a good fit to the data (Bentler, 1990; L. T. Hu & Bentler, 1998).

As theorized, the effect of personality traits on leadership emergence and effectiveness was mediated by behaviors and impressions. In line with Hypothesis 1a, extraversion was expressed in task-focused behavior (β = .199; $p < .001$), which was reflected in being seen as assertive (β = .555, $p < .001$), which, in turn, was related to perceived leadership emergence (β = .799, $p < .001$) and effectiveness (β = .564, $p < .001$). In line with Hypothesis 1b, agreeableness was expressed in member-focused behavior (β = .155, $p = .002$), which was associated with being seen as trustworthy (β = .371, $p < .001$), which then was related to leadership emergence (β = .181, $p < .001$) and effectiveness (β = .384, $p < .001$). Finally, in line with Hypothesis 1c, emotional stability was expressed in resilient behavior (β = .164, $p = .001$) leading to impressions of being seen as calm (β = .173, $p = .007$). Impressions of being seen as calm were not significantly linked with leadership emergence (β = -.003, $p = .91$) but were positively related to leadership effectiveness (β = .128, $p = .02$).

Figure 3.2.2

Model Results of the Behavioral Pathways Linking Personality to Leadership Outcomes

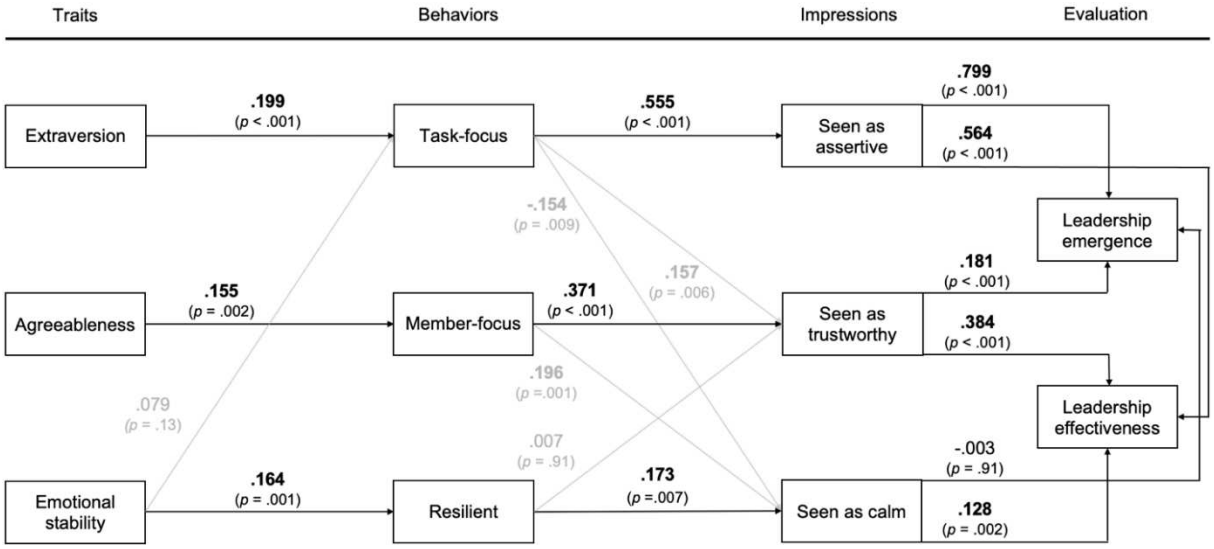


Table 3.2.2 provides the direct effects and IEs for all three pathways, as well as a comparison between the IEs on leadership emergence versus leadership effectiveness for each pathway. As expected, the extraversion pathway exerted a positive IE on both leadership emergence (β = .088, 95% CI [.041, .142]) and leadership effectiveness (β = .062, 95% CI [.029, .102]). This result supports Hypothesis 1a, although it is noteworthy that extraversion is the only personality trait in our model with significant direct effects on leadership emergence and leadership effectiveness beyond the IEs. Likewise, the agreeableness pathway had positive and significant IEs on both leadership emergence (β = .010,

95% CI [.003, .021]) and leadership effectiveness (β = .022, 95% CI [.007, .042]) supporting Hypothesis 1b. The emotional stability pathway, however, did not exert a significant IE on leadership emergence (β = .000, 95% CI [-.002, .002]), but only on leadership effectiveness (β = .004, 95% CI [.000 .009]). Nevertheless, the IE of emotional stability on leadership effectiveness provides support for Hypothesis 1c.

Table 3.2.2

Direct and Indirect Effects of Personality Traits on Leadership Outcomes

	Leadership emergence					Leadership effectiveness					ΔIE		
				95% CI					95% CI			95% CI	
	DE	p_{DE}	IE	LL_{IE}	UL_{IE}	DE	p_{DE}	IE	LL_{IE}	UL_{IE}	IE	LL_{IE}	UL_{IE}
1. Extraversion	**.055**	.030	**.088**	.041	.142	**.091**	.004	**.062**	.029	.102	**-.026**	-.044	-.011
2. Agreeableness	.014	.61	**.010**	.003	.021	.009	.79	**.022**	.007	.042	**.012**	.003	.022
3. Emotional stability	.041	.14	.000	-.002	.002	.036	.30	**.004**	.000	.009	**.004**	.001	.009

Note. DE = direct effect, IE = indirect effect, CI = confidence interval, LL = lower limit, UL = upper limit. DEs and IEs printed in bold are significant at the $p < .05$ level.

Regarding Hypotheses 2a-c, the comparison of IEs revealed that the effects of all three pathways differed significantly between the two leadership outcomes, leadership emergence and effectiveness. In addition, we also compared the final paths between interpersonal impressions and leadership outcomes as the decisive link for these divergent effects. The results for the extraversion pathway support Hypothesis 2a. The IE of extraversion on leadership effectiveness was significantly smaller than the IE on leadership emergence (Δβ = -.026, 95% CI [-.044, -.011]) because being seen as assertive had a weaker impact on leadership effectiveness than on leadership emergence (Δβ = -.236, 95% CI [-.284, -.184]). The other way around, and in line with Hypothesis 2b, the agreeableness pathway had a significantly stronger IE on leadership effectiveness compared to leadership emergence (Δβ = .012, 95% CI [.003, .022]) because being seen as trustworthy had a stronger impact on leadership effectiveness than on leadership emergence (Δβ = .203, 95% CI [.152, .255]). Finally, the emotional stability pathway provided evidence in favor of Hypothesis 2c. Emotional stability showed a stronger IE on leadership effectiveness compared to leadership emergence (Δβ = .004, 95% CI [.001, .009]) because being seen as calm had a stronger impact on leadership effectiveness than on leadership emergence (Δβ = .131, 95% CI [.085, .180]).

3.2.5 Discussion

In the present study, we explore behavioral pathways to shed light on the enigmatic and divergent effects of personality traits on leadership effectiveness and emergence. To this end,

we first showed that personality traits affect leadership outcomes indirectly via expressed behaviors and interpersonal impressions. For extraversion, we found an indirect effect on leadership emergence and effectiveness via task-focused behavior and interpersonal impressions of being seen as assertive (Hypothesis 1a). In a similar manner, we found an indirect effect of agreeableness on both leadership outcomes via member-focused behavior and interpersonal impressions of being seen as trustworthy (Hypothesis 1b). Finally, we found that emotional stability indirectly affects leadership effectiveness via resilient behavior and interpersonal impressions of being seen as calm (Hypothesis 1c). After establishing the behavioral pathways, we utilized them to unravel the divergent main effects between personality traits and leadership emergence versus effectiveness. In line with research suggesting that extraversion should be more decisive for emerging as a leader than for actually effectively leading a group (e.g., Ensari et al., 2011; Judge et al., 2002), we found the agentic extraversion pathway to be more important for leadership emergence compared to leadership effectiveness (Hypothesis 2a). More specifically, we found extraverts to behave in a task-focused manner evoking impressions of being seen as assertive that were positively evaluated with regard to leadership emergence and effectiveness. The behavioral pathway enables to track down why exactly extraversion might be more decisive for leadership emergence compared to effectiveness: Being seen as assertive was even more positively evaluated by group members with regard to leadership emergence than with regard to leadership effectiveness. In comparison, in line with research suggesting that agreeableness should be more decisive for effectively leading a group than for emerging as a group leader (e.g., DeRue et al., 2011; Ensari et al., 2011; Judge et al., 2002), we found the communal agreeableness pathway to be more important for leadership effectiveness compared to leadership emergence (Hypothesis 2b). Specifically, we found agreeable individuals to behave in a member-focused manner evoking impressions of being seen as trustworthy, which were more positively evaluated by group members with regard to leadership effectiveness compared to leadership emergence. In a similar vein, in line with research suggesting that emotional stability should be more decisive for effectively leading a group than for emerging as a group leader (Badura et al., 2022; DeRue et al., 2011; Ensari et al., 2011; Hoffman et al., 2011; cf. Judge et al., 2002), we found the resilient emotional stability pathway to be more important for leadership effectiveness compared to leadership emergence (Hypothesis 2c). In particular, we found emotionally stable individuals to behave in a resilient manner evoking impressions of being seen as calm, which were more positively evaluated by group members with regard to leadership effectiveness compared to leadership emergence.

3.2.5.1 Theoretical Implications. With this study, we follow multiple calls in the leadership literature (e.g., Antonakis et al., 2012; DeRue et al., 2011; Judge et al., 2002; Zaccaro et al., 2018) to open the "black box" (i.e., the unknown proximal mechanisms) to explain the enigmatic divergent links between distal personality traits and leadership outcomes. Thereby, we address more specific calls (e.g., Banks et al., 2021; A. B. Blake et al., 2022; J. Hu et al., 2019; Judge et al., 2004, 2009) to focus on truly behavioral constructs, which represent the key linking mechanism between personality traits and social outcomes in process models of personality (e.g., Back et al., 2011; Grosz et al., 2020; Nestler & Back, 2013). For this purpose, we drew on behavioral personality science (e.g., R. Hogan, 1996; Wiggins, 1979; Wojciszke et al., 2009) and focused on three conceptually distinct interpersonal behaviors (task-focus, member-focus, resilient) that represent the fundamental behavioral building blocks across a wide range of social situations including organizational and leadership contexts (Breil et al., 2022; Leising & Bleidorn, 2011). These behaviors can be matched with leadership-relevant big five personality traits (extraversion, agreeableness, emotional stability) and fundamentally evoked interpersonal impressions (assertive, trustworthy, calm) to understand the why and how of the puzzling links between personality traits and leadership outcomes in social groups.

The key links of the causal mediation chain to explain personality trait's divergent relation with leadership outcomes are the personality-evoked interpersonal impressions that were differently weighted by interaction partners in terms of leadership emergence and effectiveness: Extraversion-evoked impressions of assertiveness were more strongly evaluated in terms of leadership emergence, whereas agreeableness-/emotional stability-evoked impressions of trustworthiness/calmness were more strongly evaluated in terms of leadership effectiveness. However, the theoretical basis for the different evaluation of these interpersonal impressions remains unsolved. A promising approach may be to lay out these findings in the agency/communion-framework (e.g., Bakan, 1966; R. Hogan, 1982; Kiesler, 1983; Wiggins, 1991). In the case of leadership emergence, the agency component may be more influential because it pertains to the pursuit of individual goals such as self-oriented status and leadership attainment. As a result, the core agentic impression of assertiveness (e.g., Abele et al., 2008; Abele & Wojciszke, 2007) may be given greater weight. In contrast, for leadership effectiveness, the communal component may become more salient, when other-oriented action gains importance such as managing group members and aligning group processes to effectively achieve shared goals. Under these circumstances, the core communal impression of trustworthiness (e.g., Abele & Wojciszke, 2007) may receive greater weight. Another explanatory approach could be the application of prototypical leadership theories (e.g., Foti et

al., 1982; Lord et al., 1984; Offermann et al., 1994; Shondrick et al., 2010), which describe typical leader characteristics that should be particularly conducive to rising to a leadership position. When visualizing a typical leader, people may intuitively think of someone who is assertive rather than trustworthy or calm. This could provide a supplementary piece of the puzzle as to why being perceived as assertive may be more valued in terms of leadership emergence, whereas being seen as trustworthy/calm may be rather valued in terms of leadership effectiveness. In line with this notion, Offermann et al. (1994) found prototypical leaders to be more characterized by dominant-assertive attributes compared to prototypical effective leaders, whereas sensitive-trustworthy attributes were slightly more pronounced in prototypical effective leaders than in prototypical leaders. However, prototypical leadership theories typically feature agentic, communal, and occasionally resilient characteristics, making it challenging to discern a clear pattern. Following a more top-down approach on the behavioral pathways linking personality traits with leadership outcomes will help to further embed the present findings in existing theory and contribute to a deeper understanding of the behavioral-perceptual mechanisms linking personality traits with leadership outcomes.

Overall, the comparative behavioral pathway approach adopted in the present study enabled us to reveal important differences and similarities in the behavioral and perceptual processes that make a person raise as the leader of a group versus that make a person an effective group leader. Thereby, the present study contributes to the nascent literature on leadership process models (e.g., Antonakis et al., 2012; Zaccaro et al., 2018) by marrying it with the literature streams of process models of personality (e.g., Back et al., 2011; Grosz et al., 2020; Nestler & Back, 2013) and behavioral personality science (e.g., Leising & Bleidorn, 2011), which creates a powerful framework to unravel personality traits' enigmatic and divergent impacts on conceptually distinct leadership outcomes (see also Marinova et al., 2012). Adopting such a comparative behavioral pathway approach may not be restricted to leadership contexts, but also opens up a promising avenue to shed light on similarly enigmatic and divergent main effects of personality traits on a broad range of social outcomes such as popularity, status, and interpersonal attraction (see also Härtel et al., 2021).

3.2.5.2 Practical Implications. The present study also has practical implications on how organizations may design their leader selection and development procedures. Research suggests that the person who naturally raises as a leader may not necessarily be the person that leads most effectively (e.g., Judge et al., 2002). The present results complement these findings by suggesting that this may be due to personality-evoked interpersonal behaviors and impressions being differently evaluated regarding perceptions of leadership emergence versus

effectiveness. This finding is of practical importance as interpersonal behaviors and impressions represent more easily observable and concrete proximal indicators of effective leadership than less visible and more abstract distal personality traits. Thus, interpersonal behaviors and impressions have a more direct and powerful impact on leadership outcomes (see Hoffman et al., 2011). Organizations may therefore be advised to align their leader selection and development procedures to valuing the interpersonal behaviors and impressions that foster leadership effectiveness rather than emergence. The present study uncovers such undervalued behaviors and impressions, that is, member-focus and resilient behavior, along with the accompanying impressions of trustworthiness and calmness. Task-focused behavior and impressions of assertiveness also seem to be important for leadership effectiveness, but, in comparison, they seem to be somewhat overvalued when it comes to the question of who raises as a leader.

When designing specific leader selection procedures, following trait activation theory (Tett & Guterman, 2000), organizations should aim to create scenarios that make the expression of leadership relevant personality traits and the corresponding behavioral differences and impressions clearly visible. For example, in the context of an assessment center, a role play task could be conducted for which the candidate needs to prepare under intense time pressure, triggering the expression of interindividual differences in emotional stability, resilient behavior and impressions of calmness. The candidate might then be required to comfort an upset role player with emphatic, sensitive handling, triggering the expression of interindividual differences in agreeableness, member-focused behavior and impressions of trustworthiness (see also Breil et al., 2021, 2022). The formal candidate evaluation should then be geared towards the positive evaluation of such expressed behaviors and evoked impressions. Insights on the specific behaviors and impressions that foster effective leadership are also critical for designing effective leader development procedures. Whereas personality traits represent stable interindividual differences that can hardly be altered, leaders can learn to adapt their behavior and thus, the impressions they convey. Leader trainings aligned to teaching member-focused and resilient behavior therefore seems a promising leader development approach (see Lacerenza et al., 2017). Organizations may complement such trainings with feedback instruments. For instance, organizations could imply regular follower feedback or more comprehensive 360-degree feedback measures that report the extent to which the outlined effective leadership behaviors are being implemented and how well leaders evoke the associated desired impressions.

3.2.5.3 Limitations and Future Research. First, we focused on higher-order variables to gain a basic understanding of the behavioral-perceptual mechanisms that connect personality traits to leadership outcomes. Future research may delve deeper into these mechanisms by examining each of the four variable types (traits, behaviors, impressions, leadership evaluations) on a higher-resolved level. For example, future research might explore more specific behavioral pathways that focus on facets of personality traits (e.g., dominance, sociability, and gregariousness for extraversion; A. B. Blake et al., 2022; J. Hu et al., 2019; see also Judge et al., 2013). Likewise, task- and member-focus represent multidimensional behavioral constructs that can be broken down into more fine-grained components (Yukl, 2012; Yukl et al., 2002). Future research might even zoom into behaviors at the micro-level such as counting specific verbal statements (e.g., allowing someone to speak) and non-verbal gestures (e.g., dominant pointing gestures; see Grünberg et al., 2018). This would contribute to a more nuanced understanding of the enigmatic personality consequences in leadership contexts.

Second, in a similar vein, future research may explore additional pathways through which personality traits could impact leadership outcomes. For example, we found significant direct effects of extraversion on leadership emergence and effectiveness, which suggests that the agentic extraversion pathway as formulated in this study only represents a part of extraversion's total effect on these leadership outcomes. The direct effect was particularly pronounced for extraversion and leadership effectiveness. It is possible, for instance, that extraversion's warmth components (e.g., Costa & McCrae, 1995), apart from extraversion-evoked impressions of assertiveness, may have contributed to extraversion-evoked impressions of trustworthiness, both of which being important for effective leadership. We also still lack understanding of the behavioral-perceptual links of the remaining big five personality traits conscientiousness (cf. Marinova et al., 2012) and openness with leadership outcomes. Future research could develop further behavioral process models and examine behavioral dimensions like competent behavior (e.g., Breil et al., 2022) for conscientiousness or change-oriented behavior (e.g., DeRue et al., 2011) for openness.

Third, in the present study, we distinguished between leadership emergence and effectiveness at the perceptual level, that is, we explicitly asked group members about their perceptions of these conceptually distinct leadership outcomes after they interacted in short group tasks. Even within such a brief time frame, clear differences in perceptions of leadership emergence versus effectiveness became evident. Also, personality traits showed diverging leadership impacts with personality-evoked impressions being evaluated differently regarding the two leadership outcomes. However, in naturally emerging social groups, questions about

becoming a leader and the group leader's effectiveness typically arise at different stages of the group processes (Ong et al., 2016): Leadership emergence processes are characterized by lack of information (R. Hogan et al., 1994; Judge et al., 2002) and uncertainty (Marinova et al., 2012) at the beginning of group processes, whereas leadership effectiveness processes usually occur at later stages when the group leader has already been selected and is providing signals of effective leadership (Ong et al., 2016). Future research should validate whether the behavioral-perceptual pathways distinctively linking personality traits to leadership emergence and effectiveness can be replicated in naturally developing groups over time. This could be achieved through multi-method laboratory studies that videotape group interactions at multiple measurement points over several weeks (e.g., Leckelt et al., 2015). Thereby, more objective measures of leadership emergence, such as quantifying omitted influence (e.g., speaking time, correspondence between individual and group solution), and of leadership effectiveness, such as objective criteria of group performance (e.g., decision-making speed, quality of the group solution), may be included. Future research may also complement continuous assessments in real-life teams operating in natural environments (e.g., educational, sport, and business contexts; Wrzus & Mehl, 2015). To this end, ambulatory assessment methods such as daily-diary methods or interaction-based experience sampling may be appropriate (Harari et al., 2016; Larson & Csikszentmihalyi, 2014; see also Leckelt et al., 2019). This would help to demonstrate the robustness of the present findings across extended time periods, natural settings, and objective measures of leadership emergence and effectiveness.

Fourth, whereas a pattern of divergent main effects between personality traits and leadership outcomes emerged in the leadership literature, there are also some contradictory findings to this pattern (e.g., Badura et al., 2022; A. B. Blake et al., 2022; Ensari et al., 2011; Judge et al., 2002), which suggests that there may be moderators at play affecting these personality-leadership relationships. The present study contributes to our understanding of the processes by which personality is related to leadership outcomes, facilitating to identify such moderators. These moderators can intervene at any stage of the mediation process and strengthen or weaken specific links in personality-leadership pathways (e.g., Grosz et al., 2020; see also Tett & Burnett, 2003). For example, the present study was conducted in virtual groups due to restrictions of the COVID-19 pandemic. This online context may have influenced the expression of personality traits in behaviors. For instance, the expression of low emotional stability in nervous behaviors may be reduced when there is less confrontative face-to-face interaction. In terms of the link between behaviors and impressions, some information may be lost due to limitations in video and audio quality. Also, the evaluation of evoked impressions

may have been impacted. For example, impressions of trustworthiness may be more positively evaluated in virtual groups, in which a strong foundation of trust becomes crucial to facilitate effective group processes (Breuer et al., 2016). Future research may thus examine the replicability of the present findings in face-to-face groups and move on to other promising contextual moderators. For example, considering the trend of increasingly volatile, uncertain, complex, and ambiguous organizational environments (Bennett & Lemoine, 2014), it seems fruitful to investigate how such dynamic and crisis-driven contexts may affect the behavioral-perceptual pathways linking personality traits with leadership outcomes (see also De Hoogh et al., 2005). Here, task-focus and assertiveness as well as resilient behavior and calmness could become more important due to the need for quick and decisive actions while maintaining a level head in stressful situations. In comparison, member-focus and trustworthiness may be pushed to the background (e.g., Stoker et al., 2019). Understanding how contextual moderators influence the behavioral-perceptual pathways is also important for tailoring leader selection and development procedures to a team's and organization's surrounding factors.

3.2.5.4 Conclusion. The present study underlines the potential of integrating leadership process models with process models of personality and behavioral personality science to unravel the puzzling impacts of personality traits on leadership outcomes.

3.2.6 References

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4. Zooming-in on Effective Vocational Behaviors in Rapidly Changing Business Environments

4.1 Associations Between the Implementation of Telework Strategies and Job Performance: Moderating Influences of Boundary Management Preferences and Telework Experience

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Abstract. Boosted by the COVID-19 pandemic, more than ever, an organization's success depends on its teleworkers' performance. However, little attention has been paid to the individual strategies implemented by teleworkers to achieve goals such as drawing boundaries between work- and private-life, working task-oriented and productively, and keeping social contact. We collected quantitative survey data of 548 teleworkers indicating their implementation of 85 telework strategies derived from scientific literature and popular media (e.g., working in a separate room, wearing work clothes at home), self-reported job performance, boundary management preferences, and telework experience. We identified (a) the implementation of telework strategies, (b) associations with job performance, (c) divergences between the implementation and the performance association, and (d) moderating influences of boundary management preferences and telework experience. The results suggest that the most implemented telework strategies tend to be the ones most positively associated with job performance. These telework strategies serve goals related to working task-oriented and productively by adopting a conducive work attitude as well as keeping social contact by using modern communication technology rather than goals related to drawing boundaries between work- and private-life. The findings underscore the benefits of expanding a narrow focus on telework strategies stemming from boundary theory to unravel telework strategies' puzzling impacts on (tele-) work outcomes. Also, taking a person-environment fit perspective appeared to be a promising approach to tailor evidence-based best practice telework strategies to teleworkers' individual preferences and needs (boundary management preferences and telework experience).

Keywords. Telework, telework strategies, job performance, boundary theory, boundary management preferences, telework experience, person-environment fit.

Open Science Statement. The data, codebook, R-script, and supplementary results are made transparent on the open science framework: https://osf.io/gqpdf/.

4.1.1 Introduction

Teleworking has become a popular work mode (Allen et al., 2015) and its prevalence has recently been further boosted by the COVID-19 pandemic (Kniffin et al., 2021; Kramer & Kramer, 2020; Milasi et al., 2021; Rudolph et al., 2021). Thus, more than ever before, an organization's success depends on its teleworkers' performance and this trend is likely to continue due to demographic workforce changes, widespread distribution of information communication technology, as well as sustainability and work-life balance considerations (Athanasiadou & Theriou, 2021).

Some exploratory qualitative research (e.g., Basile & Beauregard, 2016; Fonner & Stache, 2012) has identified telework strategies, that is, individual strategies teleworkers implement when organizing their telework, that might impact work outcomes such as job performance. Also, the popular media is full of telework strategies (often referred to as "tips and tricks for working from home") that are suggested to enhance job performance. Examples of such telework strategies are using a separate room for teleworking or wearing work clothes at home. With this study, we respond to multiple calls for research on the differential impacts of the implementation of telework strategies on (tele-) work outcomes and potentially moderating factors (Allen et al., 2021; Rudolph et al., 2021; see also Binnewies et al., 2020). More specifically, we address blank spots of previous research on telework strategies by providing empirical evidence on (a) how much telework strategies are implemented, (b) how the implementation of telework strategies is associated with job performance, (c) divergences between the telework strategies' implementation and association with job performance, and (d) how the association between the implementation of telework strategies and job performance is moderated by teleworker characteristics such as boundary management preferences and telework experience.

Overall, this study advances the young literature on telework strategies by demonstrating that extending a narrow focus on telework strategies stemming from boundary theory (Ashforth et al., 2000; Nippert-Eng, 1996) with telework strategies focusing on goals such as working productively (e.g., Greer & Payne, 2014) by adopting a conducive work attitude and keeping social contact (e.g., Kowalski & Swanson, 2005) by using modern communication technology might be a fruitful avenue for research illuminating impacts of telework strategies on work outcomes. Also, taking a person-environment fit perspective (Edwards, 2008; Kristof, 1996), particularly boundary congruence/fit (Ammons, 2013; Kreiner, 2006), appeared to be a promising approach to identifying evidence-based best practice

telework strategies taking individual teleworker characteristics (boundary management preferences and telework experience) into account.

4.1.2 Theoretical Background

4.1.2.1 Implementation of Telework Strategies. *Telework* is a work practice enabling employees (*teleworkers*) to conduct all or a share of their work away from their on-site workplace, typically from home (Allen et al., 2015). Whereas numerous studies examined the impacts of teleworking (Gajendran & Harrison, 2007), such as reduced work-family conflict (e.g., Allen et al., 2013; Golden et al., 2006; Raghuram & Wiesenfeld, 2004), enhanced job performance (e.g., Bailey & Kurland, 2002; Bloom et al., 2015; Gajendran et al., 2015), and professional isolation (e.g., Baruch & Nicholson, 1997; Gainey & Kelley, 1999; Kurland & Cooper, 2002), little attention has been paid to the individual strategies teleworkers implement (*telework strategies*) when organizing their telework. These telework strategies may serve different goals such as drawing boundaries between work- and private-life (e.g., Basile & Beauregard, 2016; Fonner & Stache, 2012; Golden, 2021, see also Allen et al., 2021, calling for research), working task-oriented and productively (e.g., Greer & Payne, 2014; Troll et al., 2022), and keeping social contact (e.g., Ilozor et al., 2001; Turetken et al., 2011).

Most research on telework strategies stems from *boundary theory* (Ashforth et al., 2000; Nippert-Eng, 1996) proposing that individuals follow idiosyncratic approaches (*boundary management strategies*) to establish or dismantle boundaries in order to organize transitions between their work- and private-life. In an interview-based landmark study, Kreiner et al. (2009) distinguished four categories of boundary management strategies implemented by priests: Physical (manipulating physical space/items, e.g., setting up a separate workstation), temporal (manipulating time, e.g., setting work/non-work times), behavioral (inter alia establishing technological routines, e.g., not taking work-related calls after hours), and communicative (setting expectations and making arrangements, e.g., confronting boundary violators) boundary management strategies. Basile and Beauregard (2016) applied boundary management strategies to the telework context, in which boundaries between work- and private-life are particularly prone to blur. They found qualitative evidence for the implementation of physical (e.g., mimicking the physical boundary of an on-site office at home), temporal (e.g., establishing set times to finish the workday at home), behavioral (e.g., recreating technological routines of stationary work to ending up the workday at home), and communicative (e.g., making arrangements with household members facilitating undisturbed work at home) telework strategies. Other qualitative studies found similar telework strategies to be implemented (Allen et al., 2021; Fonner & Stache, 2012; Mustafa, 2010; Mustafa & Gold,

2013; Myrie & Daly, 2009; Nansen et al., 2010; Tietze, 2002; Tietze & Musson, 2003). First quantitative studies provide initial evidence on boundary related (telework) strategies' global (Kossek et al., 2006; Wepfer et al., 2018) and differentiated level of implementation (differentiating between the aforementioned categories; Binnewies et al., 2020; Haun et al., 2022; Park et al., 2020) along with impacts on outcomes such as family-to-work conflict, recovery experiences, and well-being.

Whereas most studies embedded telework strategies in the framework of boundary theory, Greer and Payne (2014) identified complementing telework strategies by asking 86 high-performing teleworkers to freely recall telework strategies facilitating task-oriented and productive telework. Keeping connected with colleagues, supervisors, and customers (e.g., being accessible via various communication channels), using modern technologies (e.g., using a technological setup at home close to the on-site setup), and showing a conducive work attitude (e.g., adopting a work-oriented mindset) were frequently mentioned. Taking a quantitative approach, Troll et al. (2022) recently found telework strategies related to self-control (Duckworth et al., 2014), in particular, altering somatic conditions (optimizing the physical state to work productively, e.g., sleeping sufficiently) and autonomous motivation (motivating oneself to start and endure work tasks), to be frequently implemented and associated with working productively among 106 teleworkers.

Furthermore, some research has found telework strategies related to keeping social contact (e.g., seeking social interaction; Kowalski & Swanson, 2005) to be associated with job satisfaction (Ilozor et al., 2001), knowledge sharing (Golden & Raghuram, 2010), and the reduction of social isolation (Mann et al., 2000). In a similar vein, building on media richness theory (MRT; Daft & Lengel, 1986), Turetken et al. (2011) examined the impacts of telework strategies related to communication media richness (i.e., the extent to which a medium approximates face-to-face communication).

