

Review article

Long-term effectiveness of health coaching in rehabilitation and prevention: A systematic review



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ABSTRACT

Objective: This systematic review aims to evaluate the long-term effectiveness of health coaching interventions in rehabilitation and prevention.

Methods: Databases and a manual search were used to identify randomized controlled trials (RCTs) in English through to June 2015. Studies were included if: (1) the target population were people of employment age, (2) the intervention addressed either people suffering from a diagnosed disease or healthy people, (3) the intervention included health coaching to influence health-related outcomes and/or processes and (4) the study had a follow-up of at least 24 weeks after the end of the intervention period.

Results: Out of 90 RCTs, 14 studies were selected using the inclusion criteria: seven were designed for the rehabilitative setting and seven for the preventive setting. Three studies of each setting found statistically significant long-term effectiveness.

Conclusions: The high number of studies evaluating health coaching underlines the relevance of this approach. Despite the increasing popularity of health coaching, a research gap exists in regard to its long-term effectiveness.

Practice implications: It is of utmost importance to consider the sustainability already during planning of health coaching interventions. The involvement of the target group and the setting seems to be a promising strategy.

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Contents

1. Introduction	1644
2. Methods	1644
2.1. Data search	1644
2.2. Study selection	1644
2.3. Quality assessment criteria	1645
2.4. Data collection	1645
3. Results	1646
3.1. Number of articles	1646
3.2. Detailed results	1646
3.2.1. Rehabilitative setting	1646

Abbreviations: BMI, body mass index; CBT, cognitive behavioral therapy; CCM, collaborative care model; CG, control group; d, day; DPP, diabetes prevention program; DS, Delphi score; h, hour; HbA1c, glycated hemoglobin; HC, health coaching; HDL, high-density lipoprotein; HE, health education; ICD, international classification of diseases; IG, intervention group; LDL, low-density lipoprotein; MDD, major depression disorder; MI, motivational interviewing; min, minute; mo, month; n.s., not significant; PMT, protection motivation theory; PICO, population, intervention, comparator, outcome; PRISMA, preferred reporting items for systematic reviews and meta-analyses; PST, problem solving technique; RA, rheumatoid arthritis; RCT, randomized controlled trials; SCT, social cognitive theory; T2DM, type II diabetes; we/wk, week.

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3.2.2. Preventive setting 1648

4. Discussion and conclusion 1649

4.1. Discussion 1649

4.1.1. Long-term effectiveness 1650

4.1.2. Efficacious intervention components 1651

4.1.3. Limitation and strength of the study 1651

4.2. Conclusion 1651

4.3. Practice implications 1651

Ethics approval and consent to participate 1652

Consent for publication 1652

Availability of data and material 1652

Competing interests 1652

Funding 1652

Authors' contributions 1652

Acknowledgements 1652

References 1652

1. Introduction

Chronic diseases constitute the main cause of mortality and morbidity in the European Union and are therefore of high individual and socioeconomic importance [1–3]. Since chronic diseases are, to a large extent, preventable [4,5], the significance of lifestyle interventions in rehabilitation and prevention is beyond controversy [6,7].

In recent years, health coaching has emerged as a promising intervention to initiate behavioral changes and improve health [8]. As a consequence, several health coaching interventions have been developed and the number of studies on this topic has increased enormously [9]. However, the research field of health coaching is widely heterogeneous. This might be ascribed to different terms that are used in this context and to different definitions that are applied [9–12]. In frequently-used definitions, health coaching is associated with a patient-centered education method which aims to motivate individuals to improve their health and promote self-management [9,13,14].

Independent of the variety in this research field, health coaching interventions for patients with diabetes, cardiovascular disease or cancer show positive effects on health outcomes [15–17]. Up until now, most interventions address people having chronic diseases [9,11,18]. Furthermore, it is striking that, at the end of the intervention period, many health coaching interventions have proved to be effective in the short-term. The long-term effectiveness seems to be unclear [10,18]. Since the success of a lifestyle intervention is, among other things, assessed by its sustainability, long-term behavior modification is a prior intervention aim [19–21].

The objective of the present systematic review is to summarize the long-term effectiveness of health coaching in rehabilitation and prevention on health-related outcomes and/or processes.

Therefore, this systematic review is conducted by posing the following questions: (a) what is the long-term effectiveness of health coaching in rehabilitation and (b) what is the long-term effectiveness of health coaching in prevention?

2. Methods

This systematic review was conducted following the international guidelines established by PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) [22].

2.1. Data search

This systematic review focused on the current literature published in English through to June 2015. The relevant publications were identified by means of a structured search of the databases PubMed and PubPsych.

Different search terms (including Medical Subject Headings), which describe a health coach, lifestyle factors and the setting, were combined to search through the titles and abstracts. Truncations (“*”) were used. Inadequate topics and settings were excluded by the logical connective “NOT” or with a filter in the databases (Table 1). Moreover, a manual search of studies was performed.

2.2. Study selection

Studies were included if they met the following inclusion criteria, inspired by PICO (population, intervention, comparator, outcome) [23]: The target populations were people of employment age. The intervention addressed sick people according to the ICD-10-catalog (International Classification of Diseases) [24] (rehabilitative setting) as well as healthy people (preventive setting). The intervention included health coaching with the aim of influencing health-related outcomes and/or processes. The outcomes were behavioral, physiological, psychological and/or social. Only randomized controlled trials (RCTs) were included. The control group were non-intervention controls (usual care) as well as an intervention controls. Since the maintenance of a behavior change occurs after at least six month according to the transtheoretical model [25], RCTs with a follow-up of at least 24 weeks after the end of the intervention period were included.

