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What is the current state of research concerning self-efficacy in exercise behaviour? Protocol for two systematic evidence maps

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ABSTRACT

Introduction Knowing about a risk factor is not sufficient to ensure corresponding behaviour as additional psychological factors play a role. Self-efficacy is one of the major factors. This also applies to physical activity and exercise behaviour, which is a major public health topic in both primary and secondary prevention. The amount of research on self-efficacy in exercise behaviour is high yet remains uncharted. This protocol presents the research design for two systematic evidence maps on self-efficacy in exercise behaviour in (1) primary prevention and (2) secondary prevention. These maps will thus provide a comprehensive overview over the current state in published empirical research as a starting point for future researchers.

Methods and analysis The databases Medline (via PubMed) and PsycINFO (via EbscoHost) will be searched using the search terms 'self-efficacy' and any of the search terms 'sport' and 'exercise' in titles and abstracts. All empirical research studies which have measured self-efficacy in relation to exercise behaviour will be included. The primary prevention systematic evidence map will aggregate all studies on healthy humans and the secondary prevention systematic evidence map will include all studies on humans with a pre-existing condition. We will extract and present the data points authors, title, year, sample size (N), age groups, surveyed sport and method of measuring self-efficacy in both systematic evidence maps. Moreover, we will extract and present the target group in the systematic evidence map on primary prevention and the pre-existing condition in the systematic evidence map on secondary prevention. In addition to a data table, we will create freely accessible evidence maps in the form of graphs.

Ethics and dissemination Since this is a protocol, an ethics approval is not required for the presented and planned work. The results of the two systematic evidence maps will be disseminated via publication in international peer-reviewed journals. In addition, data will be shared in detail via the Open Science Framework platform.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ A special strength of this study is the systematic approach to charting empirical research on self-efficacy in exercise behaviour for the first time.
⇒ The resulting systematic evidence maps will be provided in a user-friendly way via the freely accessible Open Science Framework.
⇒ Primary prevention and secondary prevention will be segregated for easier overview and extraction of topic-specific data.
⇒ A limitation of this study is that assessment of strength of evidence will not be included.
⇒ Grey literature will not be included.

INTRODUCTION

Health benefits of physical activity are widely known both in the scientific community and in the general population, yet a significant number of people lead an inactive, sedentary lifestyle.[1–3] The WHO guidelines for physical activity and sedentary behaviour report on this topic in detail[1]: The WHO recommends a weekly minimum of 150–300 min of moderate-intensity aerobic physical activity or 75–100 min of vigorous-intensity aerobic physical activity in addition to two muscle-strengthening activities throughout the week for healthy adults. While this includes sports, the WHO does not limit its recommendations to any type of physical activity. In fact, it emphasises that 'Replacing sedentary time with physical activity of any intensity (including light intensity) provides health benefits'.[1] According to the WHO, the same or higher amount is recommended for adults with chronic conditions, specifically for individuals suffering from type II diabetes, hypertension, cancer and HIV. This is necessary for health benefits in mental health, general well-being and maintenance of a healthy weight,[4–6] as well as for reducing the health risks caused by inactivity: All-cause mortality, cardiovascular disease mortality, cancer mortality and incidence of cardiovascular disease, cancer and type II diabetes.[1 7 8] Nonetheless, a significant portion of the population fails to meet those recommendations. The dimension of this issue differs wildly

among subpopulations when accounting for sex, age, socioeconomic status or ethnicity. For example, the WHO global estimates of 2016 indicate that the percentage of adults not meeting the recommendations, 27.5%, pales in comparison to the 81% of adolescents.[1] The gap between recommended amount and actual amount of physical activity even further increased during the COVID-19 pandemic,[9 10] although to a varying degree for different subpopulations,[11 12] thus showing the ongoing relevance of the topic.