Overall, mainly qualitative approaches were used to identify telework strategies stemming from different theoretical frameworks and pursuing different goals, particularly establishing boundaries between work- and private-life (Basile & Beauregard, 2016; Binnewies et al., 2020; Fonner & Stache, 2012; Golden, 2021; Haun et al., 2022; Kossek et al., 2006; Kreiner et al., 2009; Myrie & Daly, 2009; Nansen et al., 2010; Nippert-Eng, 1996; Park et al., 2020; Tietze, 2002; Tietze & Musson, 2003; Wepfer et al., 2018), but also working task-oriented and productively (Greer & Payne, 2014; Troll et al., 2021), and keeping social contact (Golden & Raghuram, 2010; Ilozor et al., 2001; Kowalski & Swanson, 2005; Mann et al., 2000; Turetken et al., 2011). Whereas qualitative approaches are suited to exploratively

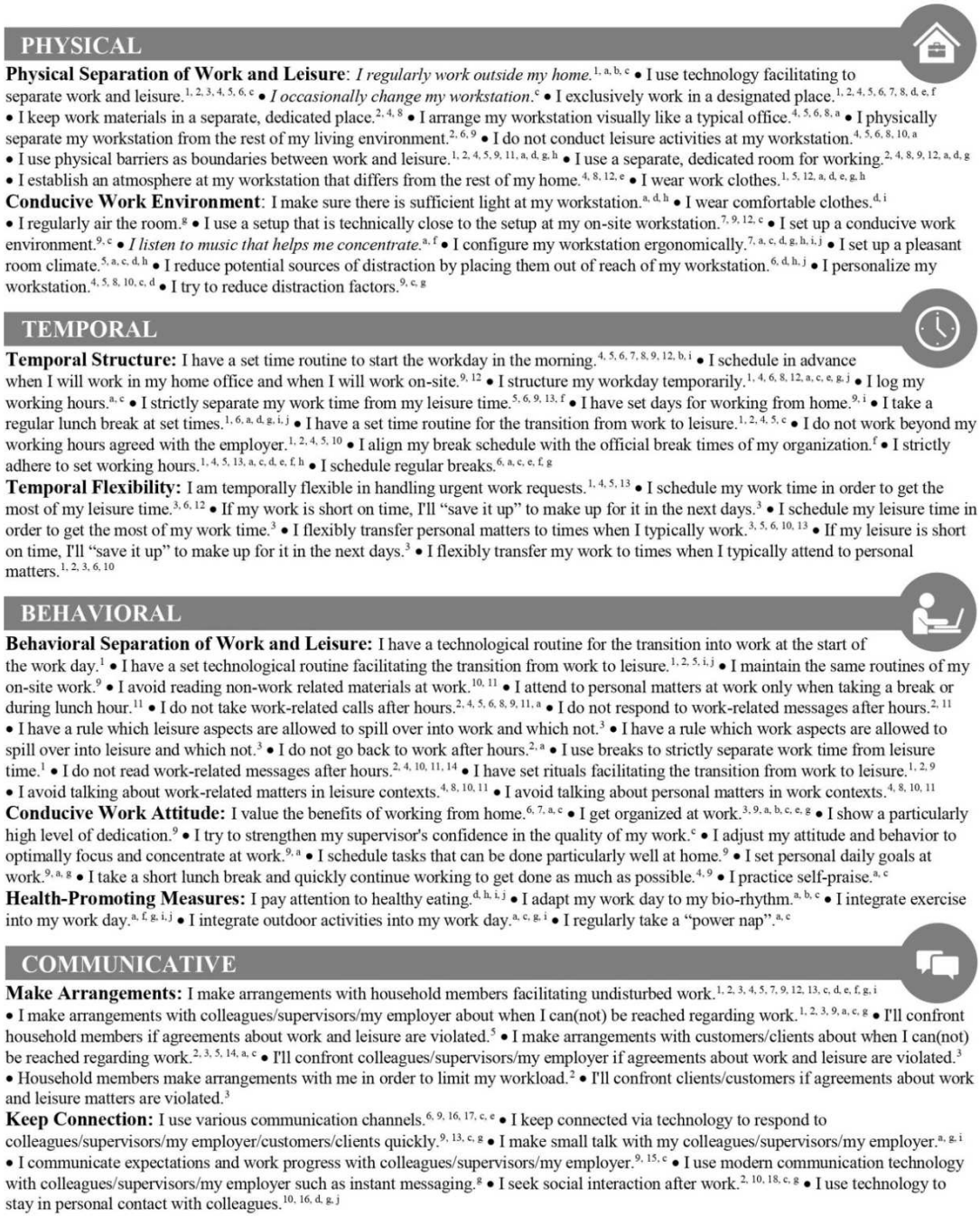
identify telework strategies, they come with limitations that can be targeted by quantitative approaches: First, participants might forget to mention implemented telework strategies. Second, the binary classification of (not) implementing a telework strategy does not display gradual differences. Both aspects impede the identification of the impacts of implementing telework strategies. Quantitative research, however, is scarce and has either been conducted outside the telework context (Binnewies et al., 2020; Wepfer et al., 2018), or has placed a narrow focus on a specific facet of telework strategies, namely, telework strategies related to boundary management (Haun et al., 2022), to self-control (Troll et al., 2022), or to keeping social contact (Golden & Raghuram, 2010; Ilozor et al., 2001; Kowalski & Swanson, 2005; Mann et al., 2000; Turetken et al., 2011). Also, previous research reported results solely on an aggregated level differentiating between broad telework strategy categories.

With this study, we advance the young literature on telework strategies by (a) quantitatively examining a comprehensive set of 85 telework strategies stemming from different theoretical streams and pursuing different goals, and (b) thereby conducting analyses on both an aggregated category level to identify overarching patterns (Binnewies et al., 2020; Haun et al., 2022; Troll et al., 2022), and on an individual telework strategy level to draw highly resolved, zoomed-in inferences. To paint a comprehensive picture, we complement telework strategies derived from the scientific literature with telework strategies from popular media (see Figure 4.1.1). Online practical guides on telework strategies have flourished during the COVID-19 pandemic and many teleworkers have presumably been searching for advice.

4.1.2.2 Associations Between Telework Strategies and Job Performance. There is initial evidence that the implementation of telework strategies is associated with outcomes such as well-being, recovery, satisfaction, knowledge sharing, and reduced isolation (Binnewies et al., 2020; Golden & Raghuram, 2010; Haun et al., 2022; Ilozor et al., 2001; Mann et al., 2000; Park et al., 2020; Wepfer et al., 2018). However, we know little about how the implementation of telework strategies is related to job performance. For instance, Binnewies et al. (2020) call for research on the consequences of boundary management strategies for job performance. Rudolph et al. (2021, p. 13) call for research on telework strategies and state that “it would be useful to have empirical information on the efficacy”. Allen et al. (2021, p. 81) conclude that “additional work is needed that provides guidance concerning the effectiveness of various strategies”.

Figure 4.1.1

Overview of Telework Strategies



Note. Telework strategies in italics were recoded. Telework strategies extracted from scientific literature (popular media) were indicated with numbers (letters). [1]Fonner & Stache (2012); [2]Basile & Beauregard (2016); [3]Kreiner et al. (2009); [4]Mustafa & Gold (2013); [5]Myrie & Daly (2009); [6]Nansen et al. (2010); [7]Kowalski & Swanson (2005); [8]Mustafa (2010); [9]Greer & Payne (2014); [10]Wepfer et al. (2018); [11]Kossek et al. (2006); [12]Tietze (2002); [13]Tietze & Musson (2003); [14]Park et al. (2020); [15]Ilozor et al. (2001); [16]Golden & Raghuram (2010); [17]Turetken et al. (2011); [18]Mann et al. (2000). [a]Mai (n.d.); [b]Prophet (2017); [c]Schulz (2020); [d]Cobler (n.d.); [e]Stross (n.d.); [f]Westdeutsche Zeitung (2020); [g]Flatley (2020); [h]Vollmer (2018); [i]Unger (2020); [j]Rewe (n.d.).

Kossek et al. (2006) provide initial evidence that boundary related telework strategies' global implementation might not be associated with job performance. Greer and Payne (2014) provide first hints on telework strategies freely-recalled by high performers (in particular keeping connected, using modern technology, showing a conducive work attitude) that might be positively associated with job performance. However, to reliably identify telework strategies associated with job performance, the inclusion of low performers is needed to (a) rule out that low performers use the same telework strategies as high performers, (b) identify telework strategies that might deteriorate job performance, and (c) make use of the full job performance range facilitating to detect significant associations by mitigating range restrictions. Troll et al. (2022) found self-control telework strategies related to autonomous motivation and somatic condition to be unique positive predictors of job performance. Turetken et al. (2011) found a positive association between telework strategies related to communication media richness and self-reported job performance.

In this study, we examine associations of a broad set of highly resolved telework strategies with job performance to paint a comprehensive, fine-grained picture. As we examine both the implementation of telework strategies and their association with job performance, this also offers the possibility to examine whether teleworkers have an intuitive understanding of telework strategies' relation to job performance, that is, whether telework strategies that are more (less) associated with job performance are implemented more (less). In particular, telework strategies can then be identified that are "under (over) implemented", that is, that are implemented less (more) frequently than they actually should be according to their high (low) association with job performance.

4.1.2.3 Moderating Influences of Boundary Management Preferences and Telework Experience. It is crucial to understand which telework strategies might be more or less strongly related to job performance for specific groups of employees sharing common characteristics (see also Binnewies et al., 2020, calling for research on moderators of boundary management strategies) to provide advice or training interventions tailored to employees' individual preferences and needs (see also Kossek, 2016). Following *person-environment fit approaches* (P-E fit; Edwards, 2008; Kristof, 1996; see also Arthur Jr. et al., 2006), a (mis-) match between person and environment induces additional effects beyond the respective separate main effects. More specifically, the preferences/needs-supplies fit considers individual preferences and needs (here related to boundary management preferences and telework experience) and environmental supplies (here related to telework strategies) interacting to predict work outcomes (here job performance).

Boundary management preferences represent the degree to which employees prefer to separate (versus integrate) work- and private-life (Ashforth et al., 2000; Kreiner, 2006): Whereas employees leaning toward separation ("separators") aim to draw rigorous boundaries, employees leaning toward integration ("integrators") aim to remove boundaries. Individual boundary management preferences are crucial in telework contexts (Allen et al., 2021; Kerman et al., 2021; Kossek et al., 2006) because borders between work- and private-life are particularly prone to blur. Following P-E fit approaches, telework strategies congruent with individual boundary management preferences may be particularly beneficial to job performance because a fit between individual preferences and needs, and the environment is achieved. Thus, telework strategies aligned to separating work- and private-life (e.g., not working beyond agreed hours) might be more beneficial for separators, whereas telework strategies aligned to integrating work- and private-life (e.g., being flexible in handling work requests) might be more beneficial for integrators. This reasoning is supported by the *boundary congruence approach* (Kreiner, 2006) combining the P-E fit approach (Edwards, 2008; Kristof, 1996) with boundary theory (Ashforth et al., 2000; Nippert-Eng, 1996). Following the boundary congruence approach, a (mis-)fit (*boundary congruence* versus *boundary incongruence*) between individual boundary management preferences and environmental boundary influences such as workplace policies and conditions induces additional effects beyond the respective separate main effects (see Chen et al., 2009, Kreiner, 2006, Rothbard et al., 2005, for initial evidence on positive impacts of boundary congruence on outcomes such as reduced work-family conflict, higher job satisfaction, and commitment). In a similar vein, the *boundary fit approach* (Ammons, 2013) proposes that a (mis-) match (*boundary fit* versus *boundary misfit*) between individual boundary management preferences and boundary enactments (actual borders that individuals establish to separate work- and private-life) induces additional effects beyond the respective separate main effects (see Haun et al., 2022). In this study, we, for the first time, explore interaction effects related to boundary congruence/fit predicting job performance, whereby telework strategies might be either seen as environmental boundary influences or actual boundary enactments. During the COVID-19 pandemic, many employees were sent to the home office without choice (Kniffin et al., 2021) providing a unique opportunity to investigate moderating influences of boundary management preferences by mitigating self-selection effects: Typically, separators tend to prefer stationary on-site work over telework because telework is to some extent inherently incongruent with the preference to separate work- and private-life (Shockley & Allen, 2010).

The COVID-19 pandemic also provides the opportunity to examine moderating influences of the individual level of telework experience as many employees who have had little experience with telework migrated to the home office (Kramer & Kramer, 2020; Milasi et al., 2021). The wide range of experience levels allows us to examine moderating influences without self-selection biases and range restrictions. Following the P-E fit approach, teleworkers with low experience might have different needs than teleworkers with high experience so telework strategies might be differently beneficial for job performance. For instance, telework strategies providing structure (e.g., maintaining routines of the on-site stationary work) might be more beneficial for unexperienced teleworkers, whereas telework strategies demanding adaptivity (e.g., flexibly transferring work to times designated for personal matters) might be more beneficial for experienced teleworkers.

4.1.2.4 Present Study. With this study, we shed light on the individual ways teleworkers organize their work processes to achieve different goals, in particular, drawing boundaries between work- and private-life, working task-oriented and productively, and keeping social contact. We aim to better understand (research question 1; RQ 1) the implementation of telework strategies, (RQ 2) associations with job performance, (RQ 3.1, 3.2) divergences between the implementation and association with job performance, and (RQ 4.1, 4.2) moderating influences of boundary management preferences and telework experience building on P-E fit theory. For this purpose, we collected survey data from 548 teleworkers assessing the implementation of 85 highly resolved telework strategies (see Figure 4.1.1), self-reported job performance, boundary management preferences, and telework experience. Due to the novelty and explorative nature of this research topic, and because this study was not preregistered, we do not formulate hypotheses but more open research questions:

- RQ 1: How much are telework strategies implemented?
- RQ 2: How is the individual implementation of telework strategies associated with job performance?
- RQ 3.1/3.2: How is the telework strategies' average implementation associated with the telework strategies' association with job performance?/How does the telework strategies' relative average implementation diverge from their relative association with job performance?
- RQ 4.1/4.2: How is the association between the individual implementation of telework strategies and job performance moderated by boundary management preferences/telework experience?

4.1.3 Method

4.1.3.1 Sample. Our final sample consists of 548 German-speaking teleworkers[35] (336 women) from various sectors (the most represented are 16.61% IT, telecommunication, media; 11.13% health and social services; 9.85% research and development) and professions (the most represented are 48.18% highly skilled and 29.38% skilled employees). We recruited participants via posting the online survey in online professional (LinkedIn, Xing) and social (Facebook) network groups without offering compensation. Participants on average spend most of their weekly working days teleworking ($M = 3.85$, $SD = 1.33$). The average age is 39.91 ($SD = 11.63$). Most participants (339, 71.72%) hold a bachelor's degree or higher. Participants have extensive years of work experience ($M = 15.52$, $SD = 11.92$) and their weekly contractual working hours ($M = 35.77$, $SD = 7.42$) are similar to the weekly working hours of German full-time employees. Data collection took place between July and December 2020 and thus, started five months after the onset of the COVID-19 pandemic declared by the World Health Organization. This should ensure that teleworkers who had been teleworking for the first time due to the pandemic have had the opportunity to develop telework strategies (Lally et al., 2010). For an overview of the survey structure and assessed variables see the Codebook at https://osf.io/gqpdf/.

4.1.3.2 Measures.

4.1.3.2.1 Telework Strategies. We originally extracted 157 telework strategies from scientific literature (Basile & Beauregard, 2016; Fonner & Stache, 2012; Golden & Raghuram, 2010; Greer & Payne, 2014; Ilozor et al., 2001; Kossek et al., 2006; Kowalski & Swanson, 2005; Kreiner et al., 2009; Mann et al., 2000; Mustafa, 2010; Mustafa & Gold, 2013; Myrie & Daly, 2009; Nansen et al., 2010; Park et al., 2020; Tietze, 2002; Tietze & Musson, 2003; Turetken et al., 2011; Wepfer et al., 2018)[36] and added 179 telework strategies from popular media (Cobler, n.d.; Flatley, 2020; Mai, n.d.; Prophet, 2017; Rewe, n.d.; Schulz, 2020; Stross, n.d.; Unger, 2020; Vollmer, 2018; Westdeutsche Zeitung, 2020) to get a comprehensive selection of highly resolved telework strategies. We extracted telework strategies from popular media by reviewing the ten first listed websites of a Google search using the keyword "home office tips" (in German). After eliminating redundant telework strategies and exotic telework strategies from popular media (e.g., playing online casino to revive attention; Westdeutsche

[35] From 1406 participants who started the online survey, we excluded 812 participants without sufficient responses, 22 participants without sufficient German skills, 18 participants without telework experience, three participants who did not respond seriously, and three students as we aimed for a permanently employed working sample.
[36] As Troll et al. (2022), Golden (2021), and Haun et al. (2022) were published after our data collection, we could not derive telework strategies from these sources.

Zeitung, 2020), we finally included 85 distinct telework strategies in our online survey (see Figure 4.1.1). Whenever necessary, we translated the telework strategies into German and reformulated them into questionnaire items (e.g., the physical telework strategy "recreating the physical boundary of an office environment by designating areas for work activities" reported in Basile & Beauregard, 2016, p. 106, was transformed into the item "I physically separate my workstation from the rest of my living environment."). Participants indicated the extent to which they implement telework strategies on a 6-point Likert scale ranging from 1 (*not at all*) to 6 (*completely*). Participants could also indicate not being aware of a particular telework strategy leading to missing values. However, the implementation of telework strategies was answered by most participants for each telework strategy (M = 534.49, SD = 23.25, Min = 420, Max = 548).

To enhance the comparability of our results with previous research and to identify overarching patterns on a higher aggregated level, we categorized the 85 telework strategies into physical, temporal, behavioral, and communicative superordinate categories (see Basile & Beauregard, 2016; Kreiner et al., 2009). Because telework strategies within the respective assigned superordinate categories were still heterogeneous, we simultaneously distinguished nine subordinate categories (e.g., "physical separation of work and leisure" and "conducive work environment" within the superordinate physical category; see Figure 4.1.1). Following guidelines for exploratory analyses (Miller, 1995) Cronbach's alpha was acceptable for all superordinate ($.66 \leq \alpha \leq .84$) and subordinate categories ($.56 \leq \alpha \leq .84$), except for temporal flexibility ($\alpha = .56$; see Table 4.1.1). Three telework strategies ("I regularly work outside my home.", "I occasionally change my workstation." within physical separation of work and leisure; "I listen to music that helps me concentrate." within conducive work environment) needed to be recoded as they were negatively correlated with the respective subordinate categories' overall score.

4.1.3.2.2 Job Performance. Participants were instructed that the assessment of job performance refers to their job performance when teleworking. Self-reported job performance ($\alpha = .70$, M = 4.13, SD = 0.52) was assessed using three items translated into German ("How would you rate your job performance as an individual employee?", "Think about your most recent assessment of your job performance or the most recent time you received feedback from your supervisor. How do you think your supervisor would rate your performance?", "How would you rate your performance as a work team member?"; Bal & De Lange, 2015). Participants responded on a 5-point Likert scale ranging from 1 (*very poor*) to 5 (*excellent*). Participants could indicate "not applicable" on the item referring to their team performance.

Nineteen participants aborted the survey before reporting their job performance leading to missing values. Even though self-reported job performance measures have limitations they substantially overlap with supervisor ratings (e.g., Heidemeier & Moser, 2009).

4.1.3.2.3 Boundary Management Preferences. Inspired by Kossek et al. (2006), we presented participants the following prompt translated into German: "With the increasing demands of work and home, employees may work in different ways to handle these demands." We then measured gradual interindividual differences in boundary management preferences with the item: "All in all, do you currently see yourself as someone who tries to keep work and personal roles separated most of the time or someone who tries to keep them integrated?" Participants responded on a 6-point Likert scale ranging from 1 (*I prefer to separate the roles*) to 6 (*I prefer to integrate the roles*). We recoded responses so that higher scores indicate preferences for separation ($M = 3.76$, $SD = 1.67$). Sixteen participants aborted the online survey before reporting their boundary management preferences leading to missing values. In the following, we use the terms *integrators*/*separators* to refer to individuals relatively lower/higher on the continuous dimension of boundary management preferences.

4.1.3.2.4 Telework Experience. Gradual interindividual differences in telework experience ($M = 4.08$, $SD = 1.67$) were assessed with the item "How experienced are you with teleworking?" translated into German. Participants responded on a 6-point Likert scale ranging from 1 (*completely unexperienced*) to 6 (*completely experienced*). Twenty-four participants aborted the online survey before reporting their telework experience leading to missing values. In the following, we use the terms *unexperienced*/*experienced* teleworkers to refer to individuals relatively lower/higher on the continuous dimension of telework experience.

4.1.3.3 Analytical Approach. We used the statistical program R (version 4.1.0; R Core Team, 2018) and the interface RStudio (version 1.2.5042; RStudio Team, 2016) for all analyses. The data and statistical code can be found in the Online Supplement at https://osf.io/gqpdf/. To identify broader patterns of results on a higher aggregated level, we summarized all appropriate results for super- and subordinate categories of telework strategies by computing (weighted) means.

To answer the question of how much telework strategies are implemented, we computed the means of the individual implementation of each of the 85 telework strategies. We then computed 85 multiple linear regressions of the individual implementation of each telework strategy on job performance. We included boundary management preferences and telework experience as additional predictors in each multiple linear regression to examine their interaction effects with telework strategies on job performance. We also included control

variables (e.g., Binnewies et al., 2020; Troll et al., 2021), that is, basic demographic (age, gender) and situational aspects (living space in m^2, $M = 109.87$, $SD = 50.16$; living with children, $M = .25$, $SD = .43$). Job performance and all predictor variables were *z*-scaled, except for the dummy-coded variables gender (0/1 = female/male) and living with children (0/1 = no/yes). We answer the question of how the individual implementation of telework strategies is associated with job performance based on the β-coefficients of the telework strategies on job performance. We answer the questions of the moderation effects of boundary management preferences and telework experience, respectively, on the association between telework strategies and job performance based on the β-coefficients corresponding to these interaction effects in the multiple linear regressions.

To examine how the telework strategies' average implementation is associated with the telework strategies' association with job performance, we correlated the 85 means of the implementation of the telework strategies with the 85 β-coefficients of the telework strategies on job performance in the outlined multiple linear regressions. To answer the question of how the telework strategies' relative implementation diverges from their relative association with job performance, we computed differences between a telework strategy's *z*-scaled implementation and a telework strategy's *z*-scaled β-coefficient on job performance in the outlined multiple linear regressions.

4.1.4 Results

The results of all research questions except RQ 3.1 are summarized in Table 4.1.1 (see Appendix 4.1.A for a corresponding table including information on standard deviations of the implementation of telework strategies, bivariate correlations between telework strategies and job performance, further regression coefficients (intercept, boundary management preferences, telework experience, and control variables), R^2, R^2_{Adjusted}, and results of the *F*-test).

Table 4.1.1

Telework Strategies' Implementation, Multiple Linear Regression Results of Telework Strategies and Interaction Effects with Boundary Management Preferences and Telework Experience Predicting Job Performance, and Divergences Between Telework Strategies' Implementation and Association With Job Performance

Telework strategy	*M*	β_T	$\beta_{T \times BMP}$	$\beta_{T \times TE}$	$\Delta M, \beta_T$
Physical (α = .84)	3.95 [3.80, 4.10]	0.07 [-0.02, 0.16]	-0.01 [-0.10, 0.07]	-0.02 [-0.11, 0.07]	-0.22
Physical separation of work and leisure (α = .83)	3.81 [3.64, 3.97]	0.07 [-0.03, 0.16]	0.00 [-0.08, 0.09]	-0.03 [-0.12, 0.05]	-0.09
I regularly work outside my home.	5.39 [5.30, 5.49]	0.09 [-0.01, 0.19]	0.08 [-0.01, 0.17]	**-0.12** [-0.22, -0.02]	-1.75
I use technology facilitating to separate work and leisure.	4.65 [4.51, 4.80]	**0.11** [0.01, 0.20]	0.02 [-0.07, 0.11]	0.02 [-0.07, 0.10]	-0.65
I occasionally change my workstation.	4.57 [4.43, 4.71]	**0.10** [0.01, 0.19]	0.05 [-0.04, 0.13]	0.00 [-0.09, 0.08]	-0.67
I exclusively work in a designated place.	4.51 [4.37, 4.64]	**0.14** [0.05, 0.23]	0.01 [-0.08, 0.09]	0.01 [-0.07, 0.09]	-0.07
I keep work materials in a separate, dedicated place.	4.46 [4.32, 4.60]	0.07 [-0.02, 0.17]	0.00 [-0.09, 0.08]	-0.06 [-0.15, 0.02]	-0.79
I arrange my workstation visually like a typical office.	3.68 [3.52, 3.83]	0.06 [-0.03, 0.15]	-0.03 [-0.11, 0.05]	**-0.09** [-0.18, 0.00]	0.02
I physically separate my workstation from the rest of my living environment.	3.57 [3.40, 3.74]	0.03 [-0.07, 0.12]	-0.02 [-0.11, 0.06]	0.03 [-0.06, 0.12]	-0.24
I do not conduct leisure activities at my workstation.	3.39 [3.24, 3.53]	**0.12** [0.02, 0.21]	-0.04 [-0.13, 0.04]	-0.04 [-0.12, 0.04]	0.95
I use physical barriers as boundaries between work and leisure.	3.27 [3.10, 3.44]	0.00 [-0.10, 0.10]	-0.03 [-0.11, 0.06]	-0.01 [-0.10, 0.08]	-0.19
I use a separate, dedicated room for working.	3.21 [3.03, 3.40]	0.01 [-0.09, 0.10]	-0.03 [-0.12, 0.06]	-0.01 [-0.09, 0.08]	-0.05
I establish an atmosphere at my workstation that differs from the rest of my home.	2.58 [2.44, 2.73]	0.05 [-0.04, 0.15]	0.00 [-0.09, 0.09]	-0.05 [-0.14, 0.03]	1.23
I wear work clothes.	2.37 [2.23, 2.50]	0.02 [-0.07, 0.11]	0.06 [-0.03, 0.15]	-0.06 [-0.15, 0.03]	1.10
Conducive work environment (α = .62)	4.11 [3.97, 4.24]	0.07 [-0.02, 0.16]	-0.03 [-0.11, 0.06]	0.00 [-0.09, 0.08]	-0.36
I make sure there is sufficient light at my workstation.	5.40 [5.32, 5.48]	0.06 [-0.03, 0.15]	-0.07 [-0.15, 0.01]	-0.06 [-0.15, 0.03]	-2.02
I wear comfortable clothes.	5.37 [5.29, 5.45]	**0.14** [0.05, 0.22]	-0.06 [-0.15, 0.02]	**-0.10** [-0.19, -0.01]	-1.19
I regularly air the room.	4.98 [4.88, 5.09]	0.03 [-0.06, 0.11]	-0.05 [-0.13, 0.03]	0.00 [-0.09, 0.10]	-1.94
I use a setup that is technically close to the setup at my on-site workstation.	4.84 [4.72, 4.96]	**0.15** [0.06, 0.25]	-0.07 [-0.16, 0.02]	0.06 [-0.02, 0.14]	-0.36
I set up a conducive work environment.	4.33 [4.21, 4.45]	**0.16** [0.07, 0.25]	-0.07 [-0.15, 0.01]	0.06 [-0.02, 0.15]	0.30
I listen to music that helps me concentrate.	4.22 [4.06, 4.37]	0.05 [-0.04, 0.14]	**0.10** [0.01, 0.18]	-0.04 [-0.12, 0.05]	-0.74
I configure my workstation ergonomically.	4.08 [3.93, 4.23]	0.02 [-0.07, 0.12]	-0.04 [-0.12, 0.04]	-0.01 [-0.09, 0.08]	-0.89
I set up a pleasant room climate.	3.82 [3.68, 3.95]	0.06 [-0.03, 0.15]	0.03 [-0.05, 0.12]	-0.02 [-0.10, 0.07]	-0.18
I reduce potential sources of distraction by placing them out of reach of my workstation.	2.88 [2.75, 3.02]	0.06 [-0.03, 0.15]	-0.02 [-0.11, 0.06]	0.00 [-0.09, 0.08]	0.91
I personalize my workstation.	2.71 [2.56, 2.86]	-0.03 [-0.12, 0.05]	-0.02 [-0.11, 0.07]	0.07 [-0.02, 0.15]	0.11
I try to reduce distraction factors.	2.57 [2.45, 2.70]	**0.12** [0.03, 0.21]	-0.01 [-0.09, 0.08]	0.00 [-0.09, 0.08]	2.00
Temporal (α = .66)	3.61 [3.46, 3.76]	0.03 [-0.06, 0.12]	-0.01 [-0.09, 0.08]	-0.03 [-0.12, 0.06]	-0.23
Temporal structure (α = .80)	3.65 [3.50, 3.81]	0.05 [-0.04, 0.15]	0.01 [-0.07, 0.10]	-0.05 [-0.13, 0.04]	-0.03
I have a set time routine to start the workday in the morning.	4.80 [4.68, 4.92]	0.02 [-0.07, 0.10]	-0.05 [-0.13, 0.03]	**-0.09** [-0.17, 0.00]	-1.82
I structure my workday temporarily.	4.51 [4.39, 4.63]	**0.18** [0.08, 0.27]	-0.07 [-0.16, 0.01]	-0.07 [-0.16, 0.01]	0.26

Telework strategy	*M*	β_T	$\beta_{T \times BMP}$	$\beta_{T \times TE}$	ΔM, β_T
I schedule in advance when I will work in my home office and when I will work on-site.	4.36 [4.22, 4.51]	0.09 [-0.01, 0.18]	0.00 [-0.09, 0.09]	0.02 [-0.06, 0.11]	-0.54
I log my working hours.	4.30 [4.13, 4.48]	**0.15** [0.06, 0.24]	0.08 [-0.01, 0.17]	-0.05 [-0.14, 0.04]	0.24
I strictly separate my work time from my leisure time.	4.07 [3.94, 4.20]	**0.22** [0.12, 0.31]	0.00 [-0.08, 0.09]	**-0.14** [-0.22, -0.05]	1.23
I have set days for working from home.	3.75 [3.58, 3.93]	0.02 [-0.07, 0.11]	-0.02 [-0.11, 0.06]	0.01 [-0.07, 0.10]	-0.52
I take a regular lunch break at set times.	3.70 [3.56, 3.85]	-0.03 [-0.12, 0.06]	-0.03 [-0.12, 0.05]	-0.03 [-0.11, 0.06]	-1.03
I have a set time routine for the transition from work to leisure.	3.38 [3.23, 3.53]	0.02 [-0.07, 0.11]	0.01 [-0.08, 0.09]	**-0.10** [-0.19, -0.02]	-0.13
I do not work beyond my working hours agreed with the employer.	3.15 [3.00, 3.29]	-0.02 [-0.11, 0.07]	**0.13** [0.05, 0.22]	-0.02 [-0.10, 0.07]	-0.20
I align my break schedule with the official break times of my organization.	2.82 [2.65, 2.99]	0.07 [-0.03, 0.16]	0.01 [-0.08, 0.10]	-0.04 [-0.13, 0.05]	1.07
I strictly adhere to set working hours.	2.64 [2.50, 2.78]	-0.01 [-0.10, 0.09]	0.05 [-0.04, 0.14]	-0.08 [-0.16, 0.01]	0.50
I schedule regular breaks.	2.29 [2.17, 2.41]	-0.04 [-0.13, 0.05]	0.03 [-0.06, 0.11]	0.02 [-0.07, 0.10]	0.56
Temporal flexibility (α = .56)	3.54 [3.40, 3.68]	-0.01 [-0.10, 0.08]	-0.03 [-0.12, 0.05]	0.00 [-0.08, 0.09]	-0.57
I am temporally flexible in handling urgent work requests.	4.79 [4.68, 4.90]	0.08 [-0.01, 0.18]	**-0.10** [-0.19, -0.01]	0.04 [-0.05, 0.12]	-1.10
I schedule my work time in order to get the most of my leisure time.	3.97 [3.85, 4.10]	-0.02 [-0.11, 0.06]	0.01 [-0.07, 0.10]	-0.01 [-0.10, 0.07]	-1.27
If my work is short on time, I'll "save it up" to make up for it in the next days.	3.65 [3.50, 3.79]	-0.05 [-0.14, 0.04]	-0.04 [-0.12, 0.05]	**-0.10** [-0.18, -0.01]	-1.20
I schedule my leisure time in order to get the most of my work time.	3.49 [3.36, 3.62]	**0.16** [0.08, 0.25]	**-0.08** [-0.16, 0.00]	0.00 [-0.08, 0.08]	1.33
I flexibly transfer personal matters to times when I typically work.	3.17 [3.04, 3.30]	**-0.15** [-0.24, -0.06]	-0.01 [-0.10, 0.07]	0.01 [-0.07, 0.10]	-1.74
If my leisure is short on time, I'll "save it up" to make up for it in the next days.	3.00 [2.87, 3.13]	0.00 [-0.08, 0.09]	0.02 [-0.06, 0.11]	-0.03 [-0.12, 0.06]	0.18
I flexibly transfer my work to times when I typically attend to personal matters.	2.68 [2.55, 2.81]	-0.07 [-0.17, 0.04]	-0.04 [-0.14, 0.05]	**0.09** [0.00, 0.18]	-0.19
Behavioral (α = .83)	3.87 [3.73, 4.01]	**0.10** [0.01, 0.19]	0.00 [-0.09, 0.08]	-0.03 [-0.11, 0.06]	0.19
Behavioral separation of work and leisure (α = .84)	3.69 [3.54, 3.85]	0.08 [-0.02, 0.17]	0.02 [-0.07, 0.10]	-0.06 [-0.14, 0.03]	0.15
I have a technological routine for the transition into work at the start of the work day.	5.11 [5.00, 5.22]	**0.15** [0.05, 0.24]	0.03 [-0.05, 0.12]	-0.08 [-0.16, 0.00]	-0.74
I have a set technological routine facilitating the transition from work to leisure.	4.89 [4.76, 5.02]	**0.14** [0.04, 0.25]	0.06 [-0.04, 0.15]	-0.03 [-0.12, 0.06]	-0.56
I maintain the same routines of my on-site work.	4.21 [4.09, 4.34]	**0.24** [0.15, 0.33]	0.02 [-0.06, 0.10]	**-0.22** [-0.30, -0.13]	1.32
I avoid reading non-work related materials at work.	3.88 [3.75, 4.01]	**0.15** [0.06, 0.25]	-0.01 [-0.09, 0.07]	-0.02 [-0.10, 0.06]	0.76
I attend to personal matters at work only when taking a break or during lunch hour.	3.82 [3.69, 3.96]	**0.17** [0.08, 0.26]	0.03 [-0.05, 0.12]	-0.06 [-0.15, 0.02]	1.00
I do not take work-related calls after hours.	3.73 [3.57, 3.89]	-0.01 [-0.10, 0.09]	0.03 [-0.06, 0.12]	-0.06 [-0.14, 0.03]	-0.80
I do not respond to work-related messages after hours.	3.62 [3.46, 3.78]	0.01 [-0.09, 0.11]	0.01 [-0.08, 0.10]	**-0.14** [-0.23, -0.05]	-0.48
I have a rule which leisure aspects are allowed to spill over into work and which not.	3.48 [3.33, 3.63]	**0.13** [0.04, 0.22]	0.02 [-0.06, 0.11]	0.09 [0.00, 0.17]	1.02
I have a rule which work aspects are allowed to spill over into leisure and which not.	3.47 [3.32, 3.62]	0.08 [-0.01, 0.17]	-0.02 [-0.11, 0.06]	-0.02 [-0.11, 0.07]	0.47
I do not go back to work after hours.	3.45 [3.31, 3.60]	0.03 [-0.06, 0.12]	0.04 [-0.05, 0.12]	-0.09 [-0.17, 0.00]	-0.07
I use breaks to strictly separate work time from leisure time.	3.32 [3.19, 3.46]	-0.03 [-0.12, 0.06]	-0.02 [-0.11, 0.06]	-0.02 [-0.11, 0.06]	-0.59
I do not read work-related messages after hours.	3.27 [3.11, 3.43]	0.03 [-0.07, 0.12]	0.00 [-0.09, 0.09]	**-0.14** [-0.23, -0.05]	0.10
I have set rituals facilitating the transition from work to leisure.	3.25 [3.10, 3.39]	0.04 [-0.05, 0.13]	0.03 [-0.05, 0.12]	-0.05 [-0.14, 0.03]	0.26
I avoid talking about work-related matters in leisure contexts.	2.98 [2.85, 3.10]	0.01 [-0.08, 0.11]	-0.02 [-0.11, 0.07]	-0.05 [-0.14, 0.04]	0.33
I avoid talking about personal matters in work contexts.	2.89 [2.77, 3.01]	0.00 [-0.09, 0.09]	0.02 [-0.06, 0.11]	0.03 [-0.05, 0.12]	0.29
Conducive work attitude (α = .65)	4.44 [4.32, 4,56]	**0.19** [0.10, 0.27]	-0.03 [-0.11, 0.05]	-0.02 [-0.10, 0.07]	0.46
I value the benefits of working from home.	5.28 [5.18, 5.38]	**0.13** [0.04, 0.22]	**-0.08** [-0.17, 0.00]	0.00 [-0.08, 0.08]	-1.15