Table 1
Search terms used for electronic databases.

Topic	Search Terms
Health coach	health coach, wellness coach, nurse manage, case manage, manager health, prevention manage, prevention coach
Lifestyle factors	physical activity, exercise, stress, resilience, diet, addiction, life style, behavioral change
Setting	rehabilitation, prevention
“NOT”	school, old, dement, gerontol, child, athlete
Filter in databases	humans (Pubmed), journal article (PubPsych)

Studies targeting children or elderly retired people were excluded. Moreover, interventions for athletic training, the evaluation of fitness courses and education programs for medical intakes were not included.

In the initial steps, two researchers read titles and abstracts of identified studies for potential eligibility. Duplicates were manually removed. Following this, the researchers independently assessed the full-texts of the remaining articles with regard to relevance. Disagreements were resolved by discussion and consensus with a third researcher; also regarding to the quality assessment of the studies (2.3) and the data collection (2.4).

2.3. Quality assessment criteria

The methodological quality of the included studies was assessed by using the Delphi List [26]. This list is commonly used in systematic reviews [27,28] and has a comparatively greater validity evidence than other standardized quality checklists [29].

Two researchers independently assessed the quality of the studies by assigning 0 or 1 point for 9 items (1 point = “yes”; 0 point = “no” or “don’t know”). The individual scores of the included studies ranged between 4 and 7 points (see Tables 2 and 3).

2.4. Data collection

Data were extracted from the included studies by one researcher and cross-checked by a second researcher. The included articles were assigned according to their setting: (1) rehabilitation and (2) prevention.

In addition to this, not only were author and year, Delphi score, aim of the study, characteristics of research participants and intervention components synthesized for both intervention and control groups but also for the duration of intervention period and of the follow-up period.

Moreover, the effectiveness at the end of the intervention period and of the follow-up period were summarized regarding the

Table 2
Description of study design and intervention of the studies in the rehabilitative setting.

Author, Year	DS	Aim	Research participants <i>a.</i> Sample size; <i>b.</i> Age; <i>c.</i> Sex; <i>d.</i> Population	Intervention components IG CG <i>a.</i> Description of coach; <i>b.</i> Frequency; <i>c.</i> Approach; <i>d.</i> Theoretical framework; <i>e.</i> Aims; <i>f.</i> Other intervention modules	Inter- vention	Follow- up	
Cinar & Schou [29]	5	“[. . .] determine if a Health Coaching (HC) approach compared with formal health education (HE) resulted in better health outcomes among type II diabetes (T2DM) patients in improving glycaemic control and oral health [. . .]”	<i>a.</i> 186 (IG = 77; CG = 109) <i>b.</i> 30–65 years <i>c.</i> X <i>d.</i> Type II diabetes patients	<i>a.</i> Coach with dental professional background <i>b.</i> + <i>c.</i> 5–6 face-to-face sessions, 3–4 telephone coaching sessions <i>c.</i> Specific psychological techniques (MI, neuro-linguistic programming & self-efficacy) <i>d.</i> Patient-oriented empowerment of patients for daily diabetes-/oral health-related practices, building up health-related capacity building skills & taking responsibility for one's own health (According to the International Coaching Council) <i>e.</i> Free periodontal cleaning & 3 seminars about oral health & diabetes management	<i>a.</i> Dietician &/or diabetes nurse in outpatient clinics <i>b.</i> + <i>c.</i> Initial session: 2 we following the baseline oral examination, patients' knowledge about main areas of health were assessed by individual sessions, 2face-to-face sessions & 4 telephone sessions <i>d.</i> X <i>e.</i> Standard lifestyle Task-oriented advice-giving referring to oral health-care practices, diet & physical exercise <i>f.</i> Free periodontal cleaning, 3 seminars about oral health & diabetes management	40 we	24 we
Fortney et al. [30]	7	“[. . .] compare the outcomes of patients randomized to Practice Based versus Telemedicine Based Collaborative Care.”	<i>a.</i> 364 (IG = 185; CG = 179) <i>b.</i> IG = 46.8 ± 12.8; CG = 47.2 ± 12.6 years <i>c.</i> 33% female <i>d.</i> Patients with depression of Federally Qualified health Centers	<i>Telemedicine-Based Collaborative Care (TBCC)</i> <i>a.</i> On-site primary care providers, off-site depression care manager, pharmacist, psychologist & psychiatrist <i>b.</i> Stepped-care: intensity was increased if treatment failed <i>c.</i> Telephone, CBT delivered via interactive video <i>d.</i> CCM, CBT <i>e.</i> X <i>f.</i> X	<i>Practice-Based Collaborative Care (PBCC)</i> <i>a.</i> On-site primary care providers & on-site nurse depression care managers <i>b.</i> Every 2 we during acute treatment & every 4 we during continuation treatment <i>c.</i> Face-to-face or telephone <i>d.</i> CCM <i>e.</i> X <i>f.</i> Symptom monitoring, education/activation, barrier assessment/resolution, establishing self-management goals, planning activities	48 we	24 we
Huijbregts et al. [31]	6	“[. . .] adapted the collaborative care model for the treatment of Major Depression Disorder (MDD) to accommodate existing practice variation and tested whether this had added value over Care as Usual.”	<i>a.</i> 150 (IG = 101; CG = 49) <i>b.</i> IG = 47.0 ± 13.5; CG = 52.1 ± 14.8 years <i>c.</i> 72.9% female <i>d.</i> People with major depressive disorder	<i>a.</i> Care Manager <i>b.</i> 6–12 PST sessions (first session 60 min, afterwards 30 min), evaluation point every 6 we <i>c.</i> Face-to-face, written instructions, telephone, net-based monitoring <i>d.</i> Target-driven CCM, adherence-enhancing techniques, PST <i>e.</i> Achieve remission improving adherence <i>f.</i> X	Usual care	18–24 we	24–30 we
Ma et al. [32]	7	“[. . .] evaluated 2 adapted Diabetes Prevention Program (DPP) lifestyle interventions	<i>a.</i> 241 (IG I = 79; IG II = 81; CG = 81) <i>b.</i> 52.9 ± 10.6 years	12 session (12-weekly) DPP lifestyle intervention curriculum (Group Lifestyle Balance)	Standard medical care	12 we	48 we