The reasons for this gap are diverse, ranging from physical and time limitations, economical barriers to practicality issues in incorporating activity into an individual's daily life.[1 13 14] Additionally, psychological barriers within the individual can play a major role: If individuals aspire to change their behaviour, including aspiring to become more active, it is by far not enough to understand the risks of the current behaviour, to be able to translate them into the necessary changes, to intend or even make the rational choice to change.[15–17] This is known as the intention-behaviour gap.[18]

To be able to support people in achieving the recommended minimum amount of physical activity, it is important to understand the reasons for the intention-behaviour gap. For this, a varying selection of factors is being considered[19–21] depending on the specialist field, theoretical background and research focus. Among those factors, some are exclusive to a theory or research focus, while some emerge consistently and are of interest across multiple specialist fields and approaches. One such major factor is the concept of self-efficacy, as evidenced by its reoccurrence in different theoretical models that aim to predict health behaviour, for example, in the theory of planned behaviour and in the health action process approach: the theory of planned behaviour[22] considers attitude, subjective norm and perceived behavioural control that shape a person's behavioural intentions, which in turn, predict behaviour, while the health action process approach[23] focuses specifically on health behaviour. Following a stage approach, risk perception and outcome expectancies form intention, followed by planning, and finally action. Self-efficacy is considered in both of them. It plays a major role in behavioural control (theory of planned behaviour)[22] and accompanies the different stages of behavioural change (health action process approach).[23]

Self-efficacy is 'the conviction that one can successfully execute the behaviour required to produce the outcomes'.[24] It is a necessary cognitive component for behavioural change, because between the desire to change the current behaviour and actually following a goal, the individual needs to believe they will be able to exhibit said behaviour, even when faced with adversity.[24]

Olander *et al*[25] offer a concise explanation and several demonstrative examples of self-efficacy influencing exercise behaviour. In their systematic review and meta-analysis, they present self-efficacy as a well-documented key aspect in increasing physical activity by acting as a mediator between interventions and an individual's resulting behaviour.[17] As a practical example, they refer to Darker *et al*[26] who showed that the largest increase in walking-self-efficacy predicted the biggest increases in walking behaviour after a single-session walking intervention.

The construct of self-efficacy can be integrated in a larger nomological network, as indicated in the brief description of the theory of planned behaviour[22] and the health action process approach.[23] To name two examples of related constructs: conscientiousness can be defined as 'a spectrum of constructs that describe individual differences in the propensity to be self-controlled, responsible to others, hardworking, orderly and rule abiding'.[27] As a personality trait, it is positively correlated with self-efficacy when examining factors of behavioural change.[28] For a second example: Locus of control can be internal or external. Specifically in health-related context, internal locus of control can be defined as 'the individual's sense of control over their health (being) directly related to their own actions' while external locus of control correspondingly refers to the 'perception that one's health is determined by external factors'.[29] Internal locus of control correlates with self-efficacy, although the strength of this link changes depending on the specifics of self-efficacy (general concept or subconcepts like disease-management self-efficacy). Both of these concepts are regarded as central components of patient empowerment.[29]

Self-efficacy can both pertain to situation-specific beliefs and also be regarded as a general construct.[30] While the general construct is widespread to the point of the General Self-Efficacy Scale having been validated in a number of different languages,[31] situation-specific beliefs often have their own specific scales with situation-specific items that are not transferable to other self-efficacy beliefs. For example, the Breastfeeding Self Efficacy Scale[32] includes the item '*I can always ensure that my baby is properly latched on for the whole feeding*' which is obviously not transferable to non-breastfeeding contexts. The Self Efficacy for Exercise Scale[33] includes the item '*How confident are you right now that you could exercise three times per week for 20 minutes if you had to exercise alone*' which is obviously not transferable to non-exercise contexts.