Telework strategy	*M*	β_T	$\beta_{T \times BMP}$	$\beta_{T \times TE}$	ΔM, β_T
I get organized at work.	4.98 [4.88, 5.09]	**0.15** [0.06, 0.24]	-0.04 [-0.12, 0.04]	0.02 [-0.06, 0.10]	-0.58
I show a particularly high level of dedication.	4.78 [4.69, 4.88]	**0.43** [0.35, 0.51]	-0.05 [-0.12, 0.03]	-0.01 [-0.09, 0.07]	2.69
I try to strengthen my supervisor's confidence in the quality of my work.	4.78 [4.67, 4.88]	**0.26** [0.17, 0.35]	0.03 [-0.06, 0.11]	0.02 [-0.06, 0.11]	0.86
I adjust my attitude and behavior to optimally focus and concentrate at work.	4.70 [4.61, 4.80]	**0.31** [0.22, 0.39]	-0.05 [-0.12, 0.03]	-0.06 [-0.14, 0.02]	1.48
I schedule tasks that can be done particularly well at home.	4.61 [4.47, 4.74]	0.05 [-0.04, 0.14]	0.01 [-0.08, 0.10]	-0.06 [-0.15, 0.02]	-1.25
I set personal daily goals at work.	4.44 [4.32, 4.56]	**0.15** [0.06, 0.24]	-0.04 [-0.13, 0.04]	**-0.09** [-0.18, -0.01]	0.06
I take a short lunch break and quickly continue working to get done as much as possible.	3.31 [3.17, 3.44]	0.06 [-0.03, 0.14]	-0.02 [-0.10, 0.07]	-0.04 [-0.13, 0.04]	0.39
I practice self-praise.	3.06 [2.92, 3.20]	**0.14** [0.05, 0.23]	-0.03 [-0.11, 0.06]	0.07 [-0.02, 0.16]	1.63
Health-promoting measures (α = .61)	3.39 [3.25, 3.53]	0.01 [-0.08, 0.10]	-0.02 [-0.10, 0.06]	0.03 [-0.05, 0.12]	-0.22
I pay attention to healthy eating.	4.27 [4.15, 4.39]	**0.13** [0.04, 0.21]	0.00 [-0.08, 0.08]	0.00 [-0.08, 0.09]	0.03
I adapt my work day to my bio-rhythm.	3.74 [3.61, 3.87]	0.03 [-0.06, 0.12]	-0.01 [-0.09, 0.08]	0.03 [-0.05, 0.12]	-0.38
I integrate exercise into my work day.	3.51 [3.38, 3.64]	0.02 [-0.07, 0.11]	0.00 [-0.08, 0.08]	0.02 [-0.06, 0.11]	-0.24
I integrate outdoor activities into my work day.	3.44 [3.30, 3.58]	-0.01 [-0.10, 0.07]	-0.01 [-0.09, 0.07]	**0.09** [0.01, 0.18]	-0.51
I regularly take a "power nap".	1.96 [1.83, 2.08]	**-0.13** [-0.21, -0.04]	-0.08 [-0.17, 0.00]	0.01 [-0.07, 0.10]	0.01
Communicative (α = .78)	4.03 [3.89, 4.17]	**0.12** [0.03, 0.21]	-0.03 [-0.12, 0.06]	-0.01 [-0.09, 0.08]	0.29
Make arrangements (α = .82)	3.54 [3.39, 3.70]	0.09 [0.00, 0.18]	-0.03 [-0.12, 0.06]	-0.01 [-0.10, 0.08]	0.52
I make arrangements with household members facilitating undisturbed work.	4.51 [4.38, 4.64]	**0.17** [0.08, 0.26]	0.04 [-0.05, 0.12]	0.01 [-0.08, 0.10]	0.22
I make arrangements with colleagues/supervisors/my employer about when I can(not) be reached regarding work.	4.18 [4.04, 4.33]	0.08 [-0.01, 0.17]	-0.07 [-0.16, 0.01]	**-0.10** [-0.18, -0.01]	-0.35
I'll confront household members if agreements about work and leisure are violated.	3.79 [3.64, 3.95]	0.07 [-0.03, 0.16]	0.00 [-0.09, 0.09]	0.05 [-0.04, 0.14]	-0.09
I make arrangements with customers/clients about when I can(not) be reached regarding work.	3.66 [3.50, 3.82]	0.05 [-0.04, 0.14]	-0.04 [-0.13, 0.05]	-0.01 [-0.10, 0.07]	-0.07
I'll confront colleagues/supervisors/my employer if agreements about work and leisure are violated.	3.04 [2.89, 3.19]	**0.15** [0.06, 0.24]	-0.03 [-0.12, 0.06]	0.00 [-0.10, 0.09]	1.75
Household members make arrangements with me in order to limit my workload.	2.79 [2.64, 2.93]	0.04 [-0.05, 0.13]	-0.04 [-0.13, 0.05]	0.00 [-0.09, 0.09]	0.85
I'll confront clients/customers if agreements about work and leisure matters are violated.	2.61 [2.45, 2.77]	0.07 [-0.03, 0.17]	-0.03 [-0.13, 0.06]	0.03 [-0.06, 0.13]	1.35
Keep connection (α = .60)	4.46 [4.32, 4.59]	**0.15** [0.06, 0.24]	-0.03 [-0.12, 0.05]	0.00 [-0.09, 0.08]	0.05
I use various communication channels.	5.54 [5.47, 5.62]	**0.17** [0.08, 0.27]	0.03 [-0.06, 0.11]	-0.04 [-0.12, 0.04]	-0.97
I keep connected via technology to respond to colleagues/supervisors/my employer/customers/clients quickly.	5.42 [5.34, 5.50]	**0.20** [0.11, 0.29]	-0.01 [-0.09, 0.08]	0.04 [-0.05, 0.12]	-0.57
I make small talk with my colleagues/supervisors/my employer.	4.63 [4.52, 4.74]	**0.09** [0.00, 0.17]	-0.07 [-0.16, 0.02]	-0.03 [-0.11, 0.05]	-0.84
I communicate expectations and work progress with colleagues/supervisors/my employer.	4.20 [4.08, 4.33]	**0.21** [0.12, 0.29]	-0.05 [-0.14, 0.03]	0.03 [-0.05, 0.11]	0.96
I use modern communication technology with colleagues/supervisors/my employer such as instant messaging.	4.14 [3.97, 4.30]	**0.14** [0.05, 0.23]	**-0.10** [-0.19, -0.02]	0.03 [-0.05, 0.11]	0.32
I seek social interaction after work.	3.70 [3.58, 3.83]	**0.14** [0.05, 0.23]	0.05 [-0.04, 0.13]	-0.05 [-0.13, 0.03]	0.86
I use technology to stay in personal contact with colleagues.	3.54 [3.38, 3.69]	**0.10** [0.01, 0.19]	-0.05 [-0.14, 0.03]	-0.01 [-0.09, 0.08]	0.59

Note. T = telework strategy; BMP = boundary management preferences; TE = telework experience. β_T represents the main effect of the telework strategy on job performance. $\beta_{T \times BMP}$ represents the interaction effect between the telework strategy and boundary management preferences on job performance. $\beta_{T \times TE}$ represents the interaction effect between the telework strategy and telework experience on job performance. ΔM, β_T is based on the difference between the *z*-scaled mean implementation (*M*) and the z-scaled beta-coefficient on job performance (β_T) of the telework strategy. *M*, β_T, $\beta_{T \times BMP}$, and $\beta_{T \times TE}$ are reported with 95%-confidence intervals. Telework strategies in italics were recoded. Multiple regression results were controlled for age, gender, living space, and living with children.
Results in bold are significant at the $p \leq .05$ level.

Concerning the implementation of telework strategies (RQ 1), we found communicative telework strategies on average to be the most implemented ($\overline{M}$ = 4.03 [3.89, 4.17]), followed by physical ($\overline{M}$ = 3.95 [3.80, 4.10]), behavioral ($\overline{M}$ = 3.87 [3.73, 4.01]), and temporal ($\overline{M}$ = 3.61 [3.46, 3.76]) telework strategies. Zooming-in on the level of subcategories, telework strategies related to keep connection ($\overline{M}$ = 4.46 [4.32, 4.59]) and to conducive work attitude ($\overline{M}$ = 4.44, [4.32, 4.56]) were on average most implemented and more implemented than the telework strategies related to all remaining subcategories. To facilitate quickly grasping which specific telework strategies drive these effects, we ordered the telework strategies in Table 4.1.1 by the mean of implementation (from high to low) in their respective subcategory.

Concerning associations between the individual implementation of telework strategies and job performance (RQ 2), we found communicative ($\overline{\beta}$ = 0.12 [0.03, 0.21]) and behavioral ($\overline{\beta}$ = 0.10 [0.01, 0.19]) telework strategies on average to be positively associated. The average performance associations of telework strategies of the respective subcategories allow us to paint a more differentiated picture: Telework strategies related to keep connection ($\overline{\beta}$ = 0.15 [0.06, 0.24]; 7 of 7 composing telework strategies had significant βs) and to conducive work attitude ($\overline{\beta}$ = 0.19 [0.10, 0.27]; 7 of 9 composing telework strategies had significant βs) were on average positively associated with job performance driving the positive performance association of communicative and behavioral telework strategies, respectively. This pattern of results remained robust when applying alternative analytical approaches, that is, computing (factor analytically identified) scales for telework strategy subcategories averaging the implementation of the respective composing telework strategies per participant and simultaneously entering these scales into multiple linear regressions predicting job performance (see Appendix 4.1.B and Appendix 4.1.C).

Concerning the association between the telework strategies' average implementation and association with job performance (RQ 3.1), we found a positive correlation between the 85 means of the implementation of the telework strategies and the 85 β-coefficients of the telework strategies on job performance (r = .55 [.39, .69], $t(83)$ = 6.06, p < .001). Concerning the divergence between the telework strategies' relative implementation from their relative association with job performance (RQ 3.2), we found positive averaged differences between a telework strategy's z-scaled implementation and a telework strategy's z-scaled β-coefficient on job performance for communicative ($\overline{\Delta}$ = 0.29) and behavioral ($\overline{\Delta}$ = 0.19) telework strategies, indicating that these categories' telework strategies in average had relative associations with job performance exceeding their relative implementations. As communicative and behavioral

telework strategies were on average positively associated with job performance, the related telework strategies might be on average considered under implemented. The higher resolved level of subcategories allows us to draw more nuanced inferences: Telework strategies related to keep connection and to conducive work attitude were the only subcategories on average positively associated with job performance, and thus, of most interest when identifying under implemented telework strategies. Here, we found telework strategies related to conducive work attitude showing on average large positive differences ($\overline{\Delta} = 0.46$), indicating that particularly these telework strategies might be seen as under implemented, whereas telework strategies related to keep connection had on average substantially less positive differences ($\overline{\Delta} = 0.05$). In comparison, we found the most negative averaged differences for temporal telework strategies ($\overline{\Delta} = -0.23$), driven by telework strategies related to temporal flexibility ($\overline{\Delta} = -0.57$), indicating that the related telework strategies on average had relative associations with job performance subceeding their relative implementations and might thus be considered over implemented.

Concerning the moderation effects of boundary management preferences (RQ 4.1) on the association between telework strategies and job performance, we found a positive interaction effect for a telework strategy related to temporal structure ("I do not work beyond my working hours agreed with the employer.", $\beta = 0.13$ [0.05, 0.22], $p = .002$), indicating that this telework strategy might be more suitable for separators. We found negative interaction effects for specific telework strategies related to temporal flexibility ("I am temporarily flexible in handling urgent work requests.", $\beta = -0.10$ [-0.19, -0.01], $p = .025$; "I schedule my leisure time in order to get the most of my work time.", $\beta = -0.08$ [-0.16, 0.00], $p = .050$), keep connection ("I use modern communication technology with colleagues/supervisors/my employer such as instant messaging.", $\beta = -0.10$ [-0.19, -0.02], $p = .014$), conducive work environment ("I listen to music that helps me concentrate.", $\beta = 0.10$ [0.01, 0.18], $p = .028$, this telework strategy was recoded so that the interaction effect needs to be reversed), and conducive work attitude ("I value the benefits of working from home.", $\beta = -0.08$ [-0.17, 0.00], $p = .050$), indicating that these telework strategies might be more suitable for integrators.

Concerning the moderation effects of telework experience (RQ 4.2) on the association between telework strategies and job performance, we found positive interaction effects for specific telework strategies related to physical separation of work and leisure ("I regularly work outside my home.", $\beta = -0.12$ [-0.22, -0.02], $p = .015$, this telework strategy was recoded so that the interaction effect needs to be reversed), health-promoting measures ("I integrate outdoor activities into my work day.", $\beta = 0.09$ [0.01, 0.18], $p = .031$), and temporal flexibility ("I flexibly transfer my work to times when I typically attend to personal matters.", $\beta = 0.09$ [0.00,

0.18], p = .044), indicating that these telework strategies might be more suitable for experienced teleworkers. We found negative interaction effects for specific telework strategies related to behavioral separation of work and leisure ("I maintain the same routines of my on-site work.", β = -0.22 [-0.30, -0.13], p < .001; "I do not read work-related messages after hours.", β = -0.14 [-0.23, -0.05], p = .002; "I do not respond to work-related messages after hours.", β = -0.14 [-0.23, -0.05], p = .002), temporal structure ("I strictly separate my work time from my leisure time.", β = -0.14 [-0.22, -0.05], p = .001; "I have a set time routine for the transition from work to leisure.", β = -0.10 [-0.19, -0.02], p = .016; "I have a set time routine to start the workday in the morning.", β = -0.09 [-0.17, 0.00], p = .043), conducive work environment ("I wear comfortable clothes.", β = -0.10 [-0.19, -0.01], p = .031), make arrangements ("I make arrangements with colleagues/supervisors/my employer about when I can(not) be reached regarding work.", β = -0.10 [-0.18, -0.01], p = .028), temporal flexibility ("If my work is short on time, I'll 'save it up' to make up for it in the next days.", β = -0.10 [-0.18, -0.01], p = .035), conducive work attitude ("I set personal daily goals at work.", β = -0.09 [-0.18, -0.01], p = .027), and physical separation of work and leisure ("I arrange my workstation visually like a typical office.", β = -0.09 [-0.18, 0.00], p = .041), indicating that these telework strategies might be more suitable for unexperienced teleworkers.

Following up on this, we explored whether the telework strategies with significant interaction effects on job performance were implemented more by the group of teleworkers the interaction effect was in favor of (see Table 4.1.2). We therefore divided the sample into separators versus integrators and experienced versus unexperienced teleworkers, respectively, and computed two-sample t-tests concerning the implementation of the telework strategies with significant interaction effects. We divided the sample using the respective scale centers (3.50) as cut-off values. This led to a group of separators (n = 288, 54%) ranking themselves closer to the scale anchor indicating a preference for separation (> 3.50) versus a group of integrators (n = 244, 46%) ranking themselves closer to the scale anchor indicating a preference for integration (< 3.50). Likewise, we divided the sample into a group of experienced teleworkers (n = 348, 66%) ranking themselves closer to the scale anchor indicating high telework experience (> 3.50) versus a group of unexperienced teleworkers (n = 176, 34%) ranking themselves closer to the scale anchor indicating low telework experience (< 3.50). Of the 20 significant interaction effects, we found higher implementations by the group of teleworkers the respective interaction effect was in favor of for six interaction effects, whereas we found significant lower implementations by the group of teleworkers the respective interaction effect was in favor of for two interaction effects.

Table 4.1.2

Mean Value Differences of the Implementation of Telework Strategies With Significant Interaction Effects on Job Performance for Boundary Management Preferences and Telework Experience

	Separators		Integrators					
Telework strategies for boundary management preferences	*M*	*SD*	*M*	*SD*	Δ*M*	*t*	*df*	*p*
I do not work beyond my working hours agreed with the employer.	3.47	1.69	2.76	1.65	**0.70**	**4.80**	521	<.001
I value the benefits of working from home.	5.34	1.17	5.22	1.21	0.12	1.16	525	.25
I use modern communication technology with colleagues/supervisors/my employer such as instant messaging.	4.17	1.93	4.08	1.93	0.10	0.56	512	.58
I listen to music that helps me concentrate.	4.19	1.87	4.23	1.86	-0.04	-0.25	525	.80
I schedule my leisure time in order to get the most of my work time.	3.36	1.56	3.66	1.43	**-0.30**	**-2.29**	521	.022
I am temporally flexible in handling urgent work requests.	4.60	1.34	5.06	1.06	**-0.46**	**-4.37**	523	<.001
	Experienced		Unexperienced					
Telework strategies for telework experience	*M*	*SD*	*M*	*SD*	Δ*M*	*t*	*df*	*p*
I arrange my workstation visually like a typical office.	3.91	1.82	3.24	1.81	**0.67**	**3.95**	521	<.001
I flexibly transfer my work to times when I typically attend to personal matters.	2.82	1.55	2.38	1.40	**0.44**	**3.16**	517	.002
I set personal daily goals at work.	4.54	1.35	4.27	1.51	**0.27**	**2.10**	516	.037
I integrate outdoor activities into my work day.	3.52	1.66	3.28	1.69	0.23	1.51	522	.13
If my work is short on time, I'll "save it up" to make up for it in the next days.	3.70	1.63	3.55	1.76	0.15	0.92	471	.36
I make arrangements with colleagues/supervisors/my employer about when I can and cannot be reached regarding work matters.	4.22	1.69	4.13	1.71	0.09	0.58	511	.56
I wear comfortable clothes.	5.37	0.92	5.35	1.00	0.02	0.23	515	.82
I maintain the same routines of my on-site work.	4.24	1.50	4.23	1.45	0.01	0.09	509	.93
I have a set time routine to start the workday in the morning.	4.78	1.46	4.84	1.39	-0.05	-0.40	522	.69
I strictly separate my work time from my leisure time.	4.04	1.53	4.19	1.56	-0.15	-1.08	522	.28
I have a set time routine for the transition from work to leisure.	3.33	1.77	3.47	1.78	-0.15	-0.90	519	.37
I regularly work outside my home.	5.32	1.17	5.58	0.96	**-0.26**	**-2.72**	415	.007
I do not read work-related messages after hours.	3.17	1.90	3.49	1.96	-0.32	-1.80	521	.073
I do not respond to work-related messages after hours.	3.46	1.91	3.94	1.84	**-0.48**	**-2.76**	521	.006

Note. Δ*M* = mean value difference of the implementation of the telework strategy between separators and integrators/experienced and unexperienced teleworkers. The sample was divided into separators (*n* = 288, 54%) versus integrators (*n* = 244, 46%) using the scale center (3.50) of the variable boundary management preferences as cut-off value. The sample was divided into experienced (*n* = 348, 66%) versus unexperienced (*n* = 176, 34%) teleworkers using the scale center (3.50) of the variable telework experience as cut-off value. Telework strategies in italics were recoded. Telework strategies sorted by Δ*M* in descending order.
Δ*M* and *t*-values in bold are significant at the $p \leq .05$ level.

4.1.5 Discussion

Drawing from previous research and the popular media, we examined a comprehensive set of 85 highly resolved telework strategies in a sample of 548 teleworkers. We found that the most implemented telework strategies tend to be the ones most positively associated with job performance (RQ 3.1). These serve less the purpose of drawing boundaries between work- and private-life (e.g., Basile & Beauregard, 2016; Fonner & Stache, 2012) but rather purposes of working task-oriented and productively (e.g., Greer & Payne, 2014) by adopting a conducive work attitude and of keeping social contact (e.g., Kowalski & Swanson, 2005; Turetken et al., 2011) by using modern communication technology (RQ 1, 2). Taking the level of implementation into account, teleworkers might be particularly advised to implement telework strategies related to conducive work attitude (RQ 3.2). In alignment with P-E fit (Edwards, 2008; Kristof, 1996) and boundary congruence/fit approaches (Ammons, 2013; Kreiner, 2006), we found that separators tend to benefit from telework strategies establishing boundaries between work- and private-life, whereas integrators tend to benefit from telework strategies dismantling boundaries between work- and private-life (RQ 4.1). Likewise, experienced teleworkers tend to benefit from telework strategies providing flexibility, whereas unexperienced teleworkers tend to benefit from telework strategies providing structure (RQ 4.2).

4.1.5.1 Implementation of Telework Strategies. We found telework strategies related to keep connection and to conducive work attitude to be most implemented. Aligning this result with previous research, Greer and Payne (2014) and Troll et al. (2022) observed similar patterns. Greer and Payne (2014) found telework strategies related to “be accessible” and to “communicate with coworkers/supervisor” to be among high performing teleworkers’ most frequently mentioned telework strategies, matching our finding of telework strategies related to keep connection. They also found telework strategies related to “adopt a work-oriented mindset”, “be extra productive”, “plan tasks”, and “set goals and prioritize” to be commonly mentioned, matching our finding of telework strategies related to conducive work attitude. Troll et al. (2022) found telework strategies related to modifying social conditions to be frequently implemented, but they laid a specific focus on getting motivated by friends/colleagues to work productively not matching the core of our telework strategies related to keep connection. However, Troll et al. (2022) also found telework strategies related to autonomous motivation (motivating oneself to start and endure work tasks) being frequently implemented that overlap with telework strategies related to conducive work attitude (e.g., practicing self-praise, showing dedication, reducing breaks to make progress).

It catches the eye that we found boundary related telework strategies to be less implemented than telework strategies related to keep connection and to conducive work attitude. This is remarkable because the largest proportion of research on telework strategies stems from boundary theory (Ashforth et al., 2000; Nippert-Eng, 1996) transferring boundary management strategies to the telework context (Allen et al., 2021; Basile & Beauregard, 2016; Fonner & Stache, 2012; Haun et al., 2022; Kossek, 2016; Mustafa, 2010; Mustafa & Gold, 2013; Myrie & Daly, 2009; Nansen et al., 2010; Tietze, 2002; Tietze & Musson, 2003). Also in the popular media (e.g., Cobler, n.d.; Stross, n.d.; Westdeutsche Zeitung, 2020) boundary related telework strategies receive much attention. Due to boundary related telework strategies being in the spotlight, one might be tempted to conclude that these are the most implemented. In contrast, the present study suggests that it is valuable to complement telework strategies serving other goals such as keeping social contact (Golden & Raghuram, 2010; Ilozor et al., 2001; Kowalski & Swanson, 2005; Mann et al., 2000; Turetken et al., 2011), and working task-oriented and productively (Greer & Payne, 2014; Troll et al., 2021) to paint a comprehensive picture of telework strategies' implementation.

4.1.5.2 Associations Between Telework Strategies and Job Performance. Responding to multiple calls for research on the effectiveness of boundary management strategies (Binnewies et al., 2020) and telework strategies (Allen et al., 2021; Rudolph et al., 2021), we found telework strategies related to conducive work attitude (driven by showing dedication, adjusting behavior and attitude to focus, strengthening the supervisor's confidence in the own work quality, getting organized, setting goals, practicing self-praise, and valuing telework benefits) and to keep connection (driven by communicating expectations and work progress, keeping connected via technology, using various communication channels, seeking social interaction after work, using modern communication technology, and using technology to stay in personal contact with colleagues) being positively associated with job performance. These results fit with high performers' implemented telework strategies: Greer and Payne (2014) found "adopt a work-oriented mindset", "be extra productive", "plan tasks", and "set goals and prioritize" as well as "be accessible" and "communicate with coworkers/supervisor" to be commonly mentioned.[37] Troll et al. (2021) found telework strategies related to autonomous motivation to predict job performance, matching our finding of a positive

[37] Greer and Payne (2014) also found telework strategies related to "use advanced technologies" (i.e., establishing a technological setup at home close to the on-site setup) being frequently mentioned by high performing teleworkers for which no separate subcategory emerged in the present study. However, we found the single related telework strategy "I use a setup that is technically close to the setup at my on-site workstation." to be positively associated with job performance in the present study matching Greer and Payne's (2014) initial findings.

association between telework strategies related to conducive work attitude and job performance.[38, 39] Finally, our finding of telework strategies related to keep connection being positively associated with job performance might be aligned with MRT (Daft & Lengel, 1986) and goes well with Turetken et al.'s (2011) finding of communication media richness predicting teleworkers' job performance.

We found telework strategies related to conducive work attitude and to keep connection to be positively associated with job performance, whereas boundary related telework strategies were less associated with job performance. On the one hand, this is in line with Kossek et al. (2006), who found the global implementation of boundary related telework strategies not being associated with job performance. On the other hand, this is striking because boundary related telework strategies are regularly referred to as "best-practice" (Golden, 2021) and proposed to foster productive teleworking in the popular media (e.g., Prophet, 2017; Schulz, 2020). The young literature on telework strategies might profit from complementing telework strategies serving goals of working task-oriented and productively, and keeping social contact when examining telework strategies' impacts on work outcomes and deriving practical recommendations.

4.1.5.3 Divergences Between Telework Strategies' Implementation and Association With Job Performance. The present study is the first to quantitatively examine a large number of telework strategies on a highly resolved level, which enabled us to suggest that telework strategies more positively associated with job performance tend to be implemented more often. Thus, it seems that teleworkers have an intuitive understanding of the telework strategies important to job performance and tend to implement them accordingly. However, there were

[38] However, whereas Troll et al. (2021) did not find goal-setting related self-control strategies (i.e., setting goals and deadlines, making to-do-lists) to be a unique predictor of job performance, goal-setting related telework strategies (e.g., setting goals, getting organized) were part of the subcategory conducive work attitude associated with job performance in the present study. A reason for the divergent findings might be controlling for other sets of self-control strategies in Troll et al. (2021). We also controlled for other subcategories of telework strategies in our supplemental analyses (see Appendix 4.1.B and Appendix 4.1.C) and found the same pattern of results reported in the main paper. However, in the present study, goal-setting related telework strategies were integrated into the subcategory conducive work attitude. Thus, in the present study, goal-setting related telework strategies were not controlled for telework strategies related to conducive work attitude, whereas in Troll et al. (2021) goal-setting related self-control strategies were controlled for self-control strategies related to autonomous motivation. Indeed, Troll et al. (2021) found positive bivariate correlations between goal-setting related self-control strategies and job performance.

[39] The second set of self-control strategies identified as unique predictor of job performance in Troll et al. (2021) were strategies related to somatic condition (i.e., optimizing the physical state to work productively, for instance, through sufficient sleep, coffee consumption, wearing fresh clothes). Self-control strategies related to somatic condition were most similar to the present study's telework strategies related to health-promoting measures (e.g., adapting work-day to bio-rhythm, eating healthy) for which we did not find a positive association with job performance. Future research might pick up on these divergent results and more closely examine impacts of telework strategies related to altering the somatic condition/health-promoting measures on job performance.

also telework strategies with substantial divergences in terms of their relative association with job performance and their relative implementation enabling us to derive initial fine-grained practical recommendations. We identified telework strategies related to conducive work attitude (driven by showing dedication, practicing self-praise, and adjusting attitude and behavior to focus) to be under implemented. In comparison, telework strategies related to keep connection were more implemented and less associated with job performance, leading to a smaller divergence. Thus, taking the current level of implementation into account, teleworkers might be advised to pay particular attention to implementing telework strategies related to conducive work attitude. Concerning telework strategies for which their relative association with job performance subceeded their relative implementation, we particularly found telework strategies related to temporal flexibility being over implemented (driven by transferring personal matters to work times, scheduling work time to get the most of leisure time, banking work times), so that teleworkers might be advised to reduce their implementation.