Table 2 (Continued)

Author, Year	DS	Aim	Research participants <i>a. Sample size; b. Age; c. Sex; d. Population</i>	Intervention components IG CG <i>a. Description of coach; b. Frequency; c. Approach; d. Theoretical framework; e. Aims; f. Other intervention modules</i>	Inter- vention	Follow- up	
		among overweight/obese adults [. . .]”	c. 47% female d. Adults with prediabetes &/or metabolic syndrome	<i>IG I:</i> Face-to-face classes to coached intervention, food tasting, 20–45 min guided physical activity <i>IG II:</i> Home-based DVD self-directed intervention, obtained weight scale, pedometer <i>Both:</i> standardized reminder messages of the lifestyle coach, participants could submit questions or concerns (IG I participants receive personalized messages)			
Pearson et al. [34]	4	“[. . .] assess the effectiveness of two self-management (SM) approaches on obesity via a 12-week telephone-based intervention.”	a. 45 (IG = 25; CG = 20) b. IG = 20.5 ± 1.7; CG = 21.4 ± 1.8 years c. 75% female d. Students (university) with a BMI ≥ 30 kg/m ²	<i>Interactive MI administered via Co-Active Life Coaching</i> a. Certified Professional Co-Active Life Coach b. Weekly for ca. 45 min c. Telephone (unscripted confidential) d. MI e. Self-management f. X	<i>Structured lifestyle treatment following the LEARN (Lifestyle, Exercise, Attitudes, Relationship, Nutrition) Program</i> a. LEARN “Specialist” b. 12 × 30–45 min c. Telephone (scripted lesson) d. Cognitive behavioral-based e. Self-management f. X	12 we	24 we
Sjöquist et al. [33]	5	“[. . .] investigate the long-term effects on perceived general health, disease activity, pain, activity limitation and cognitive behavioral factors of a one-year coaching program performed in ordinary physical practice to promote the adoption of health-enhancing physical activity in patients with early rheumatoid arthritis (RA).”	a. 228 (IG = 94; CG = 134) b. IG = 55 ± 14.0; CG = 57 ± 13.9 years c. 73.5% female d. Participants with rheumatoid arthritis	a. Physical therapists b. Monthly telephone support, body function test every 3rd mo c. Face-to-face, telephone d. X e. Aiming moderate activity 30 min/d, ≥4 d/we (adoption of health-enhancing physical activity) f. Ordinary physical therapy treatment	Ordinary physical therapy treatment	48 we	48 we
van der Wulp et al. [35]	5	“[. . .] study the effectiveness of a peer-led self-management coaching intervention in recently diagnosed patients with Type 2 diabetes.”	a. 119 (IG = 59; CG = 60) b. 61.0 (median) years c. 35% female d. Patients recently diagnosed with Type II diabetes	a. Experienced peer (expert patient) b. 3 home visits for 1 h, 2 we after the visit telephone calls, between the visits calls & mail contact as often as patient liked c. Face-to-face, telephone, mail d. SCT e. Increase self-efficacy f. X	Usual care	12 we	24 we

(BMI = Body Mass Index; CBT = cognitive behavioral therapy; CCM = collaborative care model; CG = control group; d = day; DS = Delphi score; h = hour; IG = intervention group; MI = motivational interviewing; min = minute; mo = month; PST = problem-solving treatment; SCT = social cognitive theory; we = week).

main outcome(s). The effectiveness of the intervention group at the end of the intervention period was described with respect to the control group. The effectiveness of the follow-up period was described in comparison to the baseline and to the control group. Moreover, time-by-group interaction was summarized. An intervention was deemed to be effective if a statistically significant effect ($p \leq 0.05$) was reported in the/one main outcome.