Self-efficacy scales or items can also be specific to target groups. While the item mentioned before may suit most healthy individuals in most exercise situations, there are specifics in other cases, such as health obstacles for people suffering from certain diseases. When assessing self-efficacy, these specific obstacles may need to be addressed. For example, the Self-efficacy for Physical Activity Scale[34] focuses on women suffering from Fibromyalgia and includes the item '*How confident are you that you can walk fast to do exercise over 90 minutes at least twice a week despite feeling fatigue*' which is hardly transferable to other groups due to fatigue being a leading symptom in fibromyalgia.

These two examples show the practical difference between focusing on primary intervention (targeting

Table 1 Objectives of the systematic evidence map according to the SPIDER scheme[47]

	Map 1 Primary prevention	Map 2 Secondary prevention
Sample	Healthy humans	Humans with a diagnosed medical condition
Phenomenon of interest	Self-efficacy in context with exercise behaviour	Self-efficacy in context with exercise behaviour
Design	Any	Any
Evaluation	Self-efficacy measured with any kind of scale	Self-efficacy measured with any kind of scale
Research type	Empirical research	Empirical research

any population without a pre-existing diagnosis) and secondary intervention (targeting any population with a pre-existing diagnosed condition).

The vast body of empirical studies on the topic of self-efficacy is not only extensive in number, but also complex due to branching out into the aforementioned situation-specific approaches. Therefore, researchers familiarising themselves with the research field of self-efficacy of behavioural change in physical activity will benefit from an overview that can be used as a starting point for own research processes. While there are meta-analyses and reviews on a number of subtopics[25 35], this research field in its entirety remains uncharted. Charting this research field and providing a user-friendly, comprehensive overview about the branching subtopics will make the whole topic of self-efficacy in exercise behaviour more accessible to the scientific community, as well as facilitate insight and save academic resources.

This protocol aims to outline the planned procedure of creating two systematic evidence maps. Systematic Evidence Maps are a relatively novel approach for systematic reviews on broad-based topics with an expansive body of research and allow to capture a said body of research in a user-friendly way.[36] Compared with other review forms, systematic evidence maps allow to systematically process relatively high numbers of studies without diving into analyses and details,[36 37] making them an ideal choice for mapping the research on an extensive topic like self-efficacy in exercise behaviour.

In both maps, the aims will be (1) to provide a comprehensive overview over the current state in published empirical research that focuses on self-efficacy concerning exercise behaviour, (2) to identify the currently existing subtopics of self-efficacy in that context, (3) to compile the quantity of research that has been done on the different subtopics and (4) to enable future researchers to systematically justify and derive research gaps in their specific field.

METHODS

This protocol follows the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) checklist.[38] PRISMA-P is a reporting guideline for protocols of systematic reviews, designed to ensure concise and thorough reporting. A completed PRISMA-P checklist is attached (see online supplemental file 1). The systematic evidence maps have been preregistered in the Open Science Framework on 11 November 2022.[39 40]

Hines *et al*[41] and Humayun *et al*[42] represent good examples of the type of overview we intend to generate in terms of data presentation and graphical illustration of selected subtopics.

The maps will be prepared in accordance with the Methods of Evidence Mapping provided by Schmucker *et al*,[43] which is a further development of related methodological frameworks, like the framework for Scoping Studies by Arksey and O'Malley.[44] The following steps will be used for creating the systematic evidence map:

1. Definition and prioritisation of the research question.
2. Systematic literature search.
3. Study selection.
4. Data extraction
5. Reporting the results.

The steps 1 and 2 have already been completed as described in this protocol. The planned start date for the steps 3–5 is 1 August 2023. The planned end date is 30 September 2024.

Step 1: definition and prioritisation of the research question

The first systematic evidence map will focus on self-efficacy towards exercise behaviour in primary prevention, namely in healthy individuals.[45 46] The second map will focus on self-efficacy towards exercise behaviour in secondary prevention, namely in individuals with a diagnosed medical condition.[45 46] This may include any population with an existing but undiagnosed condition, as well as risk factors that do not constitute a diagnosable condition or disease in the medical sense, like old age, non-obese overweight or sedentary lifestyle. The SPIDER scheme (table 1) provides a more thorough description of the research question (Sample, Phenomenon if Interest, Design, Evaluation, Research type).[47] The systematic evidence mapping will be split in two since (1) research interest on exercise usually focuses on one group or the other, thus allowing to reduce the volume of presented studies without omitting relevant evidence for the target audience and since (2) for target groups in secondary prevention the approach to exercise behaviour often necessitates special consideration for the pre-existing condition (eg, in the form of specialised items) that will not be of interest in primary prevention.