4.1.5.4 Moderating Influences of Boundary Management Preferences and Telework Experience. Following P-E fit approaches (preferences/needs-supply fit; Edwards, 2008; Kristof, 1996) and specific approaches related to boundary theory (Ashforth et al., 2000; Nippert-Eng, 1996), that is, the boundary congruence approach (Kreiner, 2006) and the boundary fit approach (Ammons, 2013), telework strategies congruent with individual boundary management preferences might be particularly beneficial to job performance as a fit between individual preferences and needs (boundary management preferences) and environmental boundary influences/boundary enactments (telework strategies) is achieved. Indeed, we found a telework strategy aligned to separating work- and private-life (i.e., not working beyond agreed hours) being more beneficial to job performance for separators. In comparison, we found telework strategies aligned to integrating work- and private-life (i.e., flexibly handling urgent work requests and scheduling leisure time to get the most of the work time) being more beneficial to job performance for integrators. We also identified three further telework strategies particularly beneficial to integrators that might align with a preference for integrating work- and private-life. First, using modern communication technology such as instant messaging might blur the borders between work- and private-life due to being continuously accessible for work matters. Second, listening to music that helps to concentrate might be seen as mingling a typical leisure activity with work. Third, valuing the benefits of telework might be particularly beneficial to integrators as many benefits of teleworking are aligned to a better integration of work- and private-life due to enhanced flexibility.

Concerning moderating influences of telework experience, we found two telework strategies related to spatial flexibility (i.e., working outside from home, for instance, in a café, and integrating outdoor activities into the workday) and one telework strategy related to temporal flexibility (i.e., flexibly transferring work to times when typically attending personal matters) being more beneficial to job performance for experienced teleworkers. In comparison, we found mainly telework strategies related to establishing routines (i.e., maintaining the routines of the on-site work, establishing routines to start and to end the work day, setting daily goals) and to adhering to work/non-work rules (i.e., strictly separating work and leisure time, not reading/responding to work messages after hours, making arrangements about when (not) to be reached regarding work) being more beneficial to job performance for unexperienced teleworkers. Thus, following the P-E fit approach (Edwards, 2008; Kristof, 1996), it seems that telework strategies related to flexibility might rather meet the preferences and needs of experienced teleworkers that might desire and be able to handle alternation resulting in a more positive association with job performance. In comparison, telework strategies related to establishing routines and work/non-work rules might rather meet the preferences and needs of unexperienced teleworkers that might desire and need structure resulting in a more positive association with job performance.

Overall, in the present study, we identified the effects of P-E fit on job performance, whereas previous research in the context of boundary congruence/fit (Ammons, 2013; Kreiner, 2006) rather focused on outcomes such as work-family-conflict, job satisfaction, commitment, and recovery (see Chen et al., 2009; Haun et al., 2022; Kreiner, 2006; Rothbard et al., 2005). The pattern of results underlined the utility of transferring P-E fit, in particular, boundary congruence/fit, to telework contexts to paint a differentiated picture of telework strategies' effectiveness depending on teleworkers' individual preferences and needs.

4.1.5.5 Theoretical Implications. The present study sheds light on the puzzling impacts of individual telework strategies, an under-explored field of research that is not yet well-anchored in the scientific literature. Whereas most previous studies have focused on telework strategies aligned to establishing/dismantling boundaries between work- and private-life in the tradition of boundary theory (Ashforth et al., 2000; Nippert-Eng, 1996), the present results suggest that the young field of research on telework strategies might profit from expanding this narrow focus. In particular, we demonstrate that teleworkers rather tend to implement telework strategies serving goals such as working task-oriented and productively (e.g., Greer & Payne, 2014) as well as keeping social contact (e.g., Kowalski & Swanson, 2005). Even more so, these telework strategies were most decisive for job performance. Thus, future

research on telework strategies could progress by adopting a broader focus on telework strategies serving divergent goals to understand more comprehensively telework strategies' enigmatic impacts on various (tele-) work outcomes. The present study also contributes to the literature by demonstrating that applying the P-E fit framework (Edwards, 2008; Kristof, 1996) to the telework context helps to unravel the differential impacts of telework strategies when considering teleworkers' individual preferences and needs. We did not find a one-fits-all solution to effective telework strategies uniformly applying to all teleworkers. The present findings rather suggest that the effectiveness of many telework strategies depends on teleworkers' individual boundary management preferences and experience with working from home. Thus, marrying the literature streams of P-E fit, in particular boundary congruence/fit (Ammons, 2013; Kreiner, 2006), and telework strategies seems to be another promising avenue for future research to advance progress in this nascent research field.

4.1.5.6 Organizational Implications. Whereas there are plenty of recommendations for implementing individual telework strategies spread throughout the popular media, the scientific literature still lags behind in providing empirical evidence on telework strategies' effectiveness (Allen et al., 2021; Rudolph et al., 2021; see also Binnewies et al., 2020). The present study aims to fill this gap and delivers reassuring results on the implementation of commonly circulating telework strategies: In general, teleworkers seem to have an intuitive understanding of which telework strategies are effective. That is, teleworkers tend to implement telework strategies more often that are more positively associated with job performance. However, we still found telework strategies related to adopting a conducive work attitude (e.g., practicing self-praise) to be less implemented than they probably should be according to their strong association with job performance. If verified in future confirmatory research, organizations might pick up on these findings by taking measures to educate teleworkers about effective telework strategies, especially those that are yet poorly implemented. On the other side, we also identified telework strategies for which organizations might be advised to take measures to educate their teleworkers to implement them less. In particular, we found telework strategies related to temporal flexibility (e.g., transferring personal matters to work times) to be implemented more often than they probably should be based on their low or even negative association with job performance. However, organizations need to consider that the implementation of telework strategies may not always be a matter of choice. Real-life circumstances can occasionally hinder teleworkers from implementing effective strategies and from avoiding ineffective strategies. For instance, during the COVID-19 pandemic, many teleworkers have been affected by sudden school and daycare closures due to lockdown

measures to limit the spread of the pandemic. Thus, many teleworkers might have had to switch flexibly between work requests and demands spilling over from their private-life (e.g., taking care of the children). Organizations might therefore also try to anticipate potential reasons (e.g., lack of childcare) for implementing less conducive telework strategies (e.g., transferring personal matters to work times) and to take action to mitigate these reasons (e.g., organizations might offer (virtual) childcare programs). Finally, organizations may adopt measures to identify groups of employees sharing common characteristics critical to the effectiveness of telework strategies and tailor advice (e.g., via organizational e-mail newsletters) or trainings educating about effective telework strategies to employees' individual preferences and needs. This is particularly intriguing in situations such as the COVID-19 pandemic in which employees may be urged to telework considering themselves not prepared to do so (e.g., separators and unexperienced teleworkers).

4.1.5.7 Limitations and Directions for Future Research. First, due to the cross-sectional design, we cannot draw causal inferences, that is, we can only demonstrate which telework strategies are associated with job performance, but this does not imply that the telework strategies cause between person differences in job performance. We thus suggest future research to apply longitudinal research designs (e.g., experience sampling/daily diary methods, Larson & Csikszentmihalyi, 2014; structural equation modeling approaches to cross-lagged panel models, Hamaker et al., 2015) to examine the directional impacts telework strategies and job performance have on one another over time. We also encourage future research to adopt (quasi-) experimental designs, for instance, to examine a training intervention in a pre-post control group design monitoring the implementation of telework strategies and job performance after the training (see also Binnewies et al., 2020; Rexroth et al., 2016). This could also demonstrate telework strategies' trainability with practical implications for teleworkers, who might be able to learn to telework productively by applying effective telework strategies. Against the background of ongoing change processes of work in the digital age, such as technological advances and increasing flexibility of working time and space, particularly online training interventions might be a promising starting point to do so (see Rexroth et al., 2017).

Second, our data is based on self-reports assessed at one measurement time point, which may have introduced common-method bias (CMB; Podsakoff et al., 2012). However, CMB does not always compromise results. For instance, in the present study, despite the large sample size, the majority of telework strategies did not show significant associations with job performance, which should have been the case, if CMB was a severe problem (Spector, 2006). Also CMB is less of a problem in regression models with multiple predictors and when testing

interaction effects (Siemsen et al., 2010). Nevertheless, we suggest future research to assess telework outcomes such as job performance with multiple independent, objective indicators (e.g., supervisor/coworker ratings, customer satisfaction, objective records such as the number of claims processed). Also, telework strategies might be assessed through acquaintance reports (e.g., household members, coworkers). Measuring the implementation of telework strategies and telework outcomes at different time points would be a further approach to mitigate CMB.

Third, the directionality of boundary related telework strategies (see Allen et al., 2014; Hecht & Allen, 2009; Wepfer et al., 2018) might be considered, that is, telework strategies can either be geared toward keeping private matters out of work (versus integrating) or toward keeping work out of private matters (versus integrating). In our study, we summarized findings of telework strategies related to both boundary management directions as both indicate a separation/integration of work- and private-life. However, telework strategies with a different directionality might differentially impact work outcomes. Such a differentiated pattern might be masked because divergent effects might cancel each other out. Indeed, for some telework strategies, we observed a pattern that might provide initial support for this notion (however, this pattern does not apply uniformly to all concerned telework strategies requiring to draw conclusions with caution): We found rather positive performance associations for telework strategies geared to keeping private matters out of work (e.g., avoiding to read non-work related material at work, attending to personal matters only during breaks), whereas we found rather zero performance associations for telework strategies geared to keeping work out of private matters (e.g., not going back to work after hours, not reading/responding to work-related messages/calls after hours). Future research should consider telework strategies' boundary management directionality to examine potential divergent effects on telework outcomes.

Fourth, the lack of associations of boundary related telework strategies with job performance does not imply that they do not have other positive effects. Quite the opposite, these telework strategies are likely to have various positive effects, particularly when it comes to outcomes such as reduced stress, well-being, and satisfaction (Binnewies et al., 2020; Haun et al., 2022). It should also be considered that telework strategies that have been found to be positively associated with job performance in the present study (e.g., scheduling leisure time to get the most out of work time) could have detrimental effects on other outcomes such as stress and well-being. Future research will profit from examining the effects of telework strategies on a broad set of telework outcomes to draw a differentiated picture of telework strategies' various impacts.

Fifth, in the present study, we focused on boundary management preferences and telework experience as two important individual characteristics of teleworkers that had a moderating influence on the relationship between telework strategies and job performance. Future research could examine other individual characteristics that might affect the effectiveness of telework strategies. This would contribute to a more nuanced understanding of the puzzling effects of telework strategies on (tele-) work outcomes. For instance, whereas teleworkers' personality traits such as extraversion and conscientiousness have already been shown to directly affect telework outcomes (O'Neill et al., 2009), little is known about their moderating effects. For example, it may be that extraverted teleworkers suffer particularly from social isolation (especially during times of pandemic), so they could benefit from implementing communicative telework strategies related to keep connection, such as engaging in virtual small talk with colleagues. Similarly, teleworkers with low conscientiousness might particularly benefit from telework strategies that help to maintain a clear daily structure, such as adhering to fixed work/non-work hours. However, these moderating factors are not limited to the individual characteristics of the teleworker but may also represent broader situational factors. For example, whereas we found that most boundary related telework strategies do not positively impact job performance, this could change when children are at home. In light of the lockdown measures during the COVID-19 pandemic, many teleworkers may have faced this situation. In these cases, for example, physical telework strategies related to physical separation of work and leisure, such as working in a separate room, could be beneficial because they may facilitate undisturbed work. A better understanding of the moderating factors that influence the relationship between telework strategies and (tele-) work outcomes could have immediate practical implications for organizations to tailor advice on telework strategies to employees' individual characteristics and situational circumstances.

Sixth, in the present study, we applied a P-E fit approach (Edwards, 2008; Kristof, 1996) to a teleworker sample, which stands out due to teleworkers having great latitude to self-adjust various work environmental aspects (in contrast to stationary on-site workers). It might be an exciting future research topic to examine whether performance differences between teleworker and non-teleworker samples (Gajendran & Harrison, 2007) might (to some extent) be driven by enhanced P-E fit in telework contexts, in which teleworkers are empowered to self-adjust their working environment in a way that corresponds to their individual preferences and needs. Indeed, we found initial indications that teleworkers to some extent successfully customize their telework environment. For example, whereas we found separators to profit more from not working beyond their agreed working hours, we also found separators to implement this

telework strategy more. Likewise, whereas we found integrators to profit more from being temporally flexible in handling urgent work requests and from scheduling their leisure time to get the most out of their work time, we also found integrators to implement these telework strategies more. Future confirmatory research could build on these exploratory findings.

Seventh, future research would profit from establishing a mutually accepted taxonomy of telework strategies by deriving theoretically sound dimensions of telework strategies and testing these with factor analytical or structural equation modeling procedures. A self-report questionnaire might be developed to measure the implementation of telework strategies meeting psychometric test properties. In particular, future research in this vein should make efforts to demonstrate that such a test actually measures the dimensions of telework strategies that it is claimed to measure, that is demonstrating construct validity (Badenes-Ribera et al., 2020). This would ensure that researchers use terms consistently and increase the comparability of research findings streamlining progress in this nascent research field.

Finally, we would like to emphasize the Northern European cultural context of our study, which is likely to have affected the individual ways in which participants organized their work processes from home. The cultural context has a strong influence on work-related values and norms (e.g., Hofstede, 1984; Schwartz, 1999), which also affect telework constellations (e.g., Adamovic, 2022; Peters & den Dulk, 2003). In addition, there have been cross-cultural differences in pandemic related measures to limit the spreading of the COVID-19 virus (e.g., imposing lockdowns; Bajaj et al., 2021) and in individuals' psychological responses to the COVID-19 pandemic (Yap et al., 2021), which may have caused further cross-cultural differences in the adoption of telework strategies. We therefore suggest future research to address cross-cultural similarities and differences in the way teleworkers organize their work processes.

4.1.5.8 Conclusion. This study contributes to the young literature on telework strategies by demonstrating that extending a narrow focus on telework strategies stemming from boundary theory seems to be a fruitful avenue for research illuminating the puzzling impacts of the individual ways in which teleworkers organize their work processes. In particular, future research would profit from complementing telework strategies aligned to working task-oriented and productively by adopting a conducive work attitude and to keeping social contact by using modern communication technology. Also, taking a P-E fit perspective appears to be a promising approach to paint a more fine-grained picture of telework strategies' differential impacts on work outcomes by taking teleworkers' individual preferences and needs into account.

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Appendix 4.1.A

Table 4.1.A

Standard Deviations of the Implementation of Telework Strategies, Bivariate Correlations Between Telework Strategies and Job Performance, and Supplemental Results to the Multiple Linear Regressions Predicting Job Performance in the Main Paper

Encoding	SD_{Imp}	$r_{Imp, JP}$	*p*	β_0	*p*	β_{BMP}	*p*	β_{TE}	*p*	β_{Age}	*p*	β_{Gender}	*p*	β_{Space}	*p*	$\beta_{Children}$	*p*	R^2	$R^2_{Adj.}$	*F*	*p*
P_	1.62	.07		-0.03		0.00		**0.20**		0.02		0.01		-0.02		0.09					
P_PSWL	1.75	.06		-0.03		-0.01		**0.20**		0.02		0.01		-0.02		0.09					
P_PSWL_1_r	1.14	.02	.63	-0.05	.41	-0.01	.80	**0.23**	<.001	0.02	.72	0.01	.95	-0.02	.71	0.09	.42	**.06**	**.04**	**3.63**	<.001
P_PSWL_2	1.73	**.11**	.009	-0.01	.89	-0.02	.62	**0.19**	<.001	0.02	.68	0.01	.87	-0.02	.75	0.05	.66	**.06**	**.04**	**3.27**	<.001
P_PSWL_3_r	1.66	.06	.17	-0.03	.63	-0.01	.82	**0.22**	<.001	0.02	.72	-0.02	.85	-0.02	.67	0.12	.30	**.05**	**.04**	**3.16**	<.001
P_PSWL_4	1.63	**.13**	.002	-0.04	.50	-0.02	.73	**0.20**	<.001	0.00	.97	0.02	.84	-0.03	.61	0.13	.24	**.06**	**.05**	**3.76**	<.001
P_PSWL_5	1.71	.07	.093	-0.03	.63	-0.01	.83	**0.20**	<.001	0.02	.69	0.03	.75	-0.03	.52	0.10	.36	**.05**	**.04**	**3.15**	.001
P_PSWL_6	1.84	.07	.085	0.00	.95	0.00	.99	**0.19**	<.001	0.03	.60	0.00	.99	-0.03	.59	0.09	.44	**.06**	**.04**	**3.35**	<.001
P_PSWL_7	2.02	.05	.23	-0.03	.65	0.00	.92	**0.20**	<.001	0.02	.63	0.01	.92	-0.02	.67	0.09	.41	**.05**	**.03**	**2.70**	.004
P_PSWL_8	1.74	**.11**	.013	-0.01	.82	-0.03	.57	**0.20**	<.001	0.01	.91	0.01	.89	-0.03	.53	0.09	.41	**.06**	**.04**	**3.49**	<.001
P_PSWL_9	2.01	.02	.69	-0.02	.77	0.01	.90	**0.20**	<.001	0.03	.53	0.01	.95	-0.01	.82	0.08	.48	**.04**	**.03**	**2.61**	.006
P_PSWL_10	2.18	.04	.37	-0.03	.67	0.01	.90	**0.20**	<.001	0.02	.66	0.01	.91	-0.01	.79	0.09	.42	**.05**	**.03**	**2.68**	.005
P_PSWL_11	1.71	.05	.30	-0.01	.83	0.01	.89	**0.20**	<.001	0.01	.82	0.01	.94	-0.01	.81	0.09	.42	**.05**	**.03**	**2.91**	.002
P_PSWL_12	1.62	.04	.38	-0.04	.57	0.01	.88	**0.20**	<.001	0.02	.72	0.02	.85	-0.01	.84	0.10	.35	**.05**	**.04**	**3.08**	.001
P_CWE	1.48	.08		-0.03		0.00		**0.20**		0.02		0.01		-0.02		0.09					
P_CWE_1	0.95	**.11**	.01	-0.01	.89	0.00	.95	**0.19**	<.001	0.02	.75	0.01	.95	-0.01	.81	0.07	.51	**.06**	**.04**	**3.38**	<.001
P_CWE_2	0.94	**.15**	<.001	-0.02	.70	0.01	.77	**0.21**	<.001	0.00	.94	0.01	.87	-0.01	.89	0.10	.36	**.07**	**.06**	**4.37**	<.001
P_CWE_3	1.25	.04	.40	-0.02	.79	0.00	.96	**0.20**	<.001	0.03	.59	0.01	.93	-0.01	.81	0.10	.39	**.05**	**.03**	**2.78**	.003
P_CWE_4	1.46	.16	<.001	-0.03	.68	0.00	.97	**0.17**	<.001	0.00	.99	-0.02	.80	-0.03	.56	0.08	.46	**.07**	**.05**	**4.14**	<.001
P_CWE_5	1.42	**.17**	<.001	-0.04	.48	-0.01	.82	**0.17**	<.001	0.02	.74	0.01	.95	-0.04	.42	0.11	.32	**.08**	**.06**	**4.47**	<.001
P_CWE_6_r	1.85	.05	.23	-0.03	.59	0.01	.88	**0.22**	<.001	0.02	.74	0.03	.79	-0.01	.87	0.10	.38	**.06**	**.04**	**3.47**	<.001
P_CWE_7	1.79	.05	.23	-0.01	.83	0.01	.88	**0.20**	<.001	0.02	.65	0.00	.96	-0.02	.76	0.08	.47	**.05**	**.03**	**2.63**	.006
P_CWE_8	1.61	.05	.24	-0.05	.43	0.00	.98	**0.20**	<.001	0.02	.62	0.05	.63	-0.02	.71	0.11	.34	**.05**	**.03**	**2.93**	.002
P_CWE_9	1.64	.04	.33	-0.03	.68	0.00	.97	**0.20**	<.001	0.02	.65	0.02	.83	-0.02	.76	0.10	.39	**.05**	**.03**	**2.80**	.003
P_CWE_10	1.83	-.02	.62	-0.03	.59	0.00	.93	**0.20**	<.001	0.03	.53	0.02	.84	-0.02	.73	0.10	.38	**.05**	**.03**	**2.98**	.002
P_CWE_11	1.48	**.10**	.018	-0.04	.48	-0.02	.72	**0.20**	<.001	0.00	.98	0.04	.67	-0.01	.86	0.10	.37	**.06**	**.04**	**3.47**	<.001
T	1.62	.03		-0.04		-0.01		**0.20**		0.02		0.02		-0.01		0.09					
T_TS	1.70	.04		-0.04		-0.02		**0.20**		0.02		0.02		-0.01		0.09					
T_TS_1	1.42	.03	.53	-0.02	.76	0.00	.99	**0.20**	<.001	0.02	.63	0.03	.75	-0.01	.84	0.08	.48	**.05**	**.04**	**3.21**	<.001
T_TS_2	1.38	**.17**	<.001	-0.01	.82	-0.04	.36	**0.20**	<.001	0.00	.94	0.02	.81	-0.01	.80	0.09	.42	**.08**	**.07**	**5.03**	<.001

Encoding	SD_{Imp}	$r_{Imp, JP}$	p	β_0	p	β_{BMP}	p	β_{TE}	p	β_{Age}	p	β_{Gender}	p	β_{Space}	p	$\beta_{Children}$	p	R^2	$R^2_{Adj.}$	F	p
T_TS_3	1.70	**.12**	.007	-0.04	.56	-0.02	.61	**0.18**	<.001	0.02	.71	0.03	.79	0.00	.96	0.07	.54	**.05**	**.03**	**2.76**	.004
T_TS_4	2.09	**.10**	.022	-0.07	.28	-0.03	.51	**0.20**	<.001	0.01	.89	0.05	.58	-0.01	.89	0.10	.38	**.07**	**.05**	**3.95**	<.001
T_TS_5	1.54	**.15**	<.001	-0.04	.55	-0.09	.064	**0.22**	<.001	-0.03	.53	0.01	.88	-0.01	.83	0.09	.38	**.10**	**.08**	**6.03**	<.001
T_TS_6	2.06	.03	.56	-0.03	.64	-0.01	.91	**0.19**	<.001	0.04	.41	0.02	.85	0.00	.94	0.08	.48	**.05**	**.03**	**2.68**	.005
T_TS_7	1.76	-.04	.39	-0.02	.75	0.02	.74	**0.20**	<.001	0.03	.52	0.02	.85	-0.01	.81	0.08	.45	**.05**	**.03**	**2.73**	.004
T_TS_8	1.78	.01	.78	-0.03	.62	0.00	.98	**0.21**	<.001	0.03	.60	0.02	.86	-0.03	.63	0.10	.35	**.06**	**.04**	**3.39**	<.001
T_TS_9	1.71	-.04	.41	-0.05	.41	-0.01	.82	**0.20**	<.001	0.03	.52	-0.01	.91	-0.03	.56	0.13	.24	**.07**	**.05**	**4.04**	<.001
T_TS_10	1.90	.02	.74	-0.05	.44	-0.01	.76	**0.19**	<.001	0.04	.47	0.04	.68	-0.02	.71	0.12	.30	**.04**	**.03**	**2.37**	.013
T_TS_11	1.62	-.02	.61	-0.05	.39	0.01	.91	**0.20**	<.001	0.03	.58	0.00	.97	-0.01	.81	0.09	.40	**.05**	**.04**	**3.05**	.001
T_TS_12	1.44	-.04	.41	-0.04	.56	0.01	.76	**0.21**	<.001	0.03	.56	0.02	.80	-0.03	.60	0.10	.37	**.05**	**.03**	**2.76**	.004
T_TF	1.50	.00		-0.04		0.01		**0.21**		0.01		0.01		-0.01		0.09					
T_TF_1	1.26	.07	.10	-0.03	.60	0.03	.52	**0.20**	<.001	0.02	.67	-0.01	.90	-0.01	.83	0.08	.49	**.06**	**.04**	**3.35**	<.001
T_TF_2	1.46	-.03	.57	-0.02	.72	0.02	.73	**0.20**	<.001	0.02	.74	0.01	.92	-0.02	.77	0.10	.39	**.05**	**.03**	**2.65**	.005
T_TF_3	1.67	-.04	.36	-0.04	.59	0.01	.87	**0.22**	<.001	0.00	.98	0.01	.95	0.00	.96	0.12	.31	**.06**	**.04**	**3.37**	<.001
T_TF_4	1.50	**.15**	<.001	-0.05	.41	0.04	.34	**0.20**	<.001	0.02	.64	0.04	.71	-0.02	.76	0.12	.29	**.08**	**.06**	**4.44**	<.001
T_TF_5	1.57	**-.13**	.004	-0.03	.62	-0.02	.60	**0.22**	<.001	-0.01	.90	0.03	.75	-0.01	.86	0.07	.53	**.06**	**.05**	**3.78**	<.001
T_TF_6	1.52	-.01	.89	-0.02	.81	0.02	.71	**0.23**	<.001	-0.01	.89	0.01	.90	0.00	.99	0.07	.53	**.06**	**.04**	**3.09**	.001
T_TF_7	1.52	-.02	.63	-0.07	.30	-0.02	.75	**0.21**	<.001	0.01	.88	0.00	.99	0.00	.95	0.11	.31	**.05**	**.04**	**3.15**	.001
B_	1.53	**.10**		-0.04		-0.01		**0.20**		0.02		0.03		-0.01		0.08					
B_BSWL	1.65	.06		-0.04		-0.02		**0.21**		0.01		0.02		-0.01		0.07					
B_BSWL_1	1.30	**.14**	.001	-0.02	.79	-0.03	.55	**0.20**	<.001	-0.01	.86	0.03	.74	0.00	.97	0.04	.69	**.07**	**.06**	**4.28**	<.001
B_BSWL_2	1.52	**.11**	.012	-0.05	.47	-0.04	.36	**0.20**	<.001	0.01	.85	0.03	.74	-0.01	.86	0.08	.49	**.06**	**.04**	**3.61**	<.001
B_BSWL_3	1.48	**.19**	<.001	-0.05	.37	-0.08	.078	**0.21**	<.001	-0.03	.48	0.11	.24	-0.03	.53	0.10	.36	**.13**	**.11**	**8.04**	<.001
B_BSWL_4	1.56	**.16**	<.001	-0.04	.54	-0.02	.61	**0.19**	<.001	-0.01	.89	0.07	.44	-0.02	.65	0.05	.63	**.07**	**.05**	**3.97**	<.001
B_BSWL_5	1.60	**.15**	<.001	-0.07	.29	-0.02	.58	**0.21**	<.001	-0.02	.64	0.06	.51	-0.04	.47	0.11	.30	**.08**	**.06**	**4.60**	<.001
B_BSWL_6	1.93	-.03	.53	-0.03	.60	0.01	.78	**0.20**	<.001	0.02	.66	0.00	.97	-0.01	.81	0.09	.40	**.05**	**.03**	**2.84**	.003
B_BSWL_7	1.90	-.02	.67	-0.04	.54	0.01	.85	**0.21**	<.001	0.02	.65	0.00	.96	0.00	.93	0.07	.54	**.06**	**.05**	**3.72**	<.001
B_BSWL_8	1.73	**.16**	<.001	-0.04	.52	-0.04	.41	**0.21**	<.001	0.01	.77	-0.02	.83	0.00	.95	0.03	.75	**.08**	**.06**	**4.50**	<.001
B_BSWL_9	1.76	**.11**	.012	-0.01	.82	-0.02	.64	**0.20**	<.001	0.03	.60	-0.01	.88	0.00	.99	0.05	.67	**.06**	**.04**	**3.11**	.001
B_BSWL_10	1.74	.01	.74	-0.04	.49	-0.01	.87	**0.21**	<.001	0.02	.66	-0.01	.93	-0.01	.86	0.08	.47	**.05**	**.04**	**3.13**	.001
B_BSWL_11	1.62	-.04	.40	-0.01	.91	0.01	.90	**0.19**	<.001	0.04	.45	0.00	.98	-0.01	.87	0.07	.54	**.05**	**.03**	**2.60**	.006
B_BSWL_12	1.92	.01	.90	-0.03	.60	0.00	.96	**0.22**	<.001	0.02	.69	0.00	.96	-0.02	.71	0.07	.52	**.06**	**.05**	**3.82**	<.001
B_BSWL_13	1.70	.03	.45	-0.04	.53	0.00	.93	**0.20**	<.001	0.03	.51	0.02	.85	-0.02	.72	0.07	.50	**.05**	**.03**	**2.98**	.002
B_BSWL_14	1.53	.01	.90	-0.03	.64	0.00	.96	**0.21**	<.001	0.01	.76	0.02	.85	-0.01	.87	0.08	.45	**.05**	**.03**	**2.84**	.003
B_BSWL_15	1.44	-.01	.74	-0.02	.69	0.01	.88	**0.21**	<.001	0.04	.45	0.02	.82	-0.02	.70	0.06	.60	**.05**	**.03**	**2.85**	.003
B_CWA	1.35	**.20**		-0.04		0.00		**0.18**		0.01		0.05		-0.02		0.08					
B_CWA_1	1.20	**.15**	<.001	-0.02	.79	0.00	.93	**0.18**	<.001	0.04	.42	0.02	.84	0.00	.97	0.07	.52	**.07**	**.05**	**3.92**	<.001