3. Results

3.1. Number of articles

The initial literature search identified a total number of 5185 references. Of these articles, 4418 duplicates were removed. Thus, 767 titles were screened during this step and 574 articles were excluded. Of the remaining 193 articles, the abstracts were screened. Of these, 103 studies were excluded due primarily to inadequate study design. 90 full text articles were included for assessing the eligibility criteria additive in the full text. More than 70% of these studies concerned the rehabilitative setting. On

assessing the full text, twelve studies were then found to be ineligible due to exclusion criteria. 40 studies were excluded because they did not have a follow-up period. Finally, 25 articles having an insufficient follow-up period were excluded. One article was supplemented by a manual search. 14 RCTs having a follow-up of at least 24 weeks after the end of the intervention period were included. Fig. 1 depicts the flow-chart of the review procedure.

3.2. Detailed results

According to the research questions, articles were assigned to their respective setting: seven to the rehabilitative setting [30–36] and seven to the preventive setting [37–43].

3.2.1. Rehabilitative setting

Table 2 shows the description of the study designs and the interventions of the seven studies of the rehabilitative setting. Three of the interventions were designed for patients with diabetes Type II or prediabetes and/or metabolic syndrome [30,33,36]. Two studies were designed for patients with depression

Table 3
Description of study design and intervention of the studies in the preventive setting.

Author, Year	DS Aim	Research participants a. Sample size; b. Age; c. Sex; d. Population	Intervention components IG CG a. Description of coach; b. Frequency; c. Approach; d. Theoretical framework; e. Aims; f. Other intervention modules	Inter-vention	Follow-up	
Cheng & Chan [36]	5 “[. . .] examine the effect of individual job coaching and use of health threat in job-specific occupational health education program in preventing work-related musculoskeletal back injuries [. . .]”	a. 182 (IG = 101; CG = 81) b. IG = 34.2 ± 8.3; CG = 32.9 ± 5.8 years c. 6.1% female d. Laborers	Job-specific Occupational Health Education Program a. Occupational/physical therapist b. 1/2 d training workshop c. Group coaching, individual feedback d. Protection motivation theory (originated Health Belief Model) e. Job-specific functional capacity evaluation protocol (determine the physical work abilities of individuals), based on this results participants gets individual recommendations f. X	Conventional Occupational Health Education Program a. Occupational/physical therapist b. 1/2 d training workshop c. Group coaching d. X e. X f. X	1/2 d	24 we
Duijts et al. [37]	6 “[. . .] assess the effectiveness of a preventive coaching intervention on sickness absence due to psychosocial health complaints and on general wellbeing of employees.”	a. 151 (IG = 76; CG = 75) b. IG = 43.0 ± 9.8; CG = 46.6 ± 9.7 years c. 82% female Employees at risk for sickness absence (from health care & education sector)	a. Coaches of the organization b. 7–9 1-h sessions within the course of 6 mo c. Individual meeting d. X e. X f. X	Standard (or no) treatment, free to make use of usual care present in the company	24 we	24 we
Emmons et al. [38]	4 “[. . .] evaluate the effectiveness of the Health Directions 2 intervention in the primary care setting.”	a. 2440 (CG = 625; IG I = 882; IG II = 933) b. 49.0 ± 1.1 c. 65.8% female d. Primary care setting	IG I: Patients self-guided intervention targeting 5 risk behaviors b. + c. Information material via web or print, 2 tailored feedback report; materials for patients' social network, links to key community based resources d. X e. Focused on influences at the individual, interpersonal, community levels that could motivate & maintain behavior change & be sustainable f. X IG II: IG I plus 2 brief telephone coaching calls a. Health coaches (trained in the principles of brief MI) b. At 2 & 6 we, 5–10 min c. Telephone d. MI e. X f. X	Usual care	24 we	48 we
Geraedts et al. [42]	7 “[. . .] tested the effectiveness over the period of 1 year of a Web-based guided self-help intervention, called Happy@Work, for employees with depressive symptoms who were not on sick leave.”	a. 231 (IG = 116; CG = 115) b. 43.4 ± 9.2 years c. 62.3% female d. Employees with depressive symptoms (banking companies, research institutes, security company, university)	Happy@Work1 a. Trained Master's-level students in clinical psychology b. 6 lessons with weekly assignments, feedback from a coach via webpage (option of 1 we extra time in case of delay) c. Internet-based d. PST, CBT e. Guided self-help intervention f. X	Usual care	8 we	40 we
Strijk et al. [39]	6 “[. . .] evaluates the effectiveness of a worksite lifestyle intervention on vitality, work engagement, productivity and sick leave.”	a. 730 (IG = 367; CG = 363) b. IG = 52.5 ± 4.8; CG = 52.3 ± 4.9 years c. 75.5% female d. Workers aged ≥ 45 years (from academic hospitals)	a. Personal vitality coach b. 3 individual visits (4–6 & 10–12 we after first visit á 30 min) c. Face-to-face d. Psychological behavior changing theories (goal setting, feedback, PST) e. Aiming to improve lifestyle behaviors: mental factors of vitality by relaxation exercises, physical factors of vitality by vigorous intensity physical activities, fruit intake f. Written information about a healthy lifestyle, provision of free fruit, 1 x weekly yoga & aerobic group	Written information about a healthy lifestyle in general	24 we	24 we
Tate et al. [40]	6 “[. . .] determine in a randomized prospective design whether encouraging 2500 kcal physical activity/wk produced greater 30-mo weight losses than did the standard	a. 202 (IG = 93; CG = 109) b. 42.2 ± 6.4 years c. 58% female d. Overweight adults	High physical activity treatment: exercise goal of 2500 kcal/we a. Nutritionists, exercise physiologists, psychologists b. Weekly during the first 6 mo,	Standard behavioral treatment: exercise goal of 1000 kcal/we a. Nutritionists, exercise physiologists,	22 we	98 we