Table 2 Inclusion and exclusion criteria—primary prevention

Primary prevention	Inclusion	Exclusion
Sample	Healthy humans	Humans with a pre-existing condition Non-humans
Phenomenon of interest	Self-efficacy towards exercise behaviour Self-efficacy in general/unspecified	Self-efficacy towards any non-exercise behaviour
Design	Any	
Evaluation	Self-efficacy measured with any kind of scale	Self-efficacy not measured Self-efficacy assessed without scaling
Research type	Empirical research	Secondary research
Language requirements	English abstract	No English abstract available

Step 2: systematic literature search

We developed the search strategy using steps 1–7 of the literature research manual RefHunter V.5.0[48 49] which outlines how to transform a research idea into search string suitable for searching data bases.

Information sources

We will systematically search for literature in Medline (via PubMed) and PsycINFO (via EbscoHost). We chose Medline as first database since exercise is a public health topic for both primary prevention and secondary prevention. As a second database, we chose PsycINFO since self-efficacy is a psychological concept.

Search strategy

The search terms for both maps will be 'self-efficacy' and any of the search terms 'sport' and 'exercise'. We identified the search terms for exercise behaviour by searching Medline for the intuitively relevant terms 'physical activity', 'sport', 'exercise', 'exercising' and 'workout' and compiling the MeSH terms and keywords of the first ten studies for each search term. For each of those 50 studies, we found one or both of the terms 'sport' and 'exercise' in the MeSH terms, so these two search terms comprehensively covered all studies that were found in that search. We found no alternative terms. We likewise used the search term 'self-efficacy' in a Medline search and checked the first 30 results for alternative terms. There were none. We repeated the procedure in PsycINFO with the same results.

In Medline, we will use the following search string: ((sport[Title/Abstract]) OR (exercise[Title/Abstract])) AND (self efficacy[Title/Abstract]). For PsycINFO, we adjusted the search string to the specifics of the database: (AB sport OR AB exercise) AND AB self-efficacy. As we expect a high volume of relevant studies, we will not search for grey literature and leave out forward/backward citation tracking to limit the scope. The planned dates of coverage are 1983–2022.

Preliminary searches

Since our goal is a comprehensive overview, a search with high sensitivity is of utmost importance. We conducted a pilot search on Medline on 16 September 2022: We used the search string and sorted the results chronologically by publication date, starting with the first published study in 1983, ending with the studies published in 2021. We drew a random sample of 251 (this sample size is needed for the construction of a 90% CI in a population of 3467 papers[50]) with the help of a random number generator and screened the titles and abstracts of the resulting papers for the inclusion/exclusion criteria. Online supplemental file 2 presents the resulting table with assigned random number, digital object identifier or, if unavailable, the PubMed ID (PMID), classification in Primary Prevention, Secondary Prevention or Exclusion (+Reason for Exclusion) (see online supplemental file 2). We have assigned 80 studies to the topic of primary prevention, 92 studies to secondary prevention and excluded 79.

The high rate of relevant results indicates that our search string is accurate in terms of content despite its sensitivity. Since all relevant results could be categorised into either primary or secondary prevention, we conclude that our inclusion/exclusion criteria have a high separation effect.

We pilot-tested the data extraction on ten exemplary studies for each systematic evidence map. The exemplary extraction tables are attached (see online supplemental files 3 and 4).

Step 3: study selection

The inclusion criteria and exclusion criteria in regard to form and content are summarised in tables 2 and 3.