Encoding	SD_{Imp}	$r_{Imp, JP}$	*p*	β_0	*p*	β_{BMP}	*p*	β_{TE}	*p*	β_{Age}	*p*	β_{Gender}	*p*	β_{Space}	*p*	$\beta_{Children}$	*p*	R^2	$R^2_{Adj.}$	*F*	*p*
B_CWA_2	1.22	**.16**	<.001	-0.06	.37	0.02	.63	**0.19**	<.001	0.01	.84	0.07	.44	-0.01	.89	0.10	.37	**.07**	**.05**	**3.89**	<.001
B_CWA_3	1.15	**.44**	<.001	-0.08	.16	0.00	.93	**0.14**	<.001	-0.02	.65	0.16	.063	-0.06	.27	0.08	.42	**.22**	**.20**	**15.44**	<.001
B_CWA_4	1.21	**.26**	<.001	-0.03	.57	-0.02	.58	**0.18**	<.001	0.07	.16	0.06	.49	-0.01	.87	0.01	.93	**.12**	**.10**	**7.00**	<.001
B_CWA_5	1.13	**.31**	<.001	-0.06	.34	-0.03	.50	**0.17**	<.001	-0.06	.24	0.11	.24	-0.03	.52	0.09	.39	**.14**	**.12**	**9.05**	<.001
B_CWA_6	1.55	.06	.15	-0.02	.78	0.00	.95	**0.22**	<.001	0.02	.72	0.01	.93	-0.01	.91	0.08	.47	**.06**	**.04**	**3.22**	<.001
B_CWA_7	1.42	**.16**	<.001	-0.03	.57	0.01	.86	**0.19**	<.001	0.00	.97	0.03	.72	-0.02	.76	0.11	.32	**.08**	**.06**	**4.72**	<.001
B_CWA_8	1.61	.06	.15	-0.02	.71	0.01	.87	**0.19**	<.001	0.04	.40	0.00	.97	-0.02	.64	0.10	.36	**.05**	**.03**	**2.81**	.003
B_CWA_9	1.63	**.16**	<.001	-0.05	.44	0.02	.67	**0.19**	<.001	0.02	.69	-0.01	.89	-0.01	.77	0.09	.39	**.07**	**.06**	**4.20**	<.001
B_HPM	1.52	.02		-0.03		0.01		**0.20**		0.03		0.02		-0.01		0.09					
B_HPM_1	1.38	**.11**	.008	-0.04	.47	0.00	.96	**0.19**	<.001	0.03	.55	0.05	.61	-0.01	.80	0.12	.26	**.06**	**.04**	**3.57**	<.001
B_HPM_2	1.55	.05	.22	-0.03	.61	0.01	.87	**0.20**	<.001	0.03	.50	0.00	.99	-0.01	.89	0.09	.41	**.05**	**.03**	**2.78**	.004
B_HPM_3	1.55	.02	.58	-0.03	.68	0.00	.99	**0.20**	<.001	0.03	.50	0.00	.97	-0.01	.78	0.10	.39	**.05**	**.03**	**2.71**	.004
B_HPM_4	1.66	.00	.93	-0.03	.66	0.00	.92	**0.21**	<.001	0.03	.57	0.01	.91	-0.01	.80	0.07	.52	**.05**	**.04**	**3.16**	.001
B_HPM_5	1.43	**-.10**	.019	-0.04	.51	0.02	.72	**0.21**	<.001	0.03	.49	0.04	.70	-0.01	.83	0.07	.51	**.07**	**.05**	**3.93**	<.001
C_	1.54	**.13**		-0.01		-0.01		**0.19**		0.02		0.01		-0.02		0.07					
C_MA	1.66	**.09**		0.00		-0.02		**0.20**		0.02		-0.01		-0.03		0.06					
C_MA_1	1.47	**.17**	<.001	0.03	.59	-0.01	.83	**0.22**	<.001	-0.01	.78	-0.04	.64	-0.04	.48	0.02	.82	**.08**	**.06**	**4.14**	<.001
C_MA_2	1.69	.08	.064	-0.02	.80	-0.01	.76	**0.20**	<.001	0.03	.56	0.06	.51	-0.01	.89	0.05	.62	**.07**	**.05**	**3.94**	<.001
C_MA_3	1.66	.08	.10	0.00	.99	0.00	.93	**0.22**	<.001	0.02	.65	-0.01	.91	-0.05	.40	0.07	.52	**.06**	**.04**	**2.99**	.002
C_MA_4	1.81	.06	.19	-0.01	.92	-0.04	.45	**0.19**	<.001	0.02	.73	-0.04	.70	-0.01	.92	0.08	.48	**.05**	**.03**	**2.57**	.007
C_MA_5	1.68	**.16**	<.001	0.00	.94	-0.05	.29	**0.18**	<.001	0.02	.70	0.05	.64	-0.03	.66	0.06	.63	**.07**	**.05**	**3.39**	<.001
C_MA_6	1.62	.05	.32	0.03	.66	0.00	.93	**0.22**	<.001	0.02	.63	-0.07	.50	-0.05	.36	0.07	.51	**.06**	**.04**	**2.81**	.003
C_MA_7	1.68	.06	.23	-0.02	.79	-0.07	.16	**0.19**	<.001	0.02	.72	0.01	.96	-0.02	.75	0.10	.37	**.06**	**.03**	**2.54**	.007
C_KC	1.43	**.16**		-0.02		0.00		**0.19**		0.03		0.02		-0.02		0.08					
C_KC_1	0.92	**.22**	<.001	-0.01	.83	0.00	.95	**0.17**	<.001	0.01	.80	0.00	.96	-0.03	.60	0.08	.45	**.08**	**.06**	**4.61**	<.001
C_KC_2	0.98	**.21**	<.001	-0.04	.56	0.01	.85	**0.17**	<.001	-0.01	.87	0.03	.72	-0.02	.75	0.08	.44	**.08**	**.06**	**4.81**	<.001
C_KC_3	1.33	**.11**	.016	-0.02	.70	0.02	.63	**0.19**	<.001	0.04	.36	0.02	.87	-0.01	.83	0.07	.50	**.06**	**.04**	**3.42**	<.001
C_KC_4	1.49	**.21**	<.001	-0.03	.64	-0.02	.66	**0.19**	<.001	0.04	.42	0.04	.69	-0.02	.69	0.07	.54	**.09**	**.08**	**5.66**	<.001
C_KC_5	1.93	**.15**	<.001	-0.01	.89	0.01	.84	**0.19**	<.001	0.04	.46	0.01	.93	-0.02	.65	0.05	.64	**.08**	**.06**	**4.61**	<.001
C_KC_6	1.49	**.12**	.008	-0.05	.45	-0.02	.73	**0.21**	<.001	0.04	.41	0.03	.73	-0.01	.87	0.10	.37	**.07**	**.05**	**4.19**	<.001
C_KC_7	1.87	**.12**	.006	-0.02	.77	0.03	.55	**0.19**	<.001	0.03	.59	0.01	.91	-0.01	.88	0.08	.49	**.06**	**.04**	**3.39**	<.001

Note. Gender was dummy-coded (0/1 = female/male). Children was dummy-coded (0/1 = no/yes). Imp = implementation of telework strategy; JP = self-reported job performance; BMP = boundary management preferences; TE = telework experience; P_ = physical; T_ = temporal; B_ = behavioral; C_ = communicative; PSWL = physical separation of work and leisure; CWE = conducive work environment; TF = temporal flexibility; TS = temporal structure; BSWL = behavioral separation of work and leisure; CWA = conducive work attitude; HPM = health-promoting measures; MA = make arrangements; KC = keep connection; P_PSWL_1 = I regularly work outside my home.; P_PSWL_2 = I use technology facilitating to separate work and leisure.; P_PSWL_3 = I occasionally change my workstation.; P_PSWL_4 = I exclusively work in a designated place.; P_PSWL_5 = I keep work materials in a separate, dedicated place.; P_PSWL_6 = I arrange my workstation visually like a typical office.; P_PSWL_7 = I physically

separate my workstation from the rest of my living environment.; P_PSWL_8 = I do not conduct leisure activities at my workstation.; P_PSWL_9 = I use physical barriers as boundaries between work and leisure.; P_PSWL_10 = I use a separate, dedicated room for working.; P_PSWL_11 = I establish an atmosphere at my workstation that differs from the rest of my home.; P_PSWL_12 = I wear work clothes.; P_CWE_1 = I make sure there is sufficient light at my workstation.; P_CWE_2 = I wear comfortable clothes.; P_CWE_3 = I regularly air the room.; P_CWE_4 = I use a setup that is technically close to the setup at my on-site workstation.; P_CWE_5 = I set up a conducive work environment.; P_CWE_6 = I listen to music that helps me concentrate.; P_CWE_7 = I configure my workstation ergonomically.; P_CWE_8 = I set up a pleasant room climate.; P_CWE_9 = I reduce potential sources of distraction by placing them out of reach of my workstation.; P_CWE_10 = I personalize my workstation.; P_CWE_11 = I try to reduce distraction factors.; T_TS_1 = I have a set time routine to start the workday in the morning.; T_TS_2 = I structure my workday temporarily.; T_TS_3 = I schedule in advance when I will work in my home office and when I will work on-site.; T_TS_4 = I log my working hours.; T_TS_5 = I strictly separate my work time from my leisure time.; T_TS_6 = I have set days for working from home.; T_TS_7 = I take a regular lunch break at set times.; T_TS_8 = I have a set time routine for the transition from work to leisure.; T_TS_9 = I do not work beyond my working hours agreed with the employer.; T_TS_10 = I align my break schedule with the official break times of my organization.; T_TS_11 = I strictly adhere to set working hours.; T_TS_12 = I schedule regular breaks.; T_TF_1 = I am temporally flexible in handling urgent work requests.; T_TF_2 = I schedule my work time in order to get the most of my leisure time.; T_TF_3 = If my work is short on time. I'll "save it up" to make up for it in the next days.; T_TF_4 = I schedule my leisure time in order to get the most of my work time.; T_TF_5 = I flexibly transfer personal matters to times when I typically work.; T_TF_6 = If my leisure is short on time, I'll "save it up" to make up for it in the next days.; T_TF_7 = I flexibly transfer my work to times when I typically attend to personal matters.; B_BSWL_1 = I have a technological routine for the transition into work at the start of the work day.; B_BSWL_2 = I have a set technological routine facilitating the transition from work to leisure.; B_BSWL_3 = I maintain the same routines of my on-site work.; B_BSWL_4 = I avoid reading non-work related materials at work.; B_BSWL_5 = I attend to personal matters at work only when taking a break or during lunch hour.; B_BSWL_6 = I do not take work-related calls after hours.; B_BSWL_7 = I do not respond to work-related messages after hours.; B_BSWL_8 = I have a rule which leisure aspects are allowed to spill over into work and which not.; B_BSWL_9 = I have a rule which work aspects are allowed to spill over into leisure and which not.; B_BSWL_10 = I do not go back to work after hours.; B_BSWL_11 = I use breaks to strictly separate work time from leisure time.; B_BSWL_12 = I do not read work-related messages after hours.; B_BSWL_13 = I have set rituals facilitating the transition from work to leisure.; B_BSWL_14 = I avoid talking about work-related matters in leisure contexts.; B_BSWL_15 = I avoid talking about personal matters in work contexts.; B_CWA_1 = I value the benefits of working from home.; B_CWA_2 = I get organized at work.; B_CWA_3 = I show a particularly high level of dedication.; B_CWA_4 = I try to strengthen my supervisor's confidence in the quality of my work.; B_CWA_5 = I adjust my attitude and behavior to optimally focus and concentrate at work.; B_CWA_6 = I schedule tasks that can be done particularly well at home.; B_CWA_7 = I set personal daily goals at work.; B_CWA_8 = I take a short lunch break and quickly continue working to get done as much as possible.; B_CWA_9 = I practice self-praise.; B_HPM_1 = I pay attention to healthy eating.; B_HPM_2 = I adapt my work day to my bio-rhythm.; B_HPM_3 = I integrate exercise into my work day.; B_HPM_4 = I integrate outdoor activities into my work day.; B_HPM_5 = I regularly take a "power nap".; C_MA_1 = I make arrangements with household members facilitating undisturbed work.; C_MA_2 = I make arrangements with colleagues/supervisors/my employer about when I can(not) be reached regarding work.; C_MA_3 = I'll confront household members if agreements about work and leisure are violated.; C_MA_4 = I make arrangements with customers/clients about when I can(not) be reached regarding work.; C_MA_5 = I'll confront colleagues/supervisors/my employer if agreements about work and leisure are violated.; C_MA_6 = Household members make arrangements with me in order to limit my workload.; C_MA_7 = I'll confront clients/customers if agreements about work and leisure matters are violated.; C_KC_1 = I use various communication channels.; C_KC_2 = I keep connected via technology to respond to colleagues/supervisors/my employer/customers/clients quickly.; C_KC_3 = I make small talk with my colleagues/supervisors/employer.; C_KC_4 = I communicate expectations and progress with colleagues/supervisors/my employer.; C_KC_5 = I use modern communication technology with colleagues/supervisors/my employer such as instant messaging.; C_KC_6 = I seek social interaction after work.; C_KC_7 = I use technology to stay in personal contact with colleagues; _r = recoded.

Results in bold are significant at the $p \leq .05$ level.

Appendix 4.1.B

The pattern of results of the for each telework subcategory aggregated β-coefficients predicting job performance reported in the main paper remained robust when computing scales for telework strategy subcategories averaging the implementation of the respective composing telework strategies per participant and simultaneously entering these scales into a multiple linear regression predicting job performance (using *z*-scaled variables and including control variables), and thus, remained robust when controlling for the overlap among telework strategies from different subcategories (see Table 4.1.B). More specifically, the subcategories conducive work attitude (β = 0.34 [0.24, 0.43], $p < .001$) and keep connection (β = 0.21 [0.12, 0.30], $p < .001$) were the most important positive predictors of job performance. These were followed by conducive work environment (β = 0.04 [-0.07, 0.16], $p = .45$), temporal structure (β = 0.01 [-0.10, 0.13], $p = .81$), physical separation of work and leisure (β = 0.01 [-0.10, 0.13], $p = .81$), make arrangements (β = 0.00 [-0.10, 0.10], $p = .97$), behavioral separation of work and leisure (β = -0.03 [-0.16, 0.09], $p = .59$), temporal flexibility (β = -0.03 [-0.12, 0.05], $p = .44$), and health-promoting measures (β = -0.12 [-0.22, -0.03], $p = .011$). Thus, in accordance with the results reported in the main paper, telework strategies from the subcategories conducive work attitude and keep connection appeared to be the most important positive predictors of job performance, whereas boundary related telework strategies appeared to be less important. We decided to not base our main results on the multiple linear regression based on scales of telework strategy subcategories, as the Cronbach's alphas for the subcategories were in some instances quite low ($\alpha_{\text{Temporal flexibility}} = .56$) indicating that telework strategies within subcategories were still heterogeneous. Thus, we report the results in the main paper on the level of the individual telework strategies and descriptively summarize results for the subcategories making this heterogeneity transparent.

Table 4.1.B

Multiple Linear Regression of Telework Strategy Scales Following the Categorization in the Main Paper Predicting Job Performance

	β	95%-CI	*p*
Intercept	-0.09	[-0.20, 0.02]	.12
Age	0.00	[-0.09, 0.09]	.97
Gender	**0.18**	[0.01, 0.35]	.043
Space	-0.04	[-0.13, 0.06]	.46
Children	0.06	[-0.14, 0.27]	.54
Physical separation of work and leisure	0.01	[-0.10, 0.13]	.81
Conducive work environment	0.04	[-0.07, 0.16]	.45
Temporal structure	0.01	[-0.10, 0.13]	.81
Temporal flexibility	-0.03	[-0.12, 0.05]	.44
Behavioral separation of work and leisure	-0.03	[-0.16, 0.09]	.59
Conducive work attitude	**0.34**	[0.24, 0.43]	<.001
Health-promoting measures	**-0.12**	[-0.22, -0.03]	.011
Make arrangements	0.00	[-0.10, 0.10]	.97
Keep connection	**0.21**	[0.12, 0.30]	<.001
$F(13, 495)$	**8.72**		<.001
R^2	**.19**		
$R^2_{Adj.}$	**.16**		

Note. n = 509. Gender was dummy-coded (0/1 = female/male). Children was dummy-coded (0/1 = no/yes). CI = confidence interval.
Results in bold are significant at the $p \leq .05$ level.

Appendix 4.1.C

The pattern of results of the for each telework subcategory aggregated β-coefficients predicting job performance reported in the main paper remained robust when simultaneously entering factor analytically identified scales averaging the implementation of the respective composing telework strategies per participant as predictors into a multiple linear regression predicting job performance (using *z*-scaled variables and including control variables), and thus, remained robust when controlling for the overlap among telework strategies from different factor analytically identified subcategories. To conduct this supplemental analysis, we first randomly split the data and computed an exploratory factor analysis (principal component analysis with varimax rotation computed with the psych package in R; Revelle, 2021; see Table 4.1.C1) with one half of the data. Based on the scree-plot, we identified eight factors. We labeled these factors based on the rule that a factor received the same label as the majority of the composing telework strategies in the taxonomy of the main paper (three telework strategies were assigned to a different factor than proposed by the taxonomy of the main paper). The eight factors identified were physical separation of work and leisure (seven telework strategies, α = .89), temporal structure (four telework strategies, α = .71), temporal flexibility (three telework strategies, α = .53), behavioral separation of work and leisure (four telework strategies, α = .90), conducive work attitude (three telework strategies, α = .70), health-promoting measures (three telework strategies, α = .66), make arrangements (five telework strategies, α = .79), and keep connection (two telework strategies, α = .65). Based on the other half of the data set, we computed a confirmatory factor analysis using maximum likelihood estimation (computed with the lavaan package in R; Rosseel, 2012; $\chi^2(406) = 614.68$, $p < .001$; CFI = .88; TLI = .87; SRMR = .075; RMSEA = .057). We then computed scales averaging the implementation of telework strategies per participant for each factor and entered these scales simultaneously in a multiple linear regression predicting job performance (see Table 4.1.C2). The pattern of results was similar to the results of the for each telework strategy subcategory aggregated β-coefficients predicting job performance reported in the main paper. The factors conducive work attitude (β = 0.25 [0.16, 0.34], $p < .001$) and keep connection (β = 0.21 [0.13, 0.30], $p < .001$) were the most important positive predictors of job performance. These were followed by make arrangements (β = 0.05 [-0.04, 0.15], $p = .26$), physical separation of work and leisure (β = 0.04 [-0.05, 0.14], $p = .37$), behavioral separation of work and leisure (β = 0.02 [-0.07, 0.11], $p = .65$), health promoting measures (β = -0.04 [-0.13, 0.05], $p = .38$), temporal structure (β = -0.05 [-0.14, 0.04], $p = .30$), and temporal flexibility (β = -0.06 [-0.15, 0.03], $p = .18$). We decided to not base our main results on factor

analytically identified telework strategy scales because the data generation process was not tailored to do so, leading to a somewhat arbitrary factor analytically identification of telework strategy categories (if previous research and popular media described similar telework strategies in detail factors would emerge, whereas if previous research and popular media described standalone, definite telework strategies no factors would emerge) and to a removal of a large proportion of telework strategies (potentially leading to overseeing relevant telework strategies for job performance). Considering that research on telework strategies is still in its' infancy, the focus of the present study was to assess the broad range of heterogeneous telework strategies present in the scientific literature and popular media to paint a comprehensive, highly resolved picture.

Table 4.1.C1

Principal Component Analysis of the 85 Telework Strategies With Varimax Rotation

Telework strategy	Factor loadings								Communalities
	PC2: P_PSWL	PC7: B_BSWL	PC1: T_TS	PC3: C_MA	PC4: B_CWA	PC6: B_HPM	PC5: C_KC	PC8: T_TF	
I regularly work outside my home. (recoded)		.27	.14	-.13			.13		.14
I use technology facilitating to separate work and leisure.	.28	.36	.21	.22			.24	.11	.37
I occasionally change my workstation. (recoded)	.28	.27	.32	-.11	-.11	-.20		-.16	.34
I exclusively work in a designated place.	.45	.18	.39	-.15					.43
I keep work materials in a separate, dedicated place.	.57	.16	.12		.29		.10		.46
I arrange my workstation visually like a typical office.	**.74**				.17	.18	.10		.63
I physically separate my workstation from the rest of my living environment.	**.86**								.74
I do not conduct leisure activities at my workstation.	.52	.23	.17		.18			-.20	.44
I use physical barriers as boundaries between work and leisure.	**.77**								.61
I use a separate, dedicated room for working.	**.81**								.68
I establish an atmosphere at my workstation that differs from the rest of my home.	**.66**		.15	.14	.11	.18			.52
I wear work clothes.	.29			.19	.15	.12		-.12	.18
I make sure there is sufficient light at my workstation.	.21	.16			.17	.48	.17		.36
I wear comfortable clothes.		.28		-.13	.14	.16	.15		.17
I regularly air the room.	.22				.12	**.62**			.47
I use a setup that is technically close to the setup at my on-site workstation.	.48		.13				.37		.39
I set up a conducive work environment.	**.62**				.22	.19	.19		.52
I listen to music that helps me concentrate. (recoded)				-.21	.16			-.20	.13
I configure my workstation ergonomically.	**.66**		.13			.25			.52
I set up a pleasant room climate.	.18			.19	.20	.37			.26
I reduce potential sources of distraction by placing them out of reach of my workstation.	.30			.16	.40	.19	-.18	-.14	.37
I personalize my workstation.	.28			.24		.11	.15		.20
I try to reduce distraction factors.	.31	.19	.12	.29	.34		-.19	-.26	.46
I have a set time routine to start the workday in the morning.	.13		**.65**		.14	.13	.12	-.17	.53

Telework strategy	Factor loadings								Com-munali-ties
	PC2: P PSWL	PC7: B BSWL	PC1: T TS	PC3: C MA	PC4: B CWA	PC6: B HPM	PC5: C KC	PC8: T TF	
I schedule in advance when I will work in my home office and when I will work on-site.			.42		.21			.32	.34
I structure my workday temporarily.	.21	.28	.36			.38	.16		.43
I log my working hours.		.45			.11		.27		.31
I strictly separate my work time from my leisure time.	.23	.52	.46	.14	.20	.12		-.14	.62
I have set days for working from home.	.20	.19	.40					.24	.30
I take a regular lunch break at set times.		.19	**.60**	.11	-.16	.26			.51
I have a set time routine for the transition from work to leisure.		.20	**.61**	.24	.11				.49
I do not work beyond my working hours agreed with the employer.	.11	.43	.35				-.10	.21	.38
I align my break schedule with the official break times of my organization.	.16	.24	.52			.15			.39
I strictly adhere to set working hours.		.31	**.64**	.15				-.12	.55
I schedule regular breaks.	.12		.17	.28		.43	-.14	.20	.38
I am temporally flexible in handling urgent work requests.	.23		-.48	-.15		.10			.35
I schedule my work time in order to get the most of my leisure time.						.11		**.65**	.45
If my work is short on time, I'll "save it up" to make up for it in the next days.	.12	-.14						**.51**	.30
I schedule my leisure time in order to get the most of my work time.	.16				.35	.14		.11	.19
I flexibly transfer personal matters to times when I typically work.		-.21	-.30		-.20			**.62**	.57
If my leisure is short on time, I'll "save it up" to make up for it in the next days.				.21				**.58**	.40
I flexibly transfer my work to times when I typically attend to personal matters.		-.58	-.32			.10		.20	.50
I have a technological routine for the transition into work at the start of the work day.	.18	.37	.21				.51		.49
I have a set technological routine facilitating the transition from work to leisure.	.13	.49	.25			.14	.40		.50
I maintain the same routines of my on-site work.	.19	.14	.52		.43		.13	-.14	.55
I avoid reading non-work related materials at work.	.27	.18	.15		.56			-.22	.50
I attend to personal matters at work only when taking a break or during lunch hour.	.16	.12	.37		.39	.13		-.24	.40
I do not take work-related calls after hours.		**.76**	.12	.22			-.10		.65
I do not respond to work-related messages after hours.		**.85**	.17	.13			-.10		.78
I have a rule which leisure aspects are allowed to spill over into work and which not.		.18	.30	.49	.16			-.11	.41

Telework strategy	Factor loadings								Com-munali-ties
	PC2: P_PSWL	PC7: B_BSWL	PC1: T_TS	PC3: C_MA	PC4: B_CWA	PC6: B_HPM	PC5: C_KC	PC8: T_TF	
I have a rule which work aspects are allowed to spill over into leisure and which not.		.28	.37	.47		.10			.44
I do not go back to work after hours.		**.77**	.12				-.11		.63
I use breaks to strictly separate work time from leisure time.	.15	.19	.41	.30		.42		.20	.53
I do not read work-related messages after hours.		**.83**	.19	.16					.75
I have set rituals facilitating the transition from work to leisure.		.19	.34	.32		.39			.42
I avoid talking about work-related matters in leisure contexts.	.23	.21	.28	.22	.10	-.10		.22	.29
I avoid talking about personal matters in work contexts.	.14	.25		.19	.19		-.19		.19
I value the benefits of working from home.		.22				.13	.33	.26	.25
I get organized at work.				.15	**.64**			.11	.46
I show a particularly high level of dedication.	.16				.57		.30		.47
I try to strengthen my supervisor's confidence in the quality of my work.				.11	.41		.34		.31
I adjust my attitude and behavior to optimally focus and concentrate at work.	.23	.11	.20		**.61**	.13			.50
I schedule tasks that can be done particularly well at home.			.23	.15	.45		-.13	.20	.35
I set personal daily goals at work.					**.64**	.18			.47
I take a short lunch break and quickly continue working to get done as much as possible.		-.21	-.20		.21	-.21	.21		.23
I practice self-praise.				.28	.11	.24	.34	.16	.30
I pay attention to healthy eating.			.20	.15	.26	.50			.39
I adapt my work day to my bio-rhythm.			-.14	.11	.15	.25		.52	.38
I integrate exercise into my work day.				.16	.19	**.60**			.43
I integrate outdoor activities into my work day.		-.11		.15		**.61**			.43
I regularly take a "power nap".		-.19	.15	.10	-.13	.39		.27	.31
I make arrangements with household members facilitating undisturbed work.	.24	.15	.13	.44	.37				.44
I make arrangements with colleagues/supervisors/my employer about when I can(not) be reached regarding work.		.20	.31	.49	.25		.10	.20	.50
I'll confront household members if agreements about work and leisure are violated.				**.68**	.12	.19			.53
I make arrangements with customers/clients about when I can(not) be reached regarding work.			.12	**.56**	.15		.14	.24	.44
I'll confront colleagues/supervisors/my employer if agreements about work and leisure are violated.		.21		**.77**		.16			.67

Telework strategy	Factor loadings								Com-munali-ties
	PC2: P_PSWL	PC7: B_BSWL	PC1: T_TS	PC3: C_MA	PC4: B_CWA	PC6: B_HPM	PC5: C_KC	PC8: T_TF	
Household members make arrangements with me in order to limit my workload.	.15	-.16		**.53**	.11	.17		.11	.39
I'll confront clients/customers if agreements about work and leisure matters are violated.		.16		**.79**		.18		.12	.69
I use various communication channels.							**.64**		.43
I keep connected via technology to respond to colleagues/supervisors/my employer/customers/clients quickly.					.21		**.61**		.42
I make small talk with my colleagues/supervisors/employer.			.11		-.27		.35		.22
I communicate expectations and progress with colleagues/supervisors/my employer.			.23	.37	.19		.36	.10	.37
I use modern communication technology with colleagues/supervisors/my employer such as instant messaging.		-.24		.21	-.14		.44		.33
I seek social interaction after work.	-.10	.14		.11		.38	.23		.26
I use technology to stay in personal contact with colleagues.		-.14	-.25	.24		.19	.46		.40
Eigenvalue	5.72	2.29	13.19	4.87	3.16	2.32	2.78	1.94	
Sum of squared loadings	6.31	5.73	5.28	4.77	4.29	3.75	3.19	2.96	
Proportion of variance (in %)	7.40%	6.70%	6.20%	5.60%	5.00%	4.40%	3.80%	3.50%	
Cumulative proportion of variance (in %)	7.40%	14.10%	20.30%	25.90%	30.90%	35.30%	39.20%	42.70%	

Note. n = 274. Factor loadings < |.10| are not displayed. Telework strategies in italics represent strategies being assigned to a different factor than in the categorization of the main paper. PC = principal component; P_ = physical; B_ = behavioral; T_ = temporal; C_ = communicative; PSWL = physical separation of work and leisure; BSWL = behavioral separation of work and leisure; TS = temporal structure; MA = make arrangements; CWA = conducive work attitude; HPM = health-promoting measures; KC = keep connection; TF = temporal flexibility.
Factor loadings > |.30| and loading > |.30| on the respective factor than on any other factor are bold.

Table 4.1.C2

Multiple Linear Regression of Factor Analytically Identified Telework Strategy Scales Predicting Job Performance

	β	95%-CI	*p*
Intercept	-0.07	[-0.19, 0.05]	.24
Age	-0.05	[-0.14, 0.05]	.33
Gender	0.12	[-0.06, 0.30]	.19
Space	-0.01	[-0.12, 0.10]	.85
Children	0.10	[-0.11, 0.31]	.35
Physical separation of work and leisure	0.04	[-0.05, 0.14]	.37
Temporal structure	-0.05	[-0.14, 0.04]	.30
Temporal flexibility	-0.06	[-0.15, 0.03]	.18
Behavioral separation of work and leisure	0.02	[-0.07, 0.11]	.65
Conducive work attitude	**0.25**	[0.16, 0.34]	<.001
Health-promoting measures	-0.04	[-0.13, 0.05]	.38
Make arrangements	0.05	[-0.04, 0.15]	.26
Keep connection	**0.21**	[0.13, 0.30]	<.001
$F(12, 489)$	**6.18**		<.001
R^2	**.13**		
$R^2_{Adj.}$	**.11**		

Note. $n = 502$. Gender was dummy-coded (0/1 = female/male). Children was dummy-coded (0/1 = no/yes). CI = confidence interval.
Results in bold are significant at the $p \leq .05$ level.

Appendix 4.1 References

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4.2 Examining the Extended Full-Range Leadership Model and Leadership Effectiveness in Remote Work Contexts: The Moderating Role of VUCA Environments

Publication Status. Hüttemann, D., **Härtel, T. M.**, & Müller, J. (2023). Examining the extended full-range leadership model and leadership effectiveness in remote work contexts: The moderating role of VUCA environments. Submitted to *European Management Review.*

Abstract. The COVID-19 pandemic has amplified the importance of effectively leading a remote workforce in volatile, uncertain, complex, and ambiguous (VUCA) environments. This study examines the effectiveness of transformational-transactional leadership (Full-Range Leadership Model, FRLM) and its recent extension of instrumental leadership (eFRLM) in remote work contexts. We surveyed 529 remote working followers providing perceptions on (a) their leaders' manifestation of eFRLM dimensions and factors, (b) their leaders' leadership effectiveness, and (c) their organizational environment as VUCA. Results show that instrumental leadership represents a strongly effective leadership dimension in remote work contexts explaining unique variance beyond transformational-transactional leadership. Moreover, VUCA environments moderated the association between eFRLM leadership behaviors and leadership effectiveness, with instrumental leadership being particularly effective in more pronounced VUCA environments, and transformational-transactional leadership being less effective. Overall, instrumental leadership appears crucial to consider when predicting leadership effectiveness in virtual and uncertain contexts.

Keywords. Remote leadership, instrumental leadership, transformational-transactional leadership, (extended) Full-Range Leadership Model, leadership effectiveness, VUCA.

Open Science Statement. The data, codebook, R-script, and supplementary results are made transparent on the open science framework: https://bit.ly/3EzKmou.

4.2.1 Introduction

The COVID-19 pandemic has induced various substantial changes in daily working life. In particular, effective leadership of a geographically dispersed, remote workforce in volatile, uncertain, complex, and ambiguous (VUCA) contexts has grown in significance (Krehl & Büttgen, 2022; Rudolph et al., 2021; Stoker et al., 2022). Effective remote leadership was especially challenging during the COVID-19 pandemic due to (a) employees' relative lack of remote work experience, (b) employees' lacking technological infrastructure, (c) pandemic-induced mental strain, and (d) economic pressure (Contreras et al., 2020; Dasborough & Scandura, 2022; Kniffin et al., 2021; Stoker et al., 2022).

The Full-Range Leadership Model (FRLM) is a well-established framework to understand leadership effectiveness in traditional on-site work settings (e.g., DeGroot et al., 2000; Dumdum et al., 2013; Judge & Piccolo, 2004; Lowe et al., 1996), yet little is known about its applicability to remote work settings. In addition, instrumental leadership in a more recent extension of the FRLM—the eFRLM—has been shown to explain incremental variance in predicting leadership effectiveness (Antonakis & House, 2014), but it has not been examined in remote work contexts. This is striking because flexible work arrangements, such as remote work, are prone to persist in the post-COVID-19 era (Athanasiadou & Theriou, 2021). Moreover, organizations will likely face pronounced VUCA environments in the future (Luthans & Broad, 2022). Therefore, remote work and VUCA environments represent highly relevant contextual factors that require further investigation to elucidate their impact on the effectiveness of eFRLM leadership (Antonakis & House, 2014).

To address these gaps in the literature, we collected survey data from 529 remote workers, gathering follower perceptions on (a) their respective leader's manifestation of eFRLM dimensions (i.e., transformational, transactional, and instrumental leadership) and factors (e.g., "articulating a vision," "contingent reward," and "outcome monitoring"), (b) their respective leader's leadership effectiveness, and (c) evaluations of their respective organization's environment as VUCA. We captured the follower perspective on effective leadership, which is particularly informative in remote work contexts (e.g., Kelloway et al., 2003; Purvanova & Bono, 2009). Specifically, we examined associations between the eFRLM and perceived leadership effectiveness in remote work contexts at dimensional and factor levels. This way, we could draw higher-level conclusions on the perceived effectiveness of the eFRLM dimensions and, at the same time, delve deeper into the specific eFRLM factors driving these effects. Thereby, we examine instrumental leadership's incremental predictive validity of leadership effectiveness beyond the original FRLM in remote work contexts. Also, the present

study is the first to explore the moderation effect of VUCA environments on the association between the eFRLM and leadership effectiveness at dimensional and factor levels.