Table 3 (Continued)

Author, Year	DS	Aim	Research participants a. Sample size; b. Age; c. Sex; d. Population	Intervention components IG CG a. Description of coach; b. Frequency; c. Approach; d. Theoretical framework; e. Aims; f. Other intervention modules	Inter-vention	Follow-up
		1000 kcal physical activity/wk prescription."		biweekly during mo 7–12 & monthly during month 13–18 c. Behavior therapy for obesity conducted in small groups d. X e. Reduce weight f. 1–3 social support partners, were assigned an exercise coach, given small monetary incentives	psychologists b. Weekly during the first 6 mo, biweekly during mo 7–12 & monthly during mo 13–18 c. Behavior therapy for obesity conducted in small groups d. X e. Reduce weight f. X	
van Berkel et al. [41]	6	"[. . .] evaluate the effectiveness of a worksite mindfulness-based multi-component intervention on vigorous physical activity in leisure time, sedentary behavior at work, fruit intake and determinants of these behaviors."	a. 257 (IG = 129; CG = 128) b. IG = 46.0 ± 9.4; c. CG = 45.1 ± 9.6 years d. 67.35% female e. Employees (research institute)	a. Members of the Society of Mindfulness-Based trainers (Netherlands & Flanders) b. 8 we in-company (weekly, 90 min), with homework (5 d per we, 30 min, training cd's exercises), 8 sessions e-coaching (feedback on "personal energy plan") c. Group setting, e-mail, CD d. Mindful "vitality in practice" e. Kindness and awareness f. Free fruits/vegetables, lunch walking routes, buddy-system	Information on existing lifestyle behavior-related facilities that were already available at the worksite	24 we 24 we

(CBT=cognitive behavioral therapy; CG=control group; d=day; DS=Delphi score; h=hour; IG=intervention group; MI=motivational interviewing; min=minute; mo=month; PST=problem-solving treatment; SCT=social cognitive theory; we=week).

[31,32]. Other populations were people with rheumatoid arthritis [34] and obesity [35]. The population size ranged from 45 to 364 research participants. Most studies had participants aged around 50 years [30–34,36]; one study had research participants aged around 20 years [35]. In three studies, less than 50% of the participants were female [31,33,36]. The intervention period ranged from 12 to 48 weeks. The duration of the follow-up period was mainly 24 weeks [30–32,35,36], the maximum duration was 48 weeks [33,34]. Four of the control groups were non-intervention groups [32–34,36]. The coach was described differently in each study; for instance, as an experienced peer, nurse care manager or physical therapist. The following approaches were either used alone or in combination: telephone coaching [30–32,34–36], face-to-face meetings [30–34,36], coaching via mail or Internet-based [32,36] and/or text and video coaching [31,32]. Five coaching interventions were based on classical frameworks; such as motivational interviewing (MI), social cognitive theory (SCT), problem solving technique (PST) or cognitive behavioral therapy (CBT) [30–32,35,36], and two of these were based on collaborative care model (CCM) [31,32].

The results of the health coaching interventions in the rehabilitative setting are summarized in Table 4. The main outcomes of most studies were physiological [30,33,35], two were behavioral [32,34] and one was psychological [36]. The study by Fortney et al. [31] had psychological and behavioral main outcomes.

Two studies showed statistically significant results at the end of the intervention period compared to a non-intervention control group [32,33]. Ma et al. [33] also compared two intervention groups but the results were not statistically significant. Pearson et al. [35] compared two interventions and showed a statistically significant result at the end of the intervention period. Cinar & Schou [30] and van der Wulp et al. [36] showed statistically significant results at the end of the

follow-up period compared to the baseline. At the end of the follow-up period, Ma et al. [33] reported statistically significant results for the main outcome in the intervention groups compared to the control group. Also, the results between the different intervention groups were statistically significant. Cinar & Schou [30] and Fortney et al. [31] published statistically significant effects within a time-by-group interaction as well as between the groups at the end of the follow-up period. Sjöquist et al. [34] reported statistically significant results but favoring the non-intervention control group. Two studies found no long-term effectiveness compared to the control group [32,36].

3.2.2. Preventive setting

The characteristics of the seven interventions of the preventive setting are described in Table 3. Most of the interventions were conducted with employees [37,38,40,42,43]. One intervention was especially aimed at employees with depressive symptoms [43]. One study was aimed at overweight adults [41], another was designed for the primary care setting [39]. The sample size ranged from 151 to 2440 research participants. In one study, less than 50% of the participants were women [37]. Four of the interventions had a duration of 24 weeks [38–40,42]. The minimum duration was a half-day intervention [37] and the maximum was 24-weeks [38–40,42]. The maximum follow-up period was 98 weeks [41]. In most cases, the duration was 24 weeks [37,38,40,42]. Five control groups were non-intervention controls [38–40,42,43]. The coaches in the preventive setting were for example, personal vitality coaches, occupational/physical therapists or psychologists. The approaches used were face-to-face meetings [37,38,40–42], coaching via mail or Internet-based [39,42,43], coaching via CD [42] and telephone coaching [39]. The theoretical frameworks differed; five studies describe a framework, such as PST, MI, CBT, protection motivation theory (PMT) or "psychological behavior changing theories" [37,39,40,42,43] and two indicate no framework [38,41].