Selection process

After deduplication using the systematic literature review software Rayyan,[51] we will screen title and abstract for eligibility criteria. One reviewer will independently conduct the study selection using Rayyan. A second reviewer will screen a random sample of 10%. We will calculate inter-rater agreement using Cohen's Kappa.[52] During the initial selection and data extraction, any disagreements will be resolved by discussion and used to help calibrate the assessment of the inclusion criteria and exclusion criteria.

Table 3 Inclusion and exclusion criteria—secondary prevention

Secondary prevention	Inclusion	Exclusion
Sample	Humans with a pre-existing condition	Healthy humans Non-humans
Phenomenon of interest	Self-efficacy towards exercise behaviour Self-efficacy in general/unspecified	Self-efficacy towards any non-exercise behaviour
Design	Any	
Evaluation	Self-efficacy measured with any kind of scale	Self-efficacy not measured Self-efficacy assessed without scaling
Research type	Empirical research	Secondary research
Language requirements	English abstract	No English abstract available

Step 4: data extraction

Data collection process

We will extract from the full text in the article, if available. For each information, we will copy the relevant part of the text into the extraction table, and then categorise them in a next step. It will be possible to check more than one option, if applicable. If a piece of information is not provided, we will mark it as missing.

Data items

For the first systematic evidence map, we will extract the following information with the systematic review programme SRDR+[53]: authors, title, year, sample size (N), age groups, target group, surveyed sport, method of measuring self-efficacy.

For the second systematic evidence map, we will extract the following information with the systematic review programme SRDR+[53]: authors, title, year, sample size (N), age groups, pre-existing condition, surveyed sport, method of measuring self-efficacy.

We will export the extracted information in a non-proprietary text format.

Step 5: reporting the results

Data synthesis

The categorisation is planned as follows:

We will categorise the age groups in years based on the Provisional Guidelines on Standard International Age Classifications of the WHO (1982): 1–14, 15–24, 25–44, 45–64, 64+[54] while omitting the category of <1. If the ages in a study span over more than one category, we will check the boxes for all applicable age groups. If ages are only implied (eg, older adults), we will define categorisation rules and add them in an additional document. For the primary prevention map, we will categorise the target group for the primary prevention map in general population, unspecified, recreational exercise, competitive sports, with the option to add more categories. For the secondary prevention map, we will have no predetermined categories but will present the pre-existing condition as it is named in the original publication. Likewise, we will have no predetermined categories for the surveyed sport/type of exercise and the scale used to measure self-efficacy but will present the descriptions as they are reported in the original study (for both maps). We will include a note whether the scale is a validated instrument or an ad hoc scale.

Outcomes and prioritisation

We will present the results over the Open Science Framework by extracted category.

We will depict the number of papers per year in a histogram. For the represented age groups, the target group/pre-existing condition and the surveyed sport, we will create pie charts. We will present the validated self-efficacy scales in a list and include a ratio of how many validated versus ad hoc scales we found. Additionally, we will provide a Microsoft Excel file with instructions about how to display only certain cases that may be of interest to individual researchers (eg, only age group 15–24).

ETHICS AND DISSEMINATION

Since this is a protocol, no ethics approval is required for the presented and planned work. The results of the two systematic evidence maps will be disseminated via publication in international peer-reviewed journals. We will include recommendations for future research based on our findings. Furthermore, we are aiming to discuss our results at relevant (inter)national scientific conferences that focus on public health and/or exercise.

Study records: data management

The studies included in the systematic evidence maps and the maps themselves will be made available over the Open Science Framework[55] where they have been preregistered on 11 November 2022.[39 40]

Patient and public involvement

None.

OUTLOOK

The resulting evidence maps will be a starting point for future researchers who are interested in self-efficacy in physical exercise. It will be possible to gain not only a broad overview over the state of research but also to identify the relevant empirical studies for a specific group

of interest or a specific field of application, including a handy list of validated questionnaires that are tailored for specific fields of research.

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