Results showed that the instrumental leadership dimension was perceived as the most effective leadership dimension in remote work contexts, closely followed by transformational and then transactional leadership dimensions. At the factor level, the significant predictors of perceived leadership effectiveness were, for instrumental leadership, "environmental monitoring," "path-goal facilitation," and "outcome monitoring"; for transformational leadership, "articulating a vision," "providing an appropriate model," "fostering the acceptance of group goals," and "individualized support"; and for transactional leadership "contingent reward." We thereby found instrumental leadership to explain unique variance beyond the original FRLM at dimensional and factor levels, indicating that omitted variable bias may occur when not considering instrumental leadership to predict leadership effectiveness. Also, we found that perceived effectiveness of the eFRLM dimensions and factors were moderated by VUCA environments: Whereas transformational-transactional leadership dimensions appeared to be less effective in more-pronounced VUCA environments, instrumental leadership appeared to be particularly effective. Leaders in VUCA environments may therefore focus on strategic and work-facilitating (instrumental) leadership rather than charismatic and visionary (transformational) or quid pro quo (transactional) leadership. Zooming-in on the factor level, these moderation effects might be especially traced back to the transactional leadership factor "contingent reward" being less effective in more-pronounced VUCA environments and the instrumental leadership factor "outcome monitoring" being particularly effective in more-pronounced VUCA environments. Thus, leaders in remote work and VUCA environments might be advised to focus less on value exchange (e.g., rewarding/punishing followers contingent on their performance) and more on facilitating followers' work (e.g., monitoring outcomes, anticipating goal deviations, providing corrective feedback) instead.

The present study extends the leadership literature by shedding light on the merits of established (transformational-transactional leadership, FRLM) and aspiring (instrumental leadership, eFRLM) leadership theories in unaddressed remote work and VUCA contexts through the follower lens. We heeded a call to examine how contextual factors affect instrumental leadership's effectiveness (Antonakis & House, 2014) and thereby advanced the young eFRLM literature in several ways: We determined the extent to which instrumental leadership incrementally explained variance in perceived leadership effectiveness beyond the FRLM in remote work contexts at dimensional and factor levels. Furthermore, we explored the moderation effect of VUCA environments on the association of eFRLM dimensions and their

factors with perceived leadership effectiveness. Examining the perceived eFRLM effectiveness at the dimensional and more nuanced factor levels allowed us to derive tangible implications for real-life organizations, such as an apparent need for training interventions or 360°-feedback informing about the specific eFRLM behaviors that foster effective leadership in virtual and crisis-ridden organizational contexts.

4.2.2 Theoretical Background

4.2.2.1 The Extended Full-Range Leadership Model. The FRLM (Bass, 1985) comprises the transformational, transactional, and laissez-faire dimensions of leadership. These dimensions are typically further divided into transformational leadership factors, transactional leadership factors, and a non-leadership, laissez-faire factor (Avolio & Bass, 1988; Bass, 1999; Podsakoff et al., 1990). Transformational leaders strive to (a) identify new opportunities and inspire through a shared vision (*articulating a vision*), (b) embody and model the values they espouse (*providing an appropriate model*), (c) foster collaboration to achieve a shared goal (*fostering the acceptance of group goals*), (d) set high quality and performance standards (*high performance expectations*), (e) show respect and prioritize followers' personal feelings and needs (*individualized support)*, and (f) challenge followers to re-evaluate their work and find new, innovative ways of working (*intellectual stimulation*). Transactional leaders reward their followers with tangible commodities (e.g., salary increases) or intangible commodities (e.g., recognition) when followers meet expectations (*contingent reward*). Laissez-faire leaders do not lead in an obvious sense, rather they avoid taking a position or making decisions.

However, prior research questioned whether the FRLM covers the full range of leadership factors critical to effective leadership (Antonakis & House, 2013, 2014; Hunt, 2004; Judge & Piccolo, 2004; Yukl, 1999, 2008). In particular, the FRLM has been challenged for lacking (a) strategic factors (i.e., scanning the external environment, implementing strategic goals) and (b) work-facilitating factors (i.e., facilitating follower work by providing resources and corrective, performance-enhancing feedback) rooted in task-oriented leadership (Antonakis & House, 2013; Yukl, 1999).

To address the FRLM's lack of strategic and work-facilitating factors, Antonakis and House (2004, 2014) extended the FRLM into the eFRLM. Specifically, the eFRLM proposes that (i) monitoring the organizational environment (*environmental monitoring*), (ii) implementing strategic initiatives (*strategy formulation and implementation*), (iii) implementing tactical solutions (*path-goal facilitation*), and (iv) monitoring follower performance (*outcome monitoring*) are instrumental to effective leadership. These four factors are subsumed under the *instrumental leadership* dimension. Initial research found evidence for

instrumental leadership's construct validity (Antonakis & House, 2014) and critically addressed the validity of previous findings that were solely based on FRLM factors but omitted instrumental leadership factors when predicting leadership outcomes (Antonakis & House, 2014; Rowold, 2014). Adding instrumental leadership factors in predictive models alters the estimated coefficients of FRLM factors (i.e., omitted variable bias; Cinelli & Hazlett, 2020).

There is initial empirical evidence on instrumental leadership's predictive validity. Instrumental leadership is positively associated with followers' (a) health-related outcomes (e.g., reduced stress, work-family conflict, and burnout; Allgood et al., 2022; Poethke et al., 2021; Rowold et al., 2017), (b) satisfaction-related outcomes (e.g., increased job and leadership satisfaction and higher affective commitment; Antonakis & House, 2014; Rowold, 2014), and (c) performance-related outcomes (e.g., increased task and innovation performance, higher decision-making effectiveness; Chammas & Hernandez, 2019; Delbecq et al., 2013; Gerlach et al., 2020; Kramer et al., 2019; Rowold et al., 2017). Indeed, there is also initial evidence that instrumental leadership helps to explain followers' (d) perceptions of effective leadership (Antonakis & House, 2004, 2014).

4.2.2.2 eFRLM and Leadership Effectiveness. *Leadership effectiveness* refers to a leader's efficiency in influencing and guiding followers toward achieving organizational objectives (Hogan et al., 1994; Stogdill, 1950) and represents the "standard by which leaders should be judged" (Hogan et al., 1994, p. 494). The most common assessments of effective leadership are based on followers' ratings (i.e., perceptions) of their respective leader's effectiveness (Judge et al., 2002). Perceived leadership effectiveness is considered particularly informative as it directly induces actual follower behavior (Hogan et al., 1994; Meindl, 1995) and accounts for performance above expectations (Avolio & Bass, 1988; Lowe et al., 1996). Also, perceived leadership effectiveness converges with objective leadership effectiveness criteria, such as team or organizational unit performance (Hogan et al., 1994) and has been the subject of several meta-analyses examining the effectiveness of the FRLM's dimensions and factors (e.g., Judge & Piccolo, 2004; Lowe et al., 1996).

Transformational leadership and its factors are more strongly associated with perceived leadership effectiveness than transactional leadership and its contingent reward factor (Judge & Piccolo, 2004; Lowe et al., 1996). In contrast, laissez-faire leadership is perceived as ineffective (Antonakis & House, 2013; Avolio et al., 1995; Bass & Avolio, 1993). Instrumental leadership factors were found to explain unique variance beyond FRLM factors when predicting perceived leadership effectiveness (Antonakis & House, 2004): Three of four instrumental leadership factors—"strategy formulation and implementation," "path-goal

facilitation," and "outcome monitoring"—were found to predict leadership effectiveness when simultaneously considering transformational, transactional, and instrumental leadership factors, whereas only the transformational leadership factor "idealized influence" and the transactional leadership factor "contingent reward" predicted leadership effectiveness. In terms of variance explanation, instrumental leadership turned out to be equally important as transformational leadership when predicting perceived leadership effectiveness in traditional on-site work contexts (Antonakis & House, 2014).

4.2.2.3 eFRLM and Leadership Effectiveness in Remote Work Contexts. However, previous findings on the perceived effectiveness of eFRLM dimensions and factors in traditional on-site work contexts do not necessarily apply to widespread (Allen et al., 2015; Gajendran & Harrison, 2007) remote work settings. During remote work, the leader-follower dyad differs significantly from on-site work due to spatial distance and thus, technology-mediated and often asynchronous rather than face-to-face communication (Avolio et al., 2000, 2014; Hertel et al., 2005; Kelley & Kelloway, 2012). Accordingly, leadership in remote work contexts—*remote leadership*—is defined as a social influence process mediated by information and communication technologies (ICTs), such as video conferencing, instant messaging, or digital document sharing. Employees led remotely—*remote-working followers*—perform some or all of their work away from their traditional on-site workplace, usually from home (e.g., Bailey & Kurland, 2002; Härtel et al., 2023). Thus, effective remote leaders enhance the performance of geographically dispersed followers via ICTs (Avolio et al., 2000, 2014; Van Wart et al., 2019). The rapidly evolving shift to remote work, recently amplified by the COVID-19 pandemic (Kniffin et al., 2021; Kramer & Kramer, 2020; Milasi et al., 2021; Rudolph et al., 2021), has raised questions about whether the reduced face-to-face interaction and asynchronous communication associated with remote work compromise the effectiveness of traditional leadership (Hertel et al., 2005). Initially, the leader-follower distance was assumed to have a "neutralizing effect" (Antonakis & Atwater, 2002, p. 685) on follower perceptions of leadership effectiveness. For instance, transformational leaders may require physical proximity to show attention and consideration in order to be perceived as effective by their followers (Andressen et al., 2012; Dubinsky et al., 1995; Howell et al., 2005).

The current state of research paints a mixed and incomplete picture of the generalizability of findings on the effectiveness of the FRLM from on-site to remote work contexts. Whereas some studies found supportive evidence for the effectiveness of FRLM dimensions and factors in remote work constellations (Kelloway et al., 2003; Neufeld et al., 2010; Purvanova & Bono, 2009; Ramserran & Haddud, 2018), other studies found FRLM

dimensions and factors to be less effective in remote work than in traditional on-site work settings (Andressen et al., 2012; Eisenberg et al., 2019; Hoch & Kozlowski, 2014; Howell et al., 2005). On the one hand, for instance, transformational leaders have been found to achieve higher team performance in remote working teams than in traditional teams interacting face-to-face (Purvanova & Bono, 2009). Also, for example, charismatic and intellectually stimulating emails were shown to be associated with increased individual and team performance (Kelloway et al., 2003). On the other hand, some studies (Andressen et al., 2012; Dubinsky et al., 1995; Eisenberg et al., 2019; Hoch & Kozlowski, 2014) found the performance of teams led by transformational leaders to decrease with increasing physical distance. As for instrumental leadership in the eFRLM, there is no research to date that has examined its association with perceived leadership effectiveness in remote work contexts.

Thus, the lack of research on the effectiveness of eFRLM dimensions and factors in remote work contexts opens the door to the present study. First, to our knowledge, only one study (Neufeld et al., 2010) captured the most common (Judge et al., 2002) and particularly insightful (Hogan et al., 1994; Meindl, 1995; Murphy & Cleveland, 1991) follower perspective on leadership effectiveness, which limits comparability with prior research conducted in traditional on-site work contexts. Second, we are not aware of any research that examined factor-level associations of the FRLM and perceived leadership effectiveness in remote work settings. Although a higher-level perspective should provide valuable insights into a leadership dimension's (e.g., transformational leadership) overall effectiveness, it does not allow one to draw fine-grained conclusions about the specific leadership factors (e.g., "articulating a vision") driving these effects. However, understanding which specific leadership factors might foster leadership effectiveness would facilitate the derivation of tangible recommendations for practitioners aimed at teaching specific FRLM-related skills that promote effective remote leadership. Third, and most remarkably, no study has yet examined the associations between instrumental leadership and perceived leadership effectiveness in remote work settings. Omitting instrumental leadership factors when predicting remote leadership effectiveness with FRLM factors could reduce the validity of research findings (Antonakis & House, 2014; Rowold, 2014). Also, supporting followers with resources and removing obstacles for goal achievement ("path-goal facilitation"), and providing positively framed, performance-enhancing feedback ("outcome monitoring") might be particularly beneficial to remote workers and perceived by them as effective leadership strategies (Bartsch et al., 2020; Krehl & Büttgen, 2022; Liao, 2017).

4.2.2.4 Moderating Role of VUCA Environments. The leadership behaviors that foster leadership effectiveness depend on environmental context (e.g., Osborn et al., 2002; Waldman et al., 2001). For example, dynamic and volatile organizational environments were found to moderate associations between the FRLM and firm-level outcomes (e.g., innovation or financial performance; Ensley et al., 2006; Prasad & Junni, 2016). However, less is known about the moderation effect of dynamic and volatile organizational environments on follower perceptions of effective leadership. Research suggests follower perceptions of the behaviors that influence leadership effectiveness to change in extreme contexts (Hannah et al., 2009). The extent to which an extreme environmental context is perceived as threatening varies across individuals (Benner, 1984), though. Therefore, followers may perceive eFRLM dimensions and factors as more or less effective depending on their individual perceptions of dynamic and extreme settings, such as VUCA environments. VUCA environments (Bennett & Lemoine, 2014) have recently received attention both in practice (e.g., Arkenberg, 2019; Huesmann & Khoroshylova, 2020; Kothari et al., 2021) and academia (e.g., Bennett & Lemoine, 2014; Elkington, 2018). Due to COVID-19-induced disruptions (e.g., novel forms of work communication and interaction due to remote work, financial uncertainty due to economic strain, and health concerns; Mihalache & Mihalache, 2022), followers might have perceived their then-current organizational environment as VUCA. Thus, the COVID-19 pandemic provided a unique opportunity to explore the moderation effect of follower-perceived VUCA environments on associations of eFRLM dimensions and factors with leadership effectiveness.

During the COVID-19 pandemic, followers faced a multifaceted crisis (Contreras et al., 2020) that was both a global health crisis and an economic threat to organizations and their people (Kniffin et al., 2021). Organizational environments during the COVID-19 pandemic could have been perceived as VUCA (Bennett & Lemoine, 2014) because they were (a) *volatile* (i.e., future developments were difficult to predict; e.g., dynamic pandemic events triggered adverse market reactions), (b) *uncertain* (i.e., critical information was missing; e.g., the duration that organizations were affected by COVID-19-induced preventive measures), (c) *complex* (i.e., organizational environments consisting of many interconnected parts were difficult to oversee; e.g., upstream and downstream supply chains were affected by the COVID-19 pandemic), and (d) *ambiguous* (i.e., unknown cause-effect relationships of organizational measures taken due to lacking experience; e.g., the workforce's ad hoc shift to remote work had unknown organizational impacts; Dima et al., 2021; Hadar et al., 2020; Luthans & Broad, 2022; Schulze et al., 2021; Sum, 2022; Worley & Jules, 2020). Recent research applied the VUCA concept to leadership by exploring leadership skills that may be required to succeed in such challenging

environments (e.g., Giones et al., 2019; Millar et al., 2018; Schoemaker et al., 2018). Initial evidence suggests that leaders in VUCA environments tend to employ more leadership behaviors related to instrumental leadership and that such behaviors also appear to be perceived as more effective than traditional leadership behaviors.

In VUCA environments, followers may require guidance by strategic vision (Hitt et al., 2010; Klein & House, 1995; Tavares et al., 2021). Thus, instrumental leadership's strategic factors ("environmental monitoring" and "strategy formulation and implementation") may be perceived as effective because they limit follower uncertainty and ambiguity by "redirecting attention to new goals, initiating new work structures and processes, and providing guidance and feedback" (Allgood et al., 2022, p. 7). Indeed, recent qualitative studies (Baran & Woznyj, 2021; Giones et al., 2019; Schoemaker et al., 2018) underscore the effectiveness of strategic leadership skills (e.g., considering an organization's external environment) in VUCA environments. Another strand of research (Bartsch et al., 2020; Stoker et al., 2022) found leadership behaviors resembling the work-facilitating factors of instrumental leadership ("path-goal facilitation" and "outcome monitoring") to be effective in VUCA environments. Both work-facilitating factors of instrumental leadership are rooted in directive and task-oriented leadership (i.e., limiting followers' individual decision-making by giving clear instructions, structuring tasks, and monitoring compliance with instructions; see Kamphuis et al., 2011; Stoker et al., 2019), which has already been explored in extreme contexts (Hannah et al., 2009). Applying the *threat-rigidity-hypothesis*—organizations and their people behave rigidly in threatening environments by restricting information and constricting control (see Staw et al., 1981)—to VUCA environments, leaders might respond with increased levels of directive and task-oriented leadership to buffer potential losses of control (Stoker et al., 2019, 2022) and followers may perceive such behaviors as effective. Indeed, initial evidence suggests that directive and task-oriented leadership are perceived as more effective during extreme events (e.g., Mulder & Stemerding, 1963; Mulder et al., 1971, 1986).

We advance the young eFRLM literature by adding to the underexplored stream of research examining organizational environments' impacts on perceptions of leadership outcomes (Porter & McLaughlin, 2006). More specifically, we explore the moderation effect of the extent to which followers perceive their organizational environment as VUCA on the association between the eFRLM and leadership effectiveness. Thereby we focus on the clearly defined constructs VUCA (Bennett & Lemoine, 2014) and instrumental leadership (Antonakis & House, 2014). In addition, previously observed main effects of leadership behaviors on perceived leadership effectiveness in dynamic and crisis environments do not necessarily

preclude that these exact leadership behaviors are also perceived as effective in non-crisis environments. In comparison, explicitly testing moderating effects allows us to draw conclusions about leadership behaviors that are particularly effective in dynamic and crisis environments.

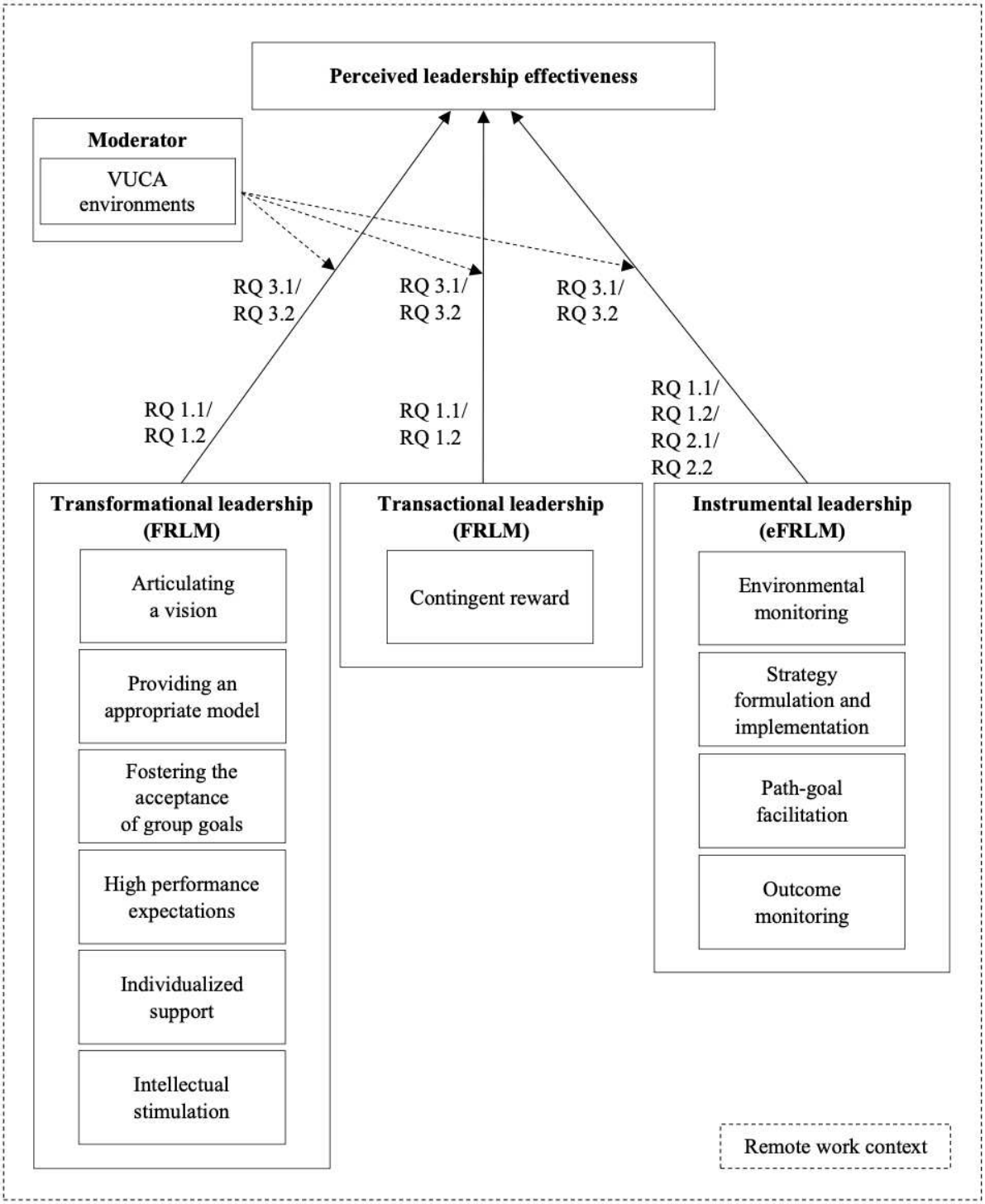
4.2.2.5 Present Study. The present study is the first to shed light on the merits of established (transformational-transactional leadership, FRLM) and up-and-coming (instrumental leadership, eFRLM) leadership theories in virtual and crisis-ridden organizational contexts through the follower lens. Specifically, we go beyond previous research by examining associations between the eFRLM and perceived leadership effectiveness in remote work settings at dimensional (research question, RQ 1.1) and factor levels (RQ 1.2). Heeding the call to examine how contextual factors affect impacts of instrumental leadership (Antonakis & House, 2014), we advance the young eFRLM literature in several ways: We determine the extent to which instrumental leadership explains incremental variance in perceived leadership effectiveness beyond the FRLM in remote work contexts at dimensional (RQ 2.1) and factor levels (RQ 2.2). We also explore the moderation effect of follower-perceived VUCA environments on associations between the eFRLM and perceived leadership effectiveness at dimensional (RQ 3.1) and factor levels (RQ 3.2). For this purpose, we surveyed 529 remote workers that provided follower perceptions on (a) their respective leader's manifestation of eFRLM dimensions and factors, (b) their perceptions of their respective leader's leadership effectiveness, and (c) evaluations of their respective organization's environment as VUCA. We formulated the following research questions (see Figure 4.2.1):

- RQ 1.1: Which eFRLM dimensions are associated with perceived leadership effectiveness in remote work contexts?
- RQ 1.2: Which eFRLM factors are associated with perceived leadership effectiveness in remote work contexts?
- RQ 2.1: Does the instrumental leadership dimension explain incremental variance beyond the original FRLM dimensions when predicting perceived leadership effectiveness in remote work contexts?
- RQ 2.2: Do instrumental leadership factors explain incremental variance beyond the original FRLM factors when predicting perceived leadership effectiveness in remote work contexts?
- RQ 3.1: How does the perceived VUCA environment moderate associations between eFRLM dimensions and perceived leadership effectiveness?

- RQ 3.2: How does the perceived VUCA environment moderate associations between eFRLM factors and perceived leadership effectiveness?

Figure 4.2.1

Conceptual Framework of the Present Study Mapping the Focal Dependent and Independent Variables and Providing an Overview of the Research Questions (RQs)



Note. VUCA = volatile, uncertain, complex, and ambiguous environments; FRLM = Full-Range Leadership Model; eFRLM = extended Full-Range Leadership Model.

4.2.3 Method

4.2.3.1 Sample. German-speaking participants in our online survey study were recruited via convenience sampling by placing advertisements in professional (LinkedIn, Xing) and social media (Facebook, Instagram, Twitter, Nebenan) network groups, on research platforms for mutual participant recruitment (SurveyCircle, PollPool[40]), and in a lecture at Osnabrück University[41]. Participation was voluntary and respondents were informed that their responses would be anonymous and that they had the right to withdraw without any consequences. All participants gave informed consent prior to participation. To ensure that participants reported to a direct leader and had experience with remote work, two screening questions were presented: "Do you report to a direct leader?" and "Do you already have remote work experience?" Participants had to agree to both questions to begin the survey. Data collection took place between July 2021 and April 2022. During this time period, preventive measures to protect against COVID-19 infections (i.e., legal obligation for employers to enable remote work) forced a large proportion of the workforce to work remotely. This should have ensured that remote-working followers gained reasonable experience with their respective leader's remote leadership in organizational environments considered as VUCA. For an overview of the survey structure and detailed information on all variables collected, see the Codebook at https://bit.ly/3EzKmou.

The final sample[42] consisted of 529 followers (67.24% female) working the majority of their weekly workdays remotely ($M = 3.27$, $SD = 1.51$). Follower age ranged from 19 to 63 years ($M = 30.91$, $SD = 10.04$) and 74.76% of participants held at least a bachelor's degree. Followers' weekly working hours ($M = 34.25$, $SD = 13.83$) equaled the average weekly working hours of the employed population in Germany (Eurostat, 2022). Followers held professional positions mainly as highly qualified employees, such as research associates,

[40] Participants recruited via SurveyCircle ($n = 150$) and PollPool ($n = 49$) received "participation points" to recruit participants for their own surveys.

[41] Participants recruited at Osnabrück University ($n = 28$) attended the undergraduate course "Human Resource Management" and received "bonus points" to add to their course grade. Most participants recruited through lecture announcements indicated that they were participating on behalf of an affiliated student who was taking the course but was not employed at that time. This way, students who did not meet the participation prerequisites (i.e., reporting to a direct leader and being experienced with telework) could also receive the bonus points, which should have mitigated unwished incentives for participating when not meeting the requirements.

[42] Of 1,120 participants who began the survey, we excluded 86 participants who did not meet the initial participation prerequisites (i.e., reporting to a direct leader and having remote work experience), 477 participants who did not provide sufficient responses (i.e., discontinuing survey participation before providing all responses except for control variables), nine participants without reasonable participation durations (i.e., less than 5 minutes), three participants with no variance in response patterns, three participants who indicated flawed participation via comments (e.g., an unintentional second participation), and 13 participants without reasonable remote work experience, that is, respondents working less than 0.5 workdays per week.

engineers, and department heads (38.81%) or as qualified employees, such as clerks, accountants, and technical draftsmen (30.78%) across various industries (most represented were 21.22% information technology, telecommunications, and media; 16.83% manufacturing industry; 14.53% research and development). The average follower had worked with their respective leader for roughly three years at the time of the study ($M = 2.89$, $SD = 1.36$). The leaders referred to by the participating followers were mostly between 40 and 44 years old and predominantly male (62.07%). On average, leaders led about 15 followers ($M = 14.75$, $SD = 15.67$) and most leaders could be located in middle management (e.g., department heads).

4.2.3.2 Measures.

4.2.3.2.1 Transformational and Transactional Leadership (FRLM). Transformational ($\alpha = .92$, $M = 3.26$, $SD = 0.60$) and transactional leadership ($\alpha = .87$, $M = 3.55$, $SD = 0.99$) were measured with 22 items and four items, respectively, using the German translation (Heinitz & Rowold, 2007; Krüger et al., 2011) of the Transformational Leadership Inventory (TLI; see Podsakoff et al., 1990, 1996a, 1996b). The six transformational leadership factors were assessed using five items for "articulating a vision" ($\alpha = .86$, $M = 3.26$, $SD = 0.85$; e.g., "My manager paints an interesting picture of the future for our group"), three items for "providing an appropriate model" ($\alpha = .80$, $M = 3.28$, $SD = 0.89$; e.g., "My manager provides a good model to follow"), four items for "fostering the acceptance of group goals" ($\alpha = .88$, $M = 3.49$, $SD = 0.93$; e.g., "My manager fosters collaboration among work groups"), three items for "high performance expectations" ($\alpha = .69$, $M = 3.42$, $SD = 0.82$; e.g., "My manager shows us that he/she expects a lot from us"), four items for "individualized support" ($\alpha = .85$, $M = 3.61$, $SD = 0.95$; e.g., "My manager behaves in a manner that is thoughtful of my personal needs"), and three items for "intellectual stimulation" ($\alpha = .82$, $M = 3.12$, $SD = 0.91$; e.g., "My manager has provided me with new ways of looking at things which used to be a puzzle for me"). The transactional leadership factor "contingent reward" ($\alpha = .87$, $M = 3.55$, $SD = 0.99$; e.g., "My manager provides me with positive feedback if I perform well") was assessed using four items. We did not assess laissez-faire leadership because it was found to be the "most inactive, as well as most ineffective" (Avolio, 1999, p. 50) dimension of leadership. Followers provided their ratings on a 5-point Likert scale ranging from 1 (*never*) to 5 (*always*).

4.2.3.2.2 Instrumental Leadership (eFRLM). We assessed instrumental leadership ($\alpha = .94$, $M = 3.55$, $SD = 0.74$) using a German translation (Rowold et al., 2017) of the instrumental leadership scale provided by Antonakis and House (2004) comprising 16 items (four items per factor) for the four factors "environmental monitoring" ($\alpha = .80$, $M = 3.83$, $SD = 0.66$; e.g., "My manager capitalizes on opportunities presented by the external

environment"), "strategy formulation and implementation" (α = .87, *M* = 3.43, *SD* = 0.90; e.g., "My manager translates the mission into specific goals"), "path-goal facilitation" (α = .86, *M* = 3.39, *SD* = 0.86; e.g., "My manager facilitates my goal achievement"), and "outcome monitoring" (α = .90, *M* = 3.54, *SD* = 0.97; e.g., "My manager provides me with constructive feedback about my mistakes"). Followers provided their ratings on a 5-point Likert scale ranging from 1 (*never*) to 5 (*always*).

4.2.3.2.3 Leadership Effectiveness. Follower ratings of their respective leader's leadership effectiveness (α = .84, *M* = 3.52, *SD* = 0.87) were assessed using four items (e.g., "My manager is effective in meeting organizational requirements") from the Multifactor Leadership Questionnaire (MLQ; Bass & Avolio, 1995; adapted and translated into German by Felfe & Goihl, 2002). Followers provided their ratings on a 5-point Likert scale ranging from 1 (*never*) to 5 (*always*).

4.2.3.2.4 VUCA Environment. We asked followers to evaluate their respective organizational environment's level of VUCA (α = .73, *M* = 3.67, *SD* = 1.03) using four self-formulated items (e.g., "The organizational environment is uncertain, i.e., there is a lack of knowledge about whether events—despite knowledge about cause and effect relationships—will cause significant changes in the organizational environment"; see the Codebook for all items at https://bit.ly/3EzKmou), one item for each VUCA dimension (i.e., volatility, uncertainty, complexity, and ambiguity). For item formulation, we drew on the most widespread VUCA framework (Bennet & Lemoine, 2014). Followers responded on a 6-point Likert scale ranging from 1 (*completely disagree*) to 6 (*completely agree*).

4.2.3.2.5 Control Variables. We measured control variables typically considered in leadership research (e.g., Antonakis & House, 2014; Liden & Antonakis, 2009). On the follower-level, we assessed age, gender, education, average number of days working remotely per week, average weekly working hours, organizational tenure in years, number of years working with the leader, and interaction frequency with the leader. On the leader-level, we assessed age, gender, hierarchical level, and control span (see the Codebook at https://bit.ly/3EzKmou for a detailed overview of all assessed control variables and response formats). Some participants aborted the online survey before providing their demographic information, leading to six missing values for each control variable except for follower gender (ten missing values) and leader gender (seven missing values).