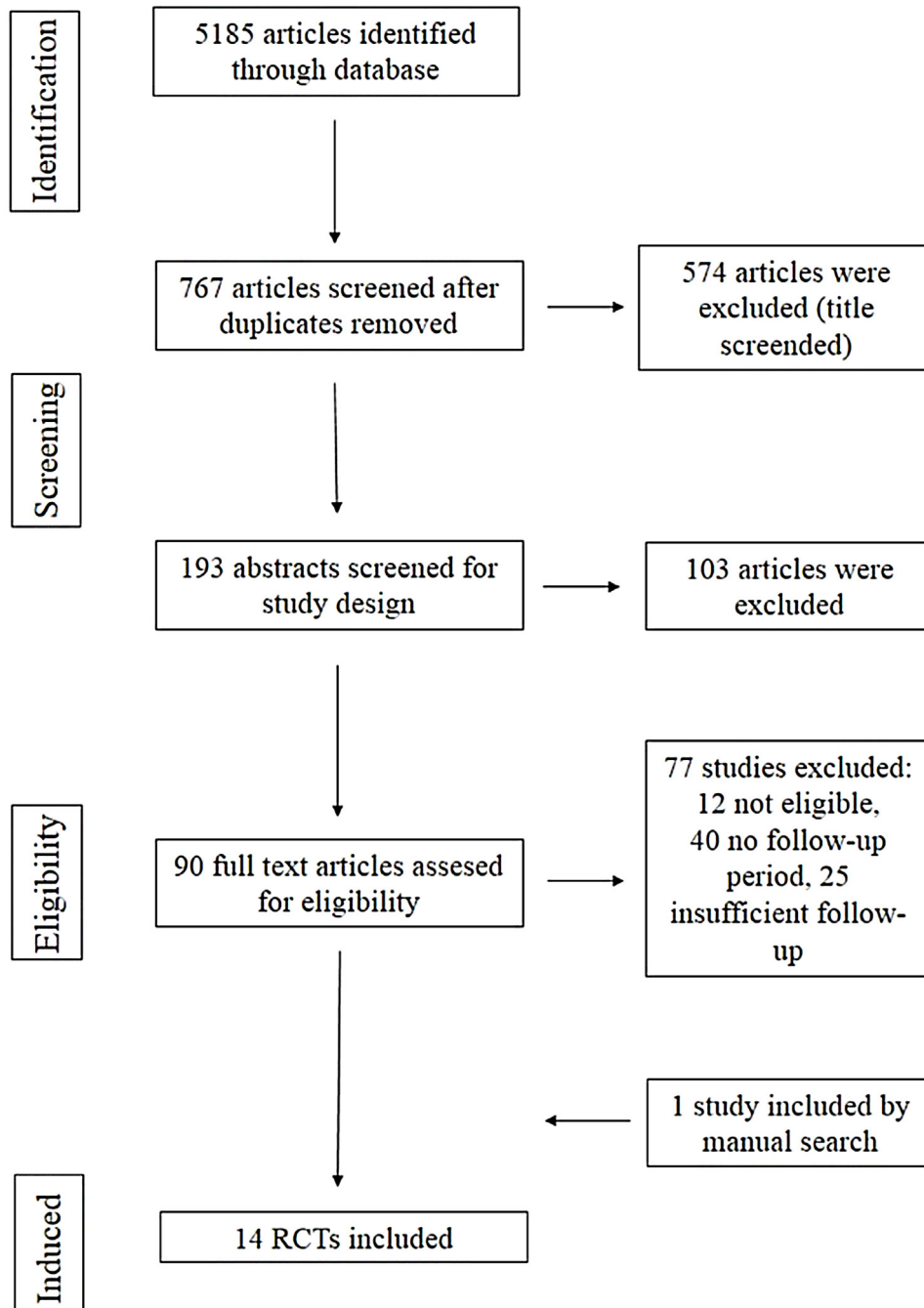


Fig. 1. Flow-chart review procedure.

The effectiveness of the health coaching interventions in the preventive setting are describe in Table 5. The main outcomes of two studies were psychological [40,43] and the main outcomes of four studies were behavioral [37–39,42]. One study had a physiological outcome [41].

Compared to their control groups, four studies showed statistically significant results at the end of the intervention period [37,38,39,41]. In the study of Cheng & Chan [37], the results at the end of the follow-up period were compared to the baseline statistically significant. At the end of the follow-up period, Cheng & Chan [37] and Duijts et al. [38] showed statistically significant results of at least one main outcome in the intervention groups

compared to the control groups. The two intervention groups in the study of Emmons et al. [39] only demonstrated statistically significant effects compared to the control group but not compared with each other.

4. Discussion and conclusion

4.1. Discussion

This systematic review summarized 14 RCTs which published long-term results of health coaching interventions in rehabilitation and prevention. Of these studies, one half was designed for the

Table 4
Effectiveness of health coaching intervention groups in the rehabilitative setting.

Study	Main outcome(s)	Intervention period Compared to CG	Follow-up period	
			Compared to Baseline	Compared to CG
Cinar & Schou [29]	HbA1c	X	**	*** ¹ **1
	Clinical attachment loss	X	**	*** ¹ **1
Fortney et al. [30]	Depression severity	n.s. ²	X ²	*** ² / ¹ **1:2
	Treatment response	X ²	X ²	*** ² / ¹ n.s.
	Remission	X ²	X ²	*** ² / ¹ n.s. ² :2
Huijbregts et al. [31]	Treatment response	n.s. ² :3	X	n.s. ² :3
Ma et al. [32]	Change in BMI	*** ² (IG I vs. CG)/ *** ² (IG II vs. CG)/ n.s. ² (IG I vs. IG II)	X	*** ² (IG I vs. CG)/ * ² (IG II vs. CG)/ * ² (IG I vs. IG II)
Pearson et al. [34]	Weight loss	* (in favor for CG)	n.s.	X
	Waist circumferences	X	X	X
	Fasting glucose	X	X	X
	Triglycerides	X	X	X
	Total cholesterol	X	X	X
	HDL	X	n.s.	X
	LDL	X	X	X
	Cholesterol:HDL	X	X	X
Sjöquist et al. [33]	General health perception	n.s./n.s. ²	n.s./n.s. ²	n.s. ¹ / ² (in favor for CG)
van der Wulp et al., 2012 [35]	Self-efficacy	X	*	n.s. ¹

(BMI = Body Mass index; CG = control group; HbA1c = glycated hemoglobin; HDL = high-density lipoprotein; IG = intervention group; LDL = low-density lipoprotein; n.s. = not significant; * = $p < 0.05$; ** = $p < 0.01$; *** = $p < 0.001$; ¹ = differences between time by group (in favor for IG); ² = intention to treat analyses; ³ = odds ratio (in favor for IG)).

Table 5
Effectiveness of health coaching intervention groups in the preventive setting.

Study	Main outcome(s)	Intervention period Compared to CG	Follow-up period	
			Compared to Baseline	Compared to CG
Cheng & Chan [36]	Knowledge of different work hazards	***	***	***
	Knowledge of proper technique in manual handling operations	***	***	***
	Knowledge of the consequences of not performing the proper manual handling operation technique	***	***	***
	Practical skills in manual handling operation	X	***	***
Duijts et al. [37]	Subjective sickness	X	X	n.s./n.s. ²
	Objective sickness	* ¹ / ² (8 mo)	X	n.s./*** ²
Emmons et al. [38]	Multiple risk behavior score (improved)	*** ² (IG I vs. CG)/ *** ² (IG II vs. CG)/ n.s. ² (IG I vs. IG II)	X	* ² (IG I vs. CG)/ * ² (IG II vs. CG)/ n.s. ² (IG I vs. IG II)
Geraedts et al. [42]	Depressive symptoms	n.s. ²	X ²	n.s. ²
Tate et al. [40]	Body weight (change)	** ¹ / ²	n.s./n.s. ²	n.s./n.s. ² (between groups from 18 to 30 mo)/n.s. ¹
Strijk et al. [39]	General vitality	n.s. ²	n.s. ²	n.s. ²
	Work-related vitality	n.s. ²	n.s. ²	n.s. ²
van Berkel et al. [41]	Vigorous physical activity (subjective & objective)	n.s./n.s. ²	X	n.s./n.s. ²
	Sedentary at work	n.s./n.s. ²	X	n.s./n.s. ²
	Fruit intake	n.s./n.s. ²	X	n.s./n.s. ²
	Behavioral determinants	n.s./n.s. ²	X	n.s./n.s. ²

(CG = control group; IG = intervention group; n.s. = not significant; * = $p \leq 0.05$; ** = $p < 0.01$; *** = $p < 0.001$; ¹ = differences between time by group; ² = intention to treat analyses).

rehabilitative setting the other half for the preventive setting. Three studies in each setting found statistically significant long-term effectiveness of the main outcome.

4.1.1. Long-term effectiveness

Over recent years, the number of publications about health coaching interventions has increased enormously. A review by Wolever et al. [9] showed that only 22 articles on health or wellness coaching were published in the year 2003 whilst in the year 2012, more than 150 studies had already been published. The

current review confirms these results and the systematic search identified 90 eligible RCTs including a health coaching intervention. Although the number of publications in general is increasing, only a few articles published long-term results. Kivelä et al. [18], for example, took the effectiveness of health coaching into account in their review but, of the 13 included studies, only two had a follow-up of a minimum of 12 weeks. Compared to the number of studies in general, the current review also identified few studies with a follow-up period. In regard to the results of the present review, it is notable that there is an equal number of articles in both settings. In

contrast to the present results, the systematic reviews of Kivelä et al. [18], Olsen & Nesbitt [11] and Wolever et al. [9] suggest that more interventions for the rehabilitative setting were developed. During the initial steps of the systematic study's selection, this review also showed that there are more articles in the rehabilitative setting. However, the studies in the rehabilitative setting frequently exhibit a lower percentage of follow-up periods of a minimum of 24 weeks compared to those studies in the preventive setting.

It seems as if the health coaching interventions are gaining importance in the prevention setting. Nonetheless, it is currently difficult to make a statement about the sustainability of health coaching in either setting.

4.1.2. Efficacious intervention components

A lack of reported intervention details, which Hill et al. [10] already noticed, can be found even in health coaching interventions having a follow-up period. Moreover, the descriptions of the coach, the target populations, the intervention components and the outcomes are heterogeneous; other systematic reviews [9,10] confirm this diversity.