4.2.3.3 Analytical Approach. To examine the associations between the eFRLM dimensions and perceived leadership effectiveness in remote work contexts (RQ 1.1), we ran hierarchical linear regression analyses (Cohen & Cohen, 1983). We sequentially entered the

control variables (Model D1) and the aggregated dimensions of transformational leadership (Model D2), transactional leadership (Model D3), and instrumental leadership (Model D4) as independent variables to predict perceived leadership effectiveness. To examine the associations between eFRLM factors and perceived leadership effectiveness (RQ 1.2), we ran analogous hierarchical linear regressions and sequentially entered the control variables (Model F1), transformational leadership factors (Model F2), transactional leadership factors (Model F3), and instrumental leadership factors (Model F4). Perceived leadership effectiveness and all predictor variables were *z*-scaled before running the hierarchical regression analyses, except for the dummy-coded variables follower and leader gender (0 = male, 1 = female).

Hierarchical regression analyses are suited to mitigate multicollinearity among independent variables (Cohen & Cohen, 1983), which has become a serious concern in leadership research (Bass, 1999). We checked for multicollinearity by computing variance inflation factors (VIF) and tolerance statistics (TOL) for the control variables and eFRLM dimensions and factors (Mansfield & Helms, 1982; see Appendix 4.2.A, Table 4.2.A1 and Table 4.2.A2). We found no signs for multicollinearity (VIF ≤ 4 and TOL $\geq .25$; O'Brien, 2007).

To answer the question whether instrumental leadership explains incremental variance beyond the original FRLM at dimensional (RQ 2.1) and factor (RQ 2.2) levels when predicting perceived leadership effectiveness in remote work contexts, we tested the differences in variance explanation (R^2) between Model D3/F3 (including control variables and FRLM dimensions/factors) and Model D4/F4 (including control variables and eFRLM dimensions/factors), respectively, using *F*-tests. This way, we also tested for distorted estimates due to overstated FRLM dimensions and factors when omitting the instrumental leadership dimensions and factors (Antonakis & House, 2014; Rowold, 2014; Rowold et al., 2017).

To explore the moderating effect of VUCA environments on associations of eFRLM dimensions and factors with perceived leadership effectiveness (RQ 3.1, 3.2), we added a fifth model to the outlined hierarchical linear regressions. Model D5/F5 additionally includes the main effect of perceived VUCA environments on perceived leadership effectiveness and the respective interaction terms of each eFRLM leadership dimension/factor with perceived VUCA environments on perceived leadership effectiveness.

For all statistical analyses, we used R (version 4.1.0; R Core Team, 2021) and the RStudio interface (version 2022.2.1.461; RStudio Team, 2022). To test the interaction effects (RQ 3.1, 3.2), we used the R package *interactions* (Long, 2021). The data and statistical code are publicly available in an online supplement at https://bit.ly/3EzKmou.

4.2.4 Results

Table 4.2.1 provides descriptive statistics and zero-order correlations among all variables. Because previous studies questioned instrumental leadership's discriminant validity (see Bormann & Rowold, 2018; Chammas & Hernandez, 2019), we checked the construct redundancy of all eFRLM factors. Of the twelve factors inspected, no zero-order correlation was above Shaffer et al.'s (2016) cut-off value of .90, indicating no lack of discriminant validity.

Table 4.2.2 shows the results of the hierarchical linear regression analyses at the dimensional level. Regarding associations between eFRLM dimensions and perceived leadership effectiveness in remote work contexts (RQ 1.1), instrumental leadership ($\beta = 0.40$ [0.32, 0.49], $p < .001$) represented the strongest predictor of leadership effectiveness in the full Model D4 (including control variables and the dimensions of transformational, transactional, and instrumental leadership), followed by transformational ($\beta = 0.36$ [0.28, 0.43], $p < .001$), and transactional leadership ($\beta = 0.20$ [0.14, 0.25], $p < .001$).

Table 4.2.3 shows the results of the hierarchical linear regression analyses at the factor level. Regarding associations between eFRLM factors and perceived leadership effectiveness in remote work contexts (RQ 1.2), we found the transformational leadership factors "articulating a vision" ($\beta = 0.22$ [0.14, 0.30], $p < .001$), "providing an appropriate model" ($\beta = 0.14$ [0.07, 0.22], $p < .001$), "fostering the acceptance of group goals" ($\beta = 0.13$ [0.05, 0.20], $p = .003$), and "individualized support" ($\beta = 0.09$ [0.02, 0.16], $p = .015$); the transactional leadership factor "contingent reward" ($\beta = 0.10$ [0.03, 0.16], $p = .003$); and the instrumental leadership factors "environmental monitoring" ($\beta = 0.15$ [0.08, 0.22], $p < .001$), "outcome monitoring" ($\beta = 0.15$ [0.07, 0.22], $p < .001$), and "path-goal facilitation" ($\beta = 0.12$ [0.04, 0.19], $p = .003$) predicting leadership effectiveness in the full Model F4 (including control variables and all factors of transformational leadership, transactional leadership, and instrumental leadership).

Table 4.2.1

Descriptive Statistics and Intercorrelations Between the Study Variables

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
1. Age[a]	30.91	10.04	-	**-.18**	**.19**	**.14**	**.32**	**.69**	**.54**	.06	**.35**	-.07	**.13**	**.09**	**-.12**	**-.14**	**-.09**	**-.09**	.02	-.06	**-.12**	-.05	**-.11**	-.02	**-.11**	**-.12**	**-.12**	**-.16**	**.13**
2. Gender[a]	.67	.47		-	-.06	.02	**-.18**	**-.13**	-.09	-.05	-.08	.11	.01	-.01	.07	.06	.01	.04	.07	.02	.08	-.04	.03	.06	.04	.01	.01	.04	-.04
3. Education[a]	5.93	1.12			-	**.14**	**.37**	-.03	-.01	.01	**.13**	-.05	**.15**	.02	-.01	.00	.00	-.04	.03	.07	.05	.03	-.03	.00	-.07	-.02	.00	.03	.08
4. Remote working time[a]	3.27	1.51				-	**.16**	**.14**	.10	**-.09**	**.06**	-.02	-.04	-.02	.03	.04	.05	.00	.04	-.01	.00	.02	.02	.03	.05	.00	-.01	.00	.07
5. Weekly working time[a]	34.25	13.83					-	**.20**	**.14**	**.13**	**.25**	**-.12**	.07	**.11**	-.04	-.08	-.05	**-.11**	**.15**	**-.12**	.00	-.09	**-.10**	-.07	**-.09**	**-.13**	-.04	-.06	**.20**
6. Corporate tenure[a]	4.99	6.79						-	**.64**	.05	**.29**	-.02	.05	**.13**	-.06	-.08	-.04	-.04	.02	-.02	-.04	-.03	-.03	.02	-.02	-.04	-.05	-.08	.05
7. Duration of working with leader[a]	2.89	3.55							-	**.09**	**.36**	-.06	**.11**	.06	-.05	-.06	.00	-.04	-.06	-.03	-.05	-.03	-.01	.02	-.02	-.02	.00	-.06	.04
8. Interaction frequency with leader[a]	4.26	1.36								-	.01	-.03	.01	-.06	**.16**	**.11**	**.11**	**.17**	.04	.10	**.19**	**.18**	**.20**	**.21**	**.12**	**.13**	**.23**	**.21**	.04
9. Age[b]	6.58	1.93									-	-.12	**.29**	**.10**	**-.14**	**-.12**	**-.10**	**-.16**	-.04	-.07	**-.10**	-.08	**-.13**	**-.13**	**-.15**	**-.13**	-.06	-.07	.06
10. Gender[b]	.38	.49										-	**-.18**	**-.13**	.00	-.03	-.01	.04	.00	.01	-.02	-.04	.02	-.01	.08	.00	.00	-.02	.01
11. Hierarchical level[b]	3.25	1.13											-	**.22**	-.02	.03	-.07	-.06	.07	-.06	-.03	-.05	-.05	.00	-.06	-.08	-.03	-.01	**.11**
12. Control span[b]	14.75	15.67												-	.07	**.09**	-.01	.08	**.10**	-.07	-.01	-.03	.00	.02	.04	-.02	-.04	.02	.01
13. Transformational leadership	3.26	0.60													-	**.91**	**.81**	**.85**	**.38**	**.43**	**.81**	**.55**	**.81**	**.70**	**.72**	**.70**	**.68**	**.79**	-.04
14. Articulating a vision	3.26	0.85														-	**.68**	**.73**	**.28**	**.38**	**.71**	**.51**	**.74**	**.68**	**.69**	**.64**	**.58**	**.74**	-.04
15. Providing an appropriate model	3.28	0.89															-	**.74**	.07	**.62**	**.64**	**.60**	**.76**	**.65**	**.63**	**.69**	**.65**	**.76**	**-.11**
16. Fostering the acceptance of group goals	3.49	0.93																-	**.10**	**.53**	**.60**	**.55**	**.76**	**.63**	**.64**	**.69**	**.66**	**.74**	**-.11**
17. High performance expectations	3.42	0.82																	-	**-.26**	**.18**	-.04	**.12**	**.14**	**.22**	.01	.05	**.09**	**.17**
18. Individualized support	3.61	0.95																		-	**.45**	**.70**	**.58**	**.49**	**.38**	**.58**	**.56**	**.61**	**-.21**
19. Intellectual stimulation	3.12	0.91																			-	**.49**	**.69**	**.57**	**.55**	**.62**	**.65**	**.67**	-.06
20. Transactional leadership/contingent reward	3.55	0.99																				-	**.62**	**.51**	**.46**	**.58**	**.59**	**.65**	**-.16**
21. Instrumental leadership	3.55	0.74																					-	**.83**	**.86**	**.89**	**.88**	**.81**	**-.15**
22. Environmental monitoring	3.83	0.66																						-	**.69**	**.64**	**.63**	**.71**	-.08
23. Strategy formulation and implementation	3.43	0.90																							-	**.67**	**.62**	**.64**	**-.15**

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
24. Path-goal facilitation	3.39	0.86																								-	**.76**	**.73**	**-.16**
25. Outcome monitoring	3.54	0.97																									-	**.73**	**-.13**
26. Perceived leadership effectiveness	3.52	0.87																										-	**-.13**
27. VUCA	3.67	1.03																											-

Note. $520 \leq n \leq 529$. VUCA = volatile, uncertain, complex, and ambiguous environments.

[a] Follower-related control variables.

[b] Leader-related control variables.

Results in bold are significant at the $p \leq .05$ level.

Table 4.2.2

Results of the Hierarchical Linear Regression Analyses Predicting Perceived Leadership Effectiveness at the eFRLM Dimensional Level

Variables	Model D1			Model D2			Model D3			Model D4			Model D5		
	β	95% CI	*p*	β	95% CI	*p*	β	95% CI	*p*	β	95% CI	*p*	β	95% CI	*p*
Constant	-.01	[-.17, .15]	.92	.04	[-.06, .14]	.40	-.01	[-.10, .09]	.92	-.01	[-.09, .08]	.89	-.01	[-.09, .08]	.85
Controls															
Age[a]	**-.21**	[-.34, -.08]	.001	**-.08**	[-.16, .00]	.047	**-.10**	[-.17, -.02]	.012	**-.07**	[-.14, .00]	.044	**-.07**	[-.14, .00]	.039
Gender[a]	.04	[-.15, .22]	.69	-.05	[-.16, .07]	.44	.01	[-.10, .11]	.89	.02	[-.08, .12]	.68	.02	[-.08, .12]	.65
Education[a]	**.10**	[.00, .19]	.050	**.06**	[.00, .12]	.048	.04	[-.02, .09]	.15	.04	[-.02, .09]	.17	.04	[-.01, .09]	.14
Remote working time[a]	.04	[-.05, .13]	.35	-.01	[-.06, .05]	.79	-.01	[-.06, .04]	.59	-.02	[-.06, .03]	.49	-.01	[-.06, .04]	.70
Weekly working time[a]	-.08	[-.18, .02]	.099	**-.06**	[-.13, .00]	.040	-.03	[-.08, .03]	.39	-.01	[-.06, .05]	.85	-.01	[-.06, .05]	.85
Corporate tenure[a]	.06	[-.07, .19]	.39	.01	[-.07, .09]	.83	.01	[-.07, .08]	.82	-.01	[-.08, .06]	.86	.00	[-.07, .07]	.93
Duration of working with leader[a]	.01	[-.10, .13]	.82	-.01	[-.08, .06]	.83	.00	[-.06, .07]	.95	-.02	[-.08, .04]	.50	-.03	[-.09, .03]	.35
Interaction frequency with leader[a]	**.23**	[.15, .32]	<.001	**.10**	[.04, .15]	.001	**.06**	[.01, .11]	.014	.05	[.00, .09]	.060	.04	[.00, .09]	.073
Age[b]	-.02	[-.12, .07]	.62	**.07**	[.01, .13]	.028	**.06**	[.01, .12]	.025	**.07**	[.02, .12]	.010	**.07**	[.02, .12]	.008
Gender[b]	-.07	[-.24, .11]	.46	-.04	[-.15, .07]	.47	-.01	[-.10, .11]	.89	-.04	[-.13, .06]	.46	-.02	[-.11, .08]	.69
Hierarchical level[b]	.00	[-.09, .09]	.99	-.01	[-.07, .05]	.56	.01	[-.05, .06]	.83	.01	[-.04, .06]	.71	.01	[-.03, .06]	.57
Control span[b]	.05	[-.04, .14]	.26	-.03	[-.09, .02]	.24	-.02	[-.07, .03]	.51	.00	[-.05, .04]	.86	.00	[-.05, .04]	.93
Transformational leadership				**.78**	[.73, .84]	<.001	**.62**	[.57, .68]	<.001	**.36**	[.28, .43]	<.001	**.36**	[.28, .43]	<.001
Transactional leadership							**.29**	[.23, .35]	<.001	**.20**	[.14, .25]	<.001	**.19**	[.13, .25]	<.001
Instrumental leadership										**.40**	[.32, .49]	<.001	**.42**	[.34, .50]	<.001
Interaction effects															
VUCA													.00	[-.05, .04]	.92
Transformational leadership x VUCA													**-.08**	[-.16, .00]	.044
Transactional leadership x VUCA													**-.08**	[-.14, -.02]	.010
Instrumental leadership x VUCA													**.14**	[.05, .22]	.002
R^2		**.09**			**.65**			**.70**			**.75**			**.76**	
ΔR^2					**.56**			**.06**			**.05**			**.01**	
Adj. R^2		**.07**			**.64**			**.70**			**.74**			**.75**	
AIC		1455.34			965.48			877.27			789.68			785.68	
BIC		1514.03			1028.31			944.22			860.74			873.11	

Note. $n = 519$. Regressions were computed using *z*-standardized data except for followers' and leaders' gender, which was dummy-coded (0/1 = male/female). VUCA = volatile, uncertain, complex, and ambiguous environments.

[a] Follower-related control variables.

[b] Leader-related control variables.

Results in bold are significant at the $p \leq .05$ level.

Table 4.2.3

Results of the Hierarchical Linear Regression Analyses Predicting Perceived Leadership Effectiveness at the eFRLM Factor Level

Variables	Model F1			Model F2			Model F3			Model F4			Model F5		
	β	95% CI	*p*	β	95% CI	*p*	β	95% CI	*p*	β	95% CI	*p*	β	95% CI	*p*
Constant	-.01	[-.17, .15]	.92	.01	[-.08, .10]	.83	-.01	[-.09, .08]	.86	-.01	[-.09, .07]	.77	-.02	[-.10, .06]	.65
Controls															
Age[a]	**-.21**	[-.34, -.08]	.001	-.08	[-.15, -.01]	.021	**-.09**	[-.16, -.02]	.012	**-.08**	[-.14, -.01]	.023	**-.09**	[-.15, -.02]	.008
Gender[a]	.04	[-.15, .22]	.69	.00	[-.10, .10]	.99	.02	[-.08, .12]	.71	.02	[-.07, .11]	.68	.02	[-.07, .11]	.66
Education[a]	**.10**	[.00, .19]	.050	.02	[-.04, .07]	.53	.02	[-.03, .07]	.49	.02	[-.03, .06]	.54	.02	[-.03, .06]	.52
Remote working time[a]	.04	[-.05, .13]	.35	-.01	[-.06, .04]	.71	-.01	[-.06, .03]	.58	-.01	[-.06, .03]	.59	-.01	[-.05, .04]	.84
Weekly working time[a]	-.08	[-.18, .02]	.099	.01	[-.05, .06]	.80	.01	[-.04, .07]	.64	.02	[-.03, .07]	.47	.02	[-.03, .08]	.36
Corporate tenure[a]	.06	[-.07, .19]	.39	.01	[-.06, .08]	.82	.01	[-.06, .08]	.75	.00	[-.07, .07]	.99	.02	[-.05, .08]	.62
Duration of working with leader[a]	.01	[-.10, .13]	.82	-.02	[-.08, .05]	.60	-.01	[-.07, .05]	.68	-.03	[-.09, .03]	.34	-.03	[-.09, .02]	.24
Interaction frequency with leader[a]	**.23**	[.15, .32]	<.001	**.08**	[.04, .13]	.001	**.07**	[.03, .12]	.003	**.05**	[.00, .09]	.036	.04	[.00, .09]	.065
Age[b]	-.02	[-.12, .07]	.62	**.06**	[.01, .11]	.031	**.06**	[.01, .11]	.029	**.06**	[.01, .11]	.014	**.06**	[.02, .11]	.009
Gender[b]	-.07	[-.24, .11]	.46	-.03	[-.13, .07]	.53	-.02	[-.12, .07]	.66	-.02	[-.10, .07]	.75	.00	[-.09, .09]	.97
Hierarchical level[b]	.00	[-.09, .09]	.99	.02	[-.04, .06]	.56	.02	[-.03, .07]	.49	.01	[-.04, .06]	.63	.01	[-.03, .06]	.54
Control span[b]	.05	[-.04, .14]	.26	-.01	[-.06, .04]	.64	-.01	[-.06, .04]	.67	.00	[-.04, .04]	.99	.00	[-.04, .04]	.99
Transformational leadership															
Articulating a vision				**.30**	[.22, .38]	<.001	**.27**	[.19, .36]	<.001	**.22**	[.14, .30]	<.001	**.21**	[.13, .29]	<.001
Providing an appropriate model				**.21**	[.14, .29]	<.001	**.20**	[.13, .28]	<.001	**.14**	[.07, .22]	<.001	**.15**	[.07, .23]	<.001
Fostering the acceptance of group goals				**.20**	[.12, .28]	<.001	**.20**	[.12, .27]	<.001	**.13**	[.05, .20]	.003	**.12**	[.04, .19]	.003
High performance expectations				.01	[-.04, .06]	.68	.01	[-.05, .06]	.81	.01	[-.04, .06]	.70	.02	[-.03, .07]	.48
Individualized support				**.22**	[.15, .28]	<.001	**.15**	[.07, .22]	<.001	**.09**	[.02, .16]	.015	**.09**	[.02, .16]	.013
Intellectual stimulation				**.09**	[.02, .15]	.014	**.08**	[.02, .15]	.017	.02	[-.05, .09]	.81	.02	[-.05, .09]	.53
Transactional leadership															
Contingent reward							**.13**	[.06, .20]	<.001	**.10**	[.03, .16]	.003	**.09**	[.03, .16]	.016
Instrumental leadership															
Environmental monitoring										**.15**	[.08, .22]	<.001	**.15**	[.08, .22]	<.001
Strategy formulation and implementation										-.04	[-.11, .03]	.26	-.04	[-.11, .03]	.30
Path-goal facilitation										**.12**	[.04, .19]	.003	**.13**	[.05, .20]	.001
Outcome monitoring										**.15**	[.07, .22]	<.001	**.15**	[.07, .22]	<.001
Interaction effects															
VUCA													.00	[-.05, .04]	.92
Articulating a vision x VUCA													-.01	[-.09, .07]	.75
Providing an appropriate model x VUCA													-.01	[-.09, .06]	.74

Variables	Model F1			Model F2			Model F3			Model F4			Model F5		
	β	95% CI	*p*	β	95% CI	*p*	β	95% CI	*p*	β	95% CI	*p*	β	95% CI	*p*
Fostering the acceptance of group goals x VUCA													-.06	[-.14, .02]	.14
High performance expectations x VUCA													-.02	[-.06, .03]	.51
Individualized support x VUCA													-.01	[-.08, .06]	.74
Intellectual stimulation x VUCA													-.02	[-.08, .05]	.66
Contingent reward x VUCA													**-.09**	[-.15, -.02]	.016
Environmental monitoring x VUCA													.04	[-.03, .10]	.24
Strategy formulation and implementation x VUCA													.02	[-.05, .10]	.55
Path-goal facilitation x VUCA													.00	[-.08, .08]	.97
Outcome monitoring x VUCA													**.11**	[.04, .19]	.003
R^2		**.09**			**.74**			**.75**			**.78**			**.79**	
ΔR^2					**.66**			**.01**			**.03**			.01	
Adj. R^2		**.07**			**.74**			**.74**			**.77**			**.78**	
AIC		1455.34			807.97			795.59			735.54			741.49	
BIC		1514.03			891.32			883.02			839.20			892.97	

Note. $n = 519$. Regressions were computed using *z*-standardized data except for followers' and leaders' gender, which was dummy-coded (0/1 = male/female). VUCA = volatile, uncertain, complex, and ambiguous environments.

[a] Follower-related control variables.

[b] Leader-related control variables.

Results in bold are significant at the $p \leq .05$ level.

We found evidence for incremental variance explanation of instrumental leadership beyond the original FRLM when predicting perceived leadership effectiveness in remote work contexts (see Table 4.2.2 and Table 4.2.3). At the dimensional level (RQ 2.1), the increase in variance explanation between Model D3 (including control variables and FRLM dimensions) and Model D4 (including control variables and eFRLM dimensions) was significant ($\Delta R^2 = .05$, $F(1, 503) = 95.03$, $p < .001$). Also, the Akaike Information Criterion (AIC; Akaike, 1987) and the Bayesian Information Criterion (BIC; Raftery, 1995) suggested Model D4 to be the best-fitting model due to its lowest AIC (789.68) and BIC (860.74) values compared to Model D1, Model D2, and Model D3. At the factor level (RQ 2.1), we also found a significant increase in variance explanation between Model F3 and Model F4 after entering the instrumental leadership factors to the control variables and FRLM factors ($\Delta R^2 = .03$, $F(4, 495) = 17.57$, $p < .001$). Again, Model F4 was found to fit the data best regarding AIC (735.54) and BIC (839.20) values.

Concerning the small but significant gain of explained variance (ΔR^2) of 5% and 3% from Model D3/F3 to Model D4/F4, it should be noted that the 70% and 75% of variance explanation found for Model D3/F3 (including only FRLM dimensions and factors) are both likely to be optimistically biased due to omitted variable bias caused by the absence of instrumental leadership dimensions and factors. Moreover, the shrinkages of the β-coefficients of the transformational leadership dimension ($\Delta\beta_{\text{Model D3-Model D4}} = .26$) and the transactional leadership dimension ($\Delta\beta_{\text{Model D3-Model D4}} = .09$) between Model D3 and Model D4 indicate overstated FRLM dimensions when not considering the instrumental leadership dimension in Model D3. Similarly, the shrinkages of the β-coefficients of the FRLM factors "fostering the acceptance of group goals" ($\Delta\beta_{\text{Model F3-Model F4}} = .07$), "intellectual stimulation" ($\Delta\beta_{\text{Model F3-Model F4}} = .06$), "providing an appropriate model" ($\Delta\beta_{\text{Model F3-Model F4}} = .06$), "individualized support" ($\Delta\beta_{\text{Model F3-Model F4}} = .06$), "intellectual stimulation" ($\Delta\beta_{\text{Model F3-Model F4}} = .06$), "articulating a vision" ($\Delta\beta_{\text{Model F3-Model F4}} = .05$), and "contingent reward" ($\Delta\beta_{\text{Model F3-Model F4}} = .03$) between Model F3 and Model F4 yield further evidence for overstated FRLM factors due to the absence of instrumental leadership factors in Model F3.

The unique contribution of instrumental leadership when predicting perceived leadership effectiveness was supported in supplemental analyses determining relative variable importance (see Appendix 4.2.A, Table 4.2.A1 and Table 4.2.A2, and the detailed explanation in Appendix 4.2.B): Employing a variance decomposition method (Lindeman, Merenda, and Gold method, LMG; Lindeman et al., 1980) and a machine learning method (random forests; Breiman, 2001, 2002) confirmed our main findings that (a) instrumental leadership was the

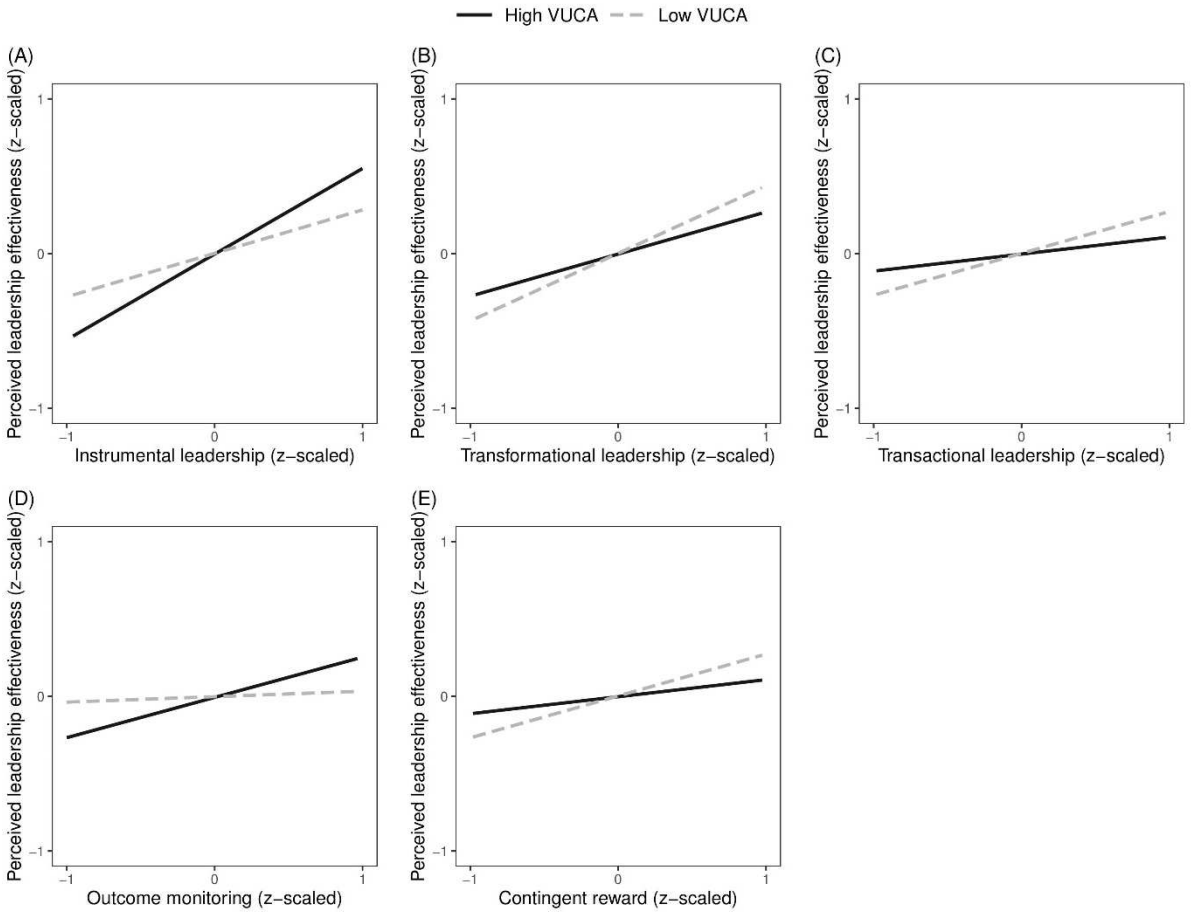
strongest predictor of perceived leadership effectiveness and (b) including instrumental leadership in the predictive model results in a substantial decrease in the variance explained by transformational-transactional leadership.

Concerning the moderation effect of perceived VUCA environments on the association between the eFRLM and leadership effectiveness at dimensional (RQ 3.1) and factor levels (RQ 3.2), a positive interaction effect indicates that the corresponding eFRLM dimension/factor is more positively associated with leadership effectiveness in environments evaluated as more VUCA. A negative interaction effect indicates that the corresponding eFRLM dimension/factor is less positively associated with leadership effectiveness in more pronounced VUCA environments. At the dimensional level (see Model D5, Table 4.2.2), we found a significant positive interaction effect for instrumental leadership (β = 0.14 [0.05, 0.22], p = .002) and significant negative interaction effects for transformational (β = -0.08 [-0.16, 0.00], p = .044) and transactional (β = -0.08 [-0.14, -0.02], p = .010) leadership. At the factor level (see Model F5, Table 4.2.3), we found a significant positive interaction effect for the instrumental leadership factor "outcome monitoring" (β = 0.11 [0.04, 0.19], p = .003) and a significant negative interaction effect for the transactional leadership factor "contingent reward" (β = -0.09 [-0.15, -0.08], p = .016). Figure 4.2.2 depicts the significant interaction effects at dimensional (A-C) and factor levels (D-E).

To further explore whether the eFRLM dimensions and factors were also differentially manifested in less/more-pronounced VUCA environments, we divided the sample into followers perceiving their organizational environment as low VUCA versus high VUCA. We then computed two-sample t-tests comparing the manifestation of eFRLM dimensions and factors between these groups (see Table 4.2.4). Using the scale center (3.50) as cut-off value, the organizational environment was perceived as low VUCA by about half the sample (n = 267, 51%) and perceived as high VUCA by the other half (n = 252, 49%). In high VUCA environments, we found a significant lower manifestation of the dimensions of transactional leadership and instrumental leadership. On the factor level, all four instrumental leadership factors, four of six transformational leadership factors ("individualized support," "providing an appropriate model," "fostering the acceptance of group goals," and "high performance expectations"), and the transactional leadership factor ("contingent reward") were significantly less manifested in high VUCA environments. The transformational leadership factor "high performance expectations" was the only eFRLM factor that was more manifested in high VUCA environments.

Figure 4.2.2

Significant Interaction Effects of Follower-Perceived VUCA Environments on the Association of eFRLM Dimensions (A-C) and eFRLM Factors (D-E) With Perceived Leadership Effectiveness



Note. VUCA = volatile, uncertain, complex, and ambiguous environments. "High VUCA" ("Low VUCA") refers to values one standard deviation above (below) the sample mean of follower-perceived VUCA environments.

Table 4.2.4

Mean Value Differences of the Implementation of eFRLM Dimensions and eFRLM Factors in Low Versus High Follower-Perceived VUCA Environments

	Low VUCA		High VUCA					
eFRLM dimensions	*M*	*SD*	*M*	*SD*	Δ_M	*t*	*df*	*p*
Transactional leadership	3.68	0.96	3.41	1.02	**-0.27**	**-3.13**	517	.002
Instrumental leadership	3.66	0.70	3.43	0.74	**-0.23**	**-3.63**	517	<.001
Transformational leadership	3.28	0.55	3.22	0.64	-0.06	-1.12	496	.26
eFRLM factors								
Individualized support	3.77	0.89	3.44	0.99	**-0.34**	**-4.07**	517	<.001
Path-goal facilitation	3.52	0.83	3.24	0.87	**-0.28**	**-3.80**	517	<.001
Outcome monitoring	3.68	0.93	3.40	0.98	**-0.28**	**-3.29**	517	.001
Contingent reward	3.68	0.96	3.41	1.02	**-0.27**	**-3.13**	517	.002
Strategy formulation and implementation	3.55	0.88	3.30	0.88	**-0.25**	**-3.20**	517	.001
Providing an appropriate model	3.36	0.82	3.19	0.95	**-0.16**	**-2.10**	494	.037
Fostering the acceptance of group goals	3.57	0.91	3.40	0.94	**-0.16**	**-2.03**	517	.042

	Low VUCA		High VUCA					
eFRLM dimensions	*M*	*SD*	*M*	*SD*	Δ_M	*t*	*df*	*p*
Intellectual stimulation	3.18	0.90	3.04	0.92	-0.14	-1.79	517	.074
Environmental monitoring	3.88	0.64	3.77	0.67	**-0.11**	**-1.96**	517	.050
Articulating a vision	3.29	0.80	3.21	0.90	-0.09	-1.15	517	.25
High performance expectations	3.34	0.81	3.52	0.81	**0.18**	**2.55**	517	.011

Note. VUCA = volatile, uncertain, complex, and ambiguous environments. Δ_M = mean value difference of the implementation of eFRLM leadership dimensions and eFRLM factors in low- versus high-pronounced VUCA environments. The sample was divided into low (n = 267, 51%) versus high (n = 252, 49%) perceived VUCA environments using the scale center (3.50) of the variable VUCA environments as a cut-off value. eFRLM dimensions and eFRLM factors are sorted by Δ_M in ascending order.
Δ_M and t-values in bold are significant at the $p \leq .05$ level.