Olsen and Nesbitt [11] identified four key features for effective health coaching programs: the use of a goal setting, MI, collaboration with primary health care providers and a program duration of 6–12 month. With regard to the duration of the intervention period, our findings do not confirm this recommendation. In the rehabilitative setting, an effective study had only an intervention duration of three month [33] and in the preventive setting, even a half-day intervention was effective [37]. Moreover, according to our review it is unclear whether the theoretical framework affected the effectiveness. For example, MI was part of both, an effective intervention [30] as well as part of an ineffective intervention [35].

Kivelä et al. [18] concluded that the intervention's effectiveness improves when the program integrates a combination of different approaches. With regard to this, the current review asserts two contrasting statements: In the rehabilitative setting, interventions taking a mixed approach are effective [30,31], but even ineffective interventions use a combination of approaches [32,34]. Telephone coaching, in particular, is a frequently used approach [44] but is not promising for the long-term effectiveness of health coaching. One of the two interventions of Emmons et al. [39] included telephone coaching, but this was not more effective. Also Pearson's et al. [35] telephone coaching was not effective in the long-term, but face-to-face contact seems to be important. In the study of Ma et al. [33], the face-to-face intervention group was more effective than the other interventions.

Regarding the description of the coach, it is striking that there are different descriptions of the coach in all the effective studies. Another review assumed that trained psychologists or health lifestyle coaches are responsible for positive effects [18].

The identification of efficacious intervention components varied, but there are conspicuous features regarding the target populations. Two of the effective studies in the rehabilitative setting were developed for patients with diabetes [30,33]. Maybe this is because diabetes is, compared to other illnesses regarding the effectiveness of lifestyle interventions, one of the most widely researched [45]. Moreover, the effective studies with diabetes patients had physiological outcomes which are more sensitive to change. This could be an indication that the effectiveness of health coaching is among other things dependent on specific chronic diseases.

In the preventive setting, more than half of the interventions were developed for employees [37,38,40,42,43]. This maybe because the challenges in working life have increased due to globalization, prolongation of working lifetime and shortage of

skilled employees. The improvement in a health related lifestyle at employment age and therefore with an associated reduction in early retirement and a rise in employability is not very relevant for the wider economy and society in general [46,47].

Differences between effective and ineffective interventions could be identified with regard to the study design. Two articles, which found a long-term effectiveness of health coaching, compared their intervention with a non-intervention control group [38,39]. These findings agree with the current literature, which shows that there are often no differences when two interventions are compared [48,49].

4.1.3. Limitation and strength of the study

Several limitations of the current systematic review need to be noted. Firstly, publication bias cannot be completely excluded because of differences in the terminology utilized for what might have been a similar topic. In addition to this, only studies published in English through to June 2015 were included. Secondly, the exact definition of the health coach, the intervention components and the outcomes are heterogeneous. Moreover, the statistical analyses used to estimate the long-term effectiveness differ. Also, only the effectiveness of the main outcome(s) of the studies and the longest follow-up periods were taken into account. Thirdly, various possibilities exist for defining the follow-up period as well as for assigning the studies in the rehabilitative or preventive settings.

One strength of the present review is the focus on the long-term effectiveness. Only those studies having a long follow-up period of a minimum of 24 weeks were included to emphasize the sustainability of the effects. Another strength is the differentiated consideration of the rehabilitative and preventive settings. The orientation towards the ICD-10-Diagnosis allows a clearly defined demarcation of the settings. Moreover, only peer-reviewed RCTs with a high methodological quality were included. No study met the maximum score of the Delphi List [26] because, in health coaching interventions, the care provider and the patient are not blinded. Furthermore, the study search and selection were accurately and systematically described. All full-texts were independently assessed and the synthesized results were cross-checked.

4.2. Conclusion

The high number of studies underlines the relevance of health coaching. However, the present systematic review shows a significant research gap regarding the sustainability of health coaching interventions in rehabilitation and prevention. With regard to resource allocation it is of utmost interest to identify components in health coaching interventions that are promising for long-term effectiveness. Despite the high number of studies a significant lack of RCTs could be identified. Based on the results of the present systematic review no specific recommendations for health coaching in rehabilitation and prevention can be developed.

In order to provide recommendations for effective components of sustainable health coaching interventions, further RCTs on health coaching interventions comprising a relevant follow-up period and the comparison with a control intervention are needed. Moreover, intervention details have to be reported clearly and cost-effectiveness evaluations should be conducted.

4.3. Practice implications

The lack of sustainable lifestyle interventions is a widely recognized problem. To overcome the problem of sustainability, health coaching might be an appropriate approach. Hence, it is of utmost importance to consider the sustainability already during

planning of health coaching interventions. The involvement of the target group and the setting seems to be a promising strategy.

Ethics approval and consent to participate

[Not applicable].

Consent for publication

[Not applicable].

Availability of data and material

[Not applicable].

Competing interests

The authors declare that they have no competing interests. [Conflicts of interest: none].

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Authors' contributions

AS conceived the idea of the study. LD developed the search strategy. LD wrote the manuscript supported by JB and AS. LD is responsible for the systematic literature search and the data collection supported by JB. IF drafted all versions of the manuscript. All authors read and approved the final manuscript.

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