4.2.5 Discussion

The goal of this study was to gain insight into effective leadership in virtual and crisis-ridden organizational settings from the perspective of followers. To this end, we surveyed 529 followers on their perceptions of the effectiveness of established (transformational-transactional) and aspiring (instrumental) leadership dimensions and factors in remote work and VUCA environments. Our research makes several contributions to the leadership literature: We found at both dimensional (RQ 1.1) and factor levels (RQ 1.2) that instrumental leadership was perceived as strongly effective in remote work contexts, along with transformational leadership and then followed by transactional leadership. Our results also indicate that instrumental leadership explains unique variance beyond the original FRLM at both dimensional (RQ 2.1) and factor (RQ 2.2) levels. This suggests that omitted variable bias may occur when instrumental leadership is not taken into account when predicting leadership outcomes in remote work contexts. Second, our study is the first to show that associations of eFRLM dimensions (RQ 3.1) and factors (RQ 3.2) with perceived leadership effectiveness are moderated by follower-perceived VUCA environments: At the dimensional level, instrumental leadership was perceived as particularly effective in more-pronounced VUCA environments, whereas both transformational and transactional leadership were perceived as less effective. At the factor level, the instrumental leadership factor "outcome monitoring" was perceived as particularly effective in more pronounced VUCA environments, whereas the transactional leadership factor "contingent reward" was perceived as less effective in more VUCA-like environments.

4.2.5.1 Implications for Theory.

4.2.5.1.1 Associations of the eFRLM Dimensions and Factors With Perceived Leadership Effectiveness in Remote Work Contexts. The present study provides initial evidence for the perceived effectiveness of instrumental leadership, transformational leadership, and transactional leadership in the context of remote work. Whereas instrumental

leadership had not been studied in virtual environments, our findings align with previous research that shows the effectiveness of transformational (Neufeld et al., 2010; Purvanova & Bono, 2009; Ramserran & Haddud, 2018) and transactional leadership (Dubinsky et al., 1995; Howell et al., 2005) in virtual environments. For instance, in line with prior studies (Kelloway et al., 2003; Shamir et al., 1994), we found charismatic factors (i.e., "articulating a vision" and "providing an appropriate model") of transformational leadership to be beneficial in remote contexts. However, some literature (Andressen et al., 2012; Eisenberg et al., 2019; Hoch & Kozlowski, 2014; Howell et al., 2005; Howell & Hall-Merenda, 1999) suggests that the effectiveness of transformational-transactional leadership vanishes with increasing leader-follower distance, which seems to contradict our findings. This discrepancy, however, may be due to changes in remote work. Whereas previous research mainly focused on leader-follower physical distance as the defining component of remote work (e.g., leader and followers working in the same versus a different city; Howell et al., 2005), our study centered on leader-follower communication via ICTs (e.g., video conferencing, instant messaging). Due to steady advancements in ICTs, the physical proximity between leaders and followers may be quite accurately simulated by now, potentially mitigating neutralizing effects of physical distance on the effectiveness of transformational-transactional leadership.

A novel contribution of our research is that we found instrumental leadership to explain unique variance in perceived leadership effectiveness during remote work beyond transformational-transactional leadership. The predictive validity for perceived leadership effectiveness held whether we examined instrumental leadership (a) on the dimensional level—where it represented the strongest predictor of leadership effectiveness—or (b) on the factor level, where three of its four factors predicted leadership effectiveness. We found that effective remote leaders displayed three key behaviors: monitoring the organization's environment ("environmental monitoring"), supporting followers by removing obstacles and allocating resources ("path-goal facilitation"), and providing performance-enhancing feedback ("outcome monitoring"). These findings generally align with previous studies that have emphasized the effectiveness of strategic and work-facilitating leadership during remote work (Bartsch et al., 2020; Krehl & Büttgen, 2022; Liao, 2017).

Finally, we found evidence for omitted variable bias when not considering instrumental leadership and its factors to predict perceived leadership effectiveness in remote work contexts. The predictive value of FRLM dimensions and factors substantially decreased and/or even lost significance after we added instrumental leadership and its factors to our predictive models. These findings align with previous research demonstrating instrumental leadership's unique

variance explanation beyond FRLM dimensions and factors (Antonakis & House, 2014; Rowold, 2014; Rowold et al., 2017) as well as distorted predictive estimates for FRLM dimensions and factors when not considering instrumental leadership (Antonakis & House, 2014; Bormann & Rowold, 2018; Rowold, 2014). In particular, our results on the relative variance importance determined via variance decomposition methods (LMG in Lindeman et al., 1980; see Appendix 4.2.A, Table 4.2.A1 and Table 4.2.A2, and the detailed explanation in Appendix 4.2.B) are consistent with the findings of the pioneering study on instrumental leadership by Antonakis and House (2014) conducted in stationary on-site work settings: Transformational leadership's variance explanation of perceived leadership effectiveness decreased from 43% to 28% after the instrumental leadership dimension was added in Antonakis and House (2014). Similarly, in the present study, transformational leadership's variance explanation decreased from 43% to 27% after adding the instrumental leadership dimension. In both Antonakis and House (2014) and the present study, instrumental leadership accounted for a similar proportion of the variance in perceived leadership effectiveness, 28% and 29 %, respectively. Therefore, the present study underscores the methodological and theoretical raison d'être of a "fuller" (Antonakis & House, 2014, p. 748) FRLM augmenting transformational-transactional leadership theory (Bass, 1985), namely instrumental leadership.

4.2.5.1.2 Moderating Role of Perceived VUCA Environments. The present study heeded calls (Antonakis & House, 2014; Hannah et al., 2009; Liden & Antonakis, 2009; Porter & McLaughlin, 2006; Wu et al., 2021) to examine the environmental boundary conditions that affect the association of leadership dimensions and factors with leadership effectiveness. In particular, VUCA environments have been moving into the spotlight of both academia (Baran & Woznyj, 2021; Bennett & Lemoine, 2014; Elkington, 2018; Giones et al., 2019; Schoemaker et al., 2018) and practice (Arkenberg, 2019; Huesmann & Khoroshylova, 2020; Kothari et al., 2021) and are likely to characterize future business environments (Luthans & Broad, 2022). The present study suggests that instrumental leadership particularly contributes to leadership effectiveness in more-pronounced VUCA environments, and this effect was mainly driven by the outcome-monitoring factor (i.e., leaders facilitate followers' work and goal achievement through corrective and performance-improving feedback). This finding aligns with preliminary research suggesting that strategic (Schoemaker et al., 2018) and especially directive/task-oriented leadership (Dynes, 1983; Kamphuis et al., 2011; Perrow, 1984) may be beneficial in volatile and crisis-ridden environments. However, in contrast to previous research stating that strategic (Boal & Schultz, 2007; Giones et al., 2019; Schaedler et al., 2022) and directive/task-oriented leadership (Stoker et al., 2019, 2022) should also be implemented more by leaders in

crisis-ridden and volatile environments, we found that instrumental leadership might actually be implemented less often in more-pronounced VUCA environments. Thus, according to the present findings, leaders seem to lack an intuitive understanding of what type of leadership is effective in times of volatility and crisis, revealing potentials for teaching effective leader behaviors in such challenging times.

In addition, we found that transformational and transactional leadership may be perceived as less effective in pronounced VUCA environments. Thereby, we found transactional leadership and also several transformational leadership factors to be less-often implemented in more VUCA-like environments, suggesting that leaders may in these regards have some intuitive understanding of less effective leadership in crisis-ridden contexts. Unsettled followers may demand less charismatic-visionary and quid pro quo leadership because an abstract vision and a simple prospect of reward may not provide sufficiently tangible guidance when the environment is complex and volatile. These findings align with previous research suggesting that transformational leadership is less effective and less implemented in extreme contexts (Geier, 2016). However, there are also findings emphasizing the effectiveness of both transformational (Bligh et al., 2004; Boehm et al., 2010; Sommer et al., 2016; Zhang et al., 2012) and transactional (Bass, 2008; Geier, 2016; Schriesheim & Murphy, 1976) leadership under extreme conditions. One possible explanation for these conflicting results may be that previous studies have not considered the full range of leadership behaviors, specifically instrumental leadership behaviors, which may have introduced omitted variable bias and overstated FRLM factors (Antonakis & House, 2014).

4.2.5.2 Limitations and Future Research. The present study has several limitations that provide opportunities for future research. First, the cross-sectional design of the present study is useful to identify covariates in the early stages of a nascent research field (Spector, 2019; Wang & Cheng, 2020), such as research on leadership effectiveness in remote work contexts and VUCA environments, but it does not allow for the inference of causal relations because it lacks temporal elements. Therefore, future research should apply longitudinal (e.g., daily/weekly diary studies; see Ohly et al., 2010) or (quasi-) experimental designs (e.g., laboratory/field training interventions manipulating leadership behaviors in a pre-post control group design; Avolio et al., 2009) to examine causal effects of eFRLM dimensions and factors on leadership effectiveness. Applying longitudinal designs would also help to understand how perceptions of leadership effectiveness may change over time. In particular, previous research has indicated that perceived effectiveness of leadership varies through the phases of extreme contexts, such as the preparation, response, and recovery phases (Hannah et al., 2009).

Second, our data consist solely of follower self-reports, which could have introduced common method bias (Podsakoff et al., 2012) and single-source bias, potentially causing inflated main effects of the eFRLM dimensions and factors on perceived leadership effectiveness. However, including additional controlling predictor variables in the hierarchical linear regression models should have mitigated common method bias (Siemsen et al., 2010). Despite this, common method bias cannot explain the interaction effects of follower-perceived VUCA environments on the association of eFRLM dimensions and factors with perceived leadership effectiveness. In the event of common method bias, effect sizes of interaction terms are rather underestimated and the power to identify significant interaction effects is reduced (Evans, 1985; McClelland & Judd, 1993).

Third, follower ratings of leadership effectiveness are prone to bias (Lord & Maher, 1993; Meindl et al., 1985) due to the influence of exogenous factors, such as followers' individual differences. However, follower ratings of leadership are considered more accurate than leader self-ratings and directly influence actual follower behavior (Hogan et al., 1994; Meindl, 1995; see also Podsakoff & Organ, 1986). In addition, follower ratings of leadership effectiveness converge with objective leadership effectiveness criteria (e.g., organizational unit performance; see Hogan et al., 1994). Nevertheless, future research should complement perceptual measures of leadership effectiveness with objective (e.g., financial performance) organizational measures (Hogan et al., 1994).

Fourth, we suggest the development of a psychometric test measuring the extent of an employee's perceived VUCA environment. A self-report questionnaire based on established techniques for scale construction (e.g., exploratory and confirmatory factor analysis; Worthington & Whittaker, 2006) may contribute to creating a uniform perceptual measurement of VUCA environments thus enhancing the comparability of future research. Our self-developed measure of perceived VUCA environments might be a fertile ground to do so because it draws on the most widespread VUCA framework (Bennett & Lemoine, 2014) and showed acceptable internal consistency ($\alpha = .73$).

Fifth, in light of our findings supporting the methodological and theoretical need of a "fuller" FRLM (Antonakis & House, 2014, p. 748), we recommend future research drawing on transformational-transactional leadership theory to control for instrumental leadership. Imitating Oc's (2018) call, we further encourage future research to explore additional contexts (e.g., change management processes) in which eFRLM dimensions and factors may be instrumental for leaders to effectively manage their followers.

4.2.5.3 Practical Implications. Leaders play a crucial role in guiding organizations and their people through uncharted and stormy waters. Instrumental leadership skills seem to be important in remote work and dynamic, crisis-ridden environments that will likely characterize future business landscapes (Luthans & Broad, 2022). However, the present findings suggest that instrumental leadership behaviors are less implemented in dynamic and crisis-ridden environments. To address this gap, companies should consider implementing training programs (Lacerenza et al., 2017) that educate organizational leaders on effective leadership, taking the specific leader-follower constellation (e.g., remote work) and organizational environment (e.g., VUCA) into account. In addition, it seems important to raise leaders' awareness of the context-dependent nature of effective leadership behaviors and to cultivate a feedback culture mirroring such behaviors, for example, by customizing 360-degree feedback instruments to constantly changing business settings (Kelloway et al., 2000; Rowold et al., 2017).

4.2.5.4 Conclusion. The COVID-19 pandemic has revealed a need for effective leadership of a geographically dispersed remote workforce in VUCA environments. The present research delved into this topic by examining the transferability of the FRLM and its more recent extension—instrumental leadership (eFRLM)—to remote and dynamic, crisis-ridden work contexts. Our findings suggest that instrumental leadership is a crucial factor impacting leadership effectiveness in remote work contexts, which may become even more important in pronounced VUCA environments. These results have practical implications for organizations seeking to effectively lead remote working employees in challenging times, and point to the potential value of training and development programs focused on educating organizational leaders on instrumental leadership skills. Overall, augmenting the FRLM with instrumental leadership appears to be a fertile ground for future research that seeks to illuminate effective leadership in nascent virtual and rapidly changing organizational contexts.

4.2.6 References

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Appendix 4.2.A

Table 4.2.A1

Supplementary Results of the Hierarchical Linear Regression Analyses Predicting Perceived Leadership Effectiveness at the eFLRM Dimensional Level

	Model D1				Model D2				Model D3				Model D4			
Variable	VIF	TOL	LMG	RF	VIF	TOL	LMG	RF	VIF	TOL	LMG	RF	VIF	TOL	LMG	RF
Controls																
Age[a]	2.36	.42	.02	50.85	2.43	.41	.01	23.30	2.43	.41	.01	18.82	2.49	.40	.01	4.66
Gender[a]	1.07	.93	.00	7.85	1.09	.92	.00	3.30	1.10	.91	.00	2.85	1.11	.90	.00	0.70
Education[a]	1.27	.79	.00	22.61	1.31	.76	.00	14.54	1.32	.76	.00	10.72	1.32	.76	.00	1.98
Remote working time[a]	1.07	.93	.00	24.60	1.08	.93	.00	3.60	1.08	.93	.00	2.54	1.08	.93	.00	2.96
Weekly working time[a]	1.37	.73	.00	48.34	1.45	.69	.00	9.91	1.46	.69	.00	7.19	1.47	.68	.00	4.74
Corporate tenure[a]	2.49	.40	.00	32.12	2.53	.40	.00	14.88	2.53	.40	.00	10.93	2.55	.39	.00	3.56
Duration of working with leader[a]	1.85	.54	.00	8.99	1.88	.53	.00	22.13	1.88	.53	.00	15.50	1.89	.53	.00	2.96
Interaction frequency with leader[a]	1.06	.95	.05	24.96	1.11	.90	.01	10.87	1.13	.88	.01	8.19	1.17	.86	.01	3.53
Age[b]	1.32	.76	.00	30.52	1.34	.75	.00	10.61	1.34	.75	.00	7.68	1.36	.74	.00	4.01
Gender[b]	1.07	.94	.00	9.23	1.08	.93	.00	11.78	1.08	.93	.00	9.31	1.10	.91	.00	0.76
Hierarchical level[b]	1.20	.83	.00	22.16	1.22	.82	.00	18.80	1.23	.82	.00	14.64	1.23	.81	.00	2.77
Control span[b]	1.10	.91	.00	42.28	1.14	.88	.00	18.90	1.14	.88	.00	15.14	1.15	.87	.00	4.73
Transformational leadership					1.08	.93	.59	211.47	1.53	.66	.43	166.21	3.02	.33	.27	122.26
Transactional leadership									1.51	.66	.23	86.52	1.70	.59	.16	51.40
Instrumental leadership													3.37	.30	.29	130.23

Note. n = 519. Regressions were computed using z-standardized data except for followers' and leaders' gender, which was dummy-coded (0/1 = male/female). VIF = variance inflation factor; TOL = tolerance statistics; LMG = explained variance by a predictor variable based on the Lindeman, Merenda, and Gold method (Lindeman et al., 1980) for variance decomposition; RF = increase in node purity, which is calculated for each tree and then averaged over all trees, based on the random forest algorithm proposed by Breiman (2001, 2002) with the *ntree* parameter set at the default (500 trees).

[a] Follower-related control variables.

[b] Leader-related control variables.

Table 4.2.A2

Supplementary Results of the Hierarchical Linear Regression Analyses Predicting Perceived Leadership Effectiveness at the eFLRM Factor Level

Variables	Model F1				Model F2				Model F3				Model F4			
	VIF	TOL	LMG	RF	VIF	TOL	LMG	RF	VIF	TOL	LMG	RF	VIF	TOL	LMG	RF
Controls																
Age[a]	2.36	.42	.02	50.85	2.43	.41	.01	9.07	2.43	.41	.01	7.90	2.49	.40	.01	4.66
Gender[a]	1.07	.93	.00	7.85	1.09	.92	.00	1.12	1.10	.91	.00	1.07	1.11	.90	.00	0.70
Education[a]	1.27	.79	.00	22.61	1.31	.76	.00	3.27	1.32	.76	.00	5.62	1.32	.76	.00	1.98
Remote working time[a]	1.07	.93	.00	24.60	1.09	.92	.00	5.04	1.09	.92	.00	1.17	1.10	.91	.00	2.96
Weekly working time[a]	1.37	.73	.00	48.34	1.45	.69	.00	8.43	1.46	.69	.00	3.14	1.47	.68	.00	4.74
Corporate tenure[a]	2.49	.40	.00	32.12	2.53	.40	.00	5.94	2.53	.40	.00	5.42	2.55	.39	.00	3.56
Duration of working with leader[a]	1.85	.54	.00	8.99	1.88	.53	.00	5.40	1.88	.53	.00	4.45	1.89	.53	.00	2.96
Interaction frequency with leader[a]	1.06	.95	.05	24.96	1.11	.90	.01	7.44	1.13	.88	.01	6.31	1.17	.86	.01	3.53
Age[b]	1.32	.76	.00	30.52	1.34	.75	.00	6.56	1.34	.75	.00	5.62	1.36	.74	.00	4.01
Gender[b]	1.07	.94	.00	9.23	1.08	.93	.00	1.49	1.08	.93	.00	1.17	1.10	.91	.00	0.76
Hierarchical level[b]	1.20	.83	.00	22.16	1.22	.82	.00	4.75	1.23	.82	.00	4.20	1.23	.81	.00	2.77
Control span[b]	1.10	.91	.00	42.28	1.14	.88	.00	8.19	1.14	.88	.00	7.09	1.15	.87	.00	4.73
Transformational leadership																
Articulating a vision					3.28	.31	.17	77.13	3.37	.30	.15	76.65	3.94	.25	.10	62.33
Providing an appropriate role model					3.19	.31	.16	82.77	3.21	.31	.15	75.57	3.38	.30	.09	59.75
Fostering the acceptance of group goals					3.00	.33	.16	74.54	3.00	.33	.14	67.20	3.26	.31	.09	49.77
High performance expectations					1.40	.72	.01	7.70	1.40	.71	.01	7.12	1.44	.70	.00	4.60
Individualized support					2.12	.47	.11	38.75	2.83	.35	.09	28.76	2.95	.34	.06	14.66
Intellectual stimulation					2.36	.42	.11	35.97	2.36	.42	.10	32.90	2.61	.38	.06	32.90
Transactional leadership																
Contingent reward									2.35	.43	.10	35.94	2.41	.41	.06	17.92
Instrumental leadership																
Environmental monitoring													2.73	.37	.08	27.37
Strategy formulation and implementation													2.78	.36	.05	10.14
Path-goal facilitation													3.31	.30	.08	41.33
Outcome monitoring													3.21	.31	.09	43.09

Note. $n = 519$. Regressions were computed using z-standardized data except for followers' and leaders' gender, which was dummy-coded (0/1 = male/female). VIF = variance inflation factor; TOL = tolerance statistics; LMG = explained variance by a predictor variable based on the Lindeman, Merenda, and Gold method (Lindeman et al., 1980) for variance decomposition; RF = increase in node purity, which is calculated for each tree and then averaged over all trees, based on the random forest algorithm proposed by Breiman (2001, 2002) with the *ntree* parameter set at the default (500 trees).

[a] Follower-related control variables.

[b] Leader-related control variables.

Appendix 4.2.B

Previous research found instrumental leadership to explain unique variance in leadership outcomes beyond FRLM dimensions and factors (Antonakis & House, 2014; Rowold, 2014; Rowold et al., 2017). In addition, omitting instrumental leadership factors in predictive models has previously been shown to distort the FRLM's dimension and factor estimates (Antonakis & House, 2014; Bormann & Rowold, 2018; Rowold, 2014). Given that the eFRLM dimensions and factors are not orthogonal (i.e., they are intercorrelated), the change in R^2 observed in our main hierarchical regression analyses between Model D3/F3 (including control variables and FRLM dimensions/factors) and Model D4/F4 (including control variables and eFRLM dimensions/factors) does not indicate the total actual incremental variance explained by instrumental leadership (see Antonakis & House, 2014). To further investigate the relative importance of the instrumental leadership dimensions and factors when predicting leadership effectiveness, we employed two methods for assessing the eFRLM's relative variable importance (Grömping, 2009): (a) the Lindeman, Merenda, and Gold method (LMG; Lindeman et al., 1980) for variance decomposition in multiple linear regression analyses, using the R package *relaimpo* (Grömping, 2007), and (b) the random forest (RF) machine learning algorithm for variable importance (Breiman, 2001, 2002), using the R package *randomForest* (Liaw & Wiener, 2002). Both methods are appropriate for handling intercorrelated predictors and have been applied in previous research (Bi, 2012; Grömping, 2009). The supplemental findings support our main findings, that is, (a) instrumental leadership contributes unique variance when predicting perceived leadership effectiveness beyond the FRLM and control variables and (b) there may be omitted variable bias and overstated estimates when not considering instrumental leadership in FRLM predictive models.

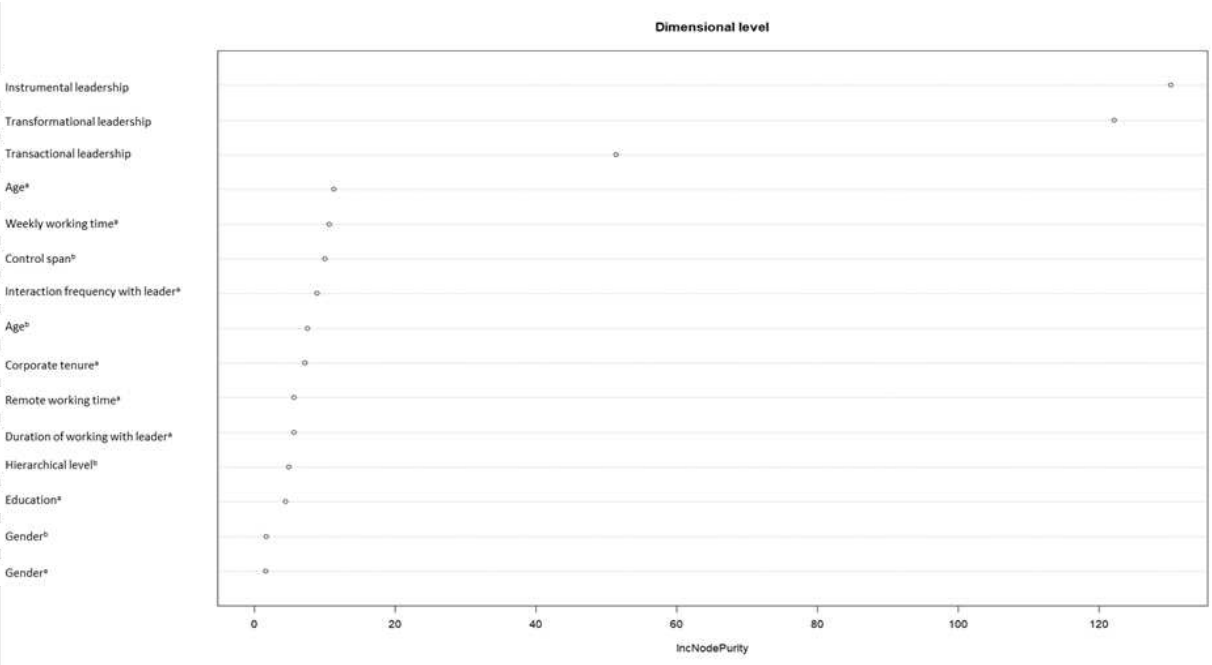
The LMG method (Lindeman et al., 1980) decomposes the variance explained (R^2) by a predictor variable considering both its direct effect and its effect in combination with other variables in the model (Johnson & Lebreton, 2004). This method estimates semi-partial coefficients (Kruskal, 1987; Liu et al., 2021) and is particularly recommended for decomposing R^2 (Grömping, 2007). When applied at the dimensional level (see Table 4.2.A1), the LMG method showed that the contribution of transformational leadership to the variance explained in perceived leadership effectiveness decreased from 43% (Model D3) to 27% (Model D4) after adding instrumental leadership. In comparison, instrumental leadership accounted for 29% of the actual variance explanation in Model D4, explaining more variance than transformational leadership. Our findings are consistent with the pioneering study on instrumental leadership by Antonakis and House (2014) conducted in stationary on-site work settings: Transformational

leadership's variance explanation of perceived leadership effectiveness decreased from 43% to 28% after the instrumental leadership dimension was added in Antonakis and House (2014). In the present study, transformational leadership's variance explanation decreased from 43% to 27%. In both Antonakis and House (2014) and the present study, instrumental leadership accounted for a similar proportion of the variance in perceived leadership effectiveness, 28% and 29%, respectively. Similarly, at the factor level (see Table 4.2.A2), the variance explanation of transformational leadership decreased substantially, with each of its corresponding six factors losing an average of 4% in R^2 after instrumental leadership factors were entered into Model F4. On average, instrumental leadership factors each contributed 7.47% to the actual variance explained in the prediction of leadership effectiveness, whereas the average contribution of transformational leadership factors was 6.63%.

The RF algorithm (Breiman, 2001, 2002) calculates the relative variance importance of predictor variables based on their contribution to the homogeneity of nodes and leaves in the modeled random forest. The importance of each predictor variable is measured by their increase in node purity (*IncNodePurity*), which is calculated for each tree and then averaged over all trees (Liaw & Wiener, 2002). An increase in node purity, as measured by the residual sum of squares, leads to a decrease in mean squared error (MSE) in regression analyses (González et al., 2015). The default number of trees (*ntree* parameter) used for computing the node purity increase was set at 500. When applied to our main hierarchical linear regression models predicting leadership effectiveness with control variables and eFRLM dimensions (Model D4; see Figure 4.2.B1) or factors (Model F4; see Figure 4.2.B2), the RF algorithm revealed that the instrumental leadership dimension was the most influential predictor in terms of increase in node purity (130.23), along with transformational leadership (122.26). Similarly, the instrumental leadership factors "outcome monitoring" (43.09) and "path-goal facilitation" (41.33) were among the top five most influential predictors in terms of increase in node purity, along with the transformational leadership factors "articulating a vision" (62.33), "providing an appropriate model" (59.75), and "fostering the acceptance of group goals" (49.77). These findings provide further support for the relative importance of instrumental leadership at both dimensional and factor levels and its predictive validity for leadership effectiveness. The corresponding values for the node purity increase for control variables and eFRLM dimensions/factors can be found in Table 4.2.A1 and Table 4.2.A2, respectively.

Figure 4.2.B1

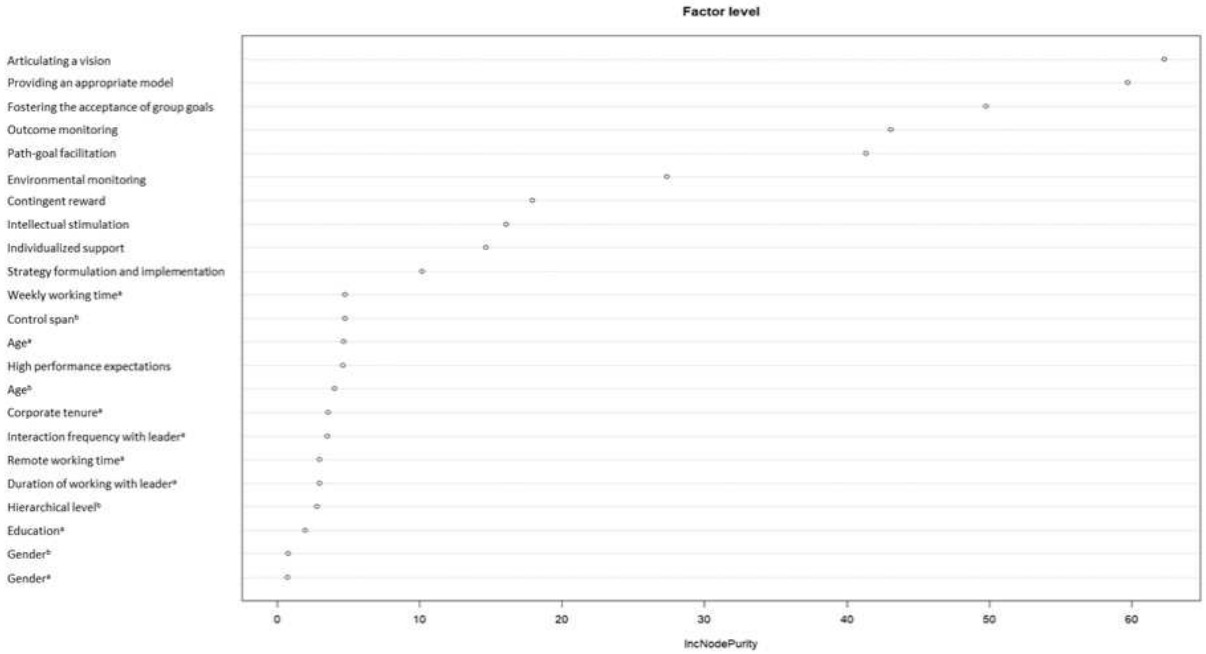
Results of the Random Forest Algorithm Predicting Perceived Leadership Effectiveness Including Control Variables and eFRLM Dimensions



Note. Gender was dummy-coded (0/1 = male/female). The relevance of each control variable and eFRLM dimension is measured in terms of the increase in node purity ("IncNodePurity").
[a] Follower-related control variables.
[b] Leader-related control variables.

Figure 4.2.B2

Results of the Random Forest Algorithm Predicting Perceived Leadership Effectiveness Including Control Variables and eFRLM Factors



Note. Gender was dummy-coded (0/1 = male/female). The relevance of each control variable and eFRLM factor is measured in terms of the increase in node purity ("IncNodePurity").
[a] Follower-related control variables.
[b] Leader-related control variables.

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