Motivational aspects of physical activity in (first-line) chronic disease management: a qualitative review

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Abstract

Inleiding

Chronische aandoeningen vormen in toenemende mate een uitdaging binnen de eerstelijnszorg. Fysieke activiteit speelt een cruciale rol in de preventie en behandeling van diverse chronische ziekten. Desondanks blijft de therapietrouw voor fysieke activiteit laag, mede door uiteenlopende motivatieproblemen. Het begrijpen van motivatiebevorderende en -belemmerende factoren en het definiëren van effectieve interventies om deze determinanten te beïnvloeden, zijn essentieel om fysieke activiteit duurzaam te integreren als onderdeel van een multifactorieel behandelplan.

Methodologie

Deze literatuurstudie werd uitgevoerd volgens de PRISMA-richtlijnen. Studies werden geselecteerd op basis van vooraf gedefinieerde in- en exclusiecriteria, met focus op volwassenen met één of meerdere chronische aandoening(en). Enkel Engelstalige publicaties tussen januari 2018 en december 2023 binnen de eerstelijnszorgsetting werden geïncludeerd. De primaire uitkomst betreft motivatie voor fysieke activiteit. De zoektocht gebeurde via Medline (Pubmed) en leverde 571 studies op, waarvan 16 kernartikels (11 kwantitatief, 3 kwalitatief, 2 mixed methods) geïncludeerd werden voor primaire outcome analyse. Relevante motivatiebelemmerende en -bevorderende factoren met betrekking tot fysieke activiteit in een chronisch zieke patiëntenpopulatie, werden als achtergrondinformatie in kaart gebracht aan de hand van 16 bijkomende artikels. We beoogden de uitvoering van een systematische review en meta-analyse. Echter, gezien de substantiële heterogeniteit in subpopulaties, interventietechnieken en manier van rapportering, werd een systematische narratieve review uitgevoerd met rapportering van data op kwalitatieve basis.

Resultaten

Motivationele barrières variëren per subpopulatie, maar omvatten vaak fysieke beperkingen, eerdere negatieve ervaringen, angst, lage zelfeffectiviteit en een gebrek aan sociale steun. Veelvoorkomende bevorderende factoren zijn onder andere recente diagnose, positieve ervaringen, persoonsgerichte begeleiding, sociale steun en educatie. Diverse gedragsinterventies bleken effectief in het verhogen van motivatie of FA-niveau: acceptance-based behandelingen, motiverende gespreksvoering en interventies op basis van het Transtheoretical Model, de Health Action Process Approach en het COM-B model. Hoewel kennisvergroting vaak wordt bereikt, voorspelt kennis alleen geen langdurige therapietrouw. Duurzame gedragsverandering vereist psychologische flexibiliteit, motivatie, zelfregulatie, sociale steun en gewoontevorming. Gunstige contextuele factoren en het geleidelijk integreren van fysieke activiteit in het dagelijks leven dragen bij aan een succesvolle integratie van fysieke activiteit in het behandelplan. Doeltreffende interventies hebben gemeen dat ze autonome motivatie stimuleren, zelfeffectiviteit verhogen, zelfregulatievaardigheden aanleren en planningsstrategieën afstemmen op persoonlijke waarden en normen. Patiënt-centered care is hierbij een belangrijk gegeven, waarbij de interactie tussen patiënt en zorgverlener centraal staat.

Besluit

Er bestaat geen uniforme motivatiestrategie of interventie die toepasbaar is voor alle patiënten met een chronische aandoening. De effectiviteit van gedragsveranderingstechnieken lijkt eerder te liggen in het strategisch combineren van complementaire methoden, geïnformeerd door theoretische modellen zoals de zelfdeterminatietheorie, het trans-theoretisch model, het health action process model en het behavior change wheel. Een effectieve interventieaanpak vraagt om een multilevel gedragsmodel dat, naast individuele en interpersoonlijke, ook structurele en omgevingsfactoren in rekening brengt. Zorgverleners moeten beweegadvies op maat geven en langdurige motivatie ondersteunen, terwijl structurele barrières, zoals financiële ongelijkheid, beleidsmatig aangepakt dienen te worden.

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Introduction`

Rationale

Chronic diseases are an important challenge in (primary) health care and require long-term management. These conditions have a great impact on the global burden of disease, which will most likely increase in the upcoming years. (1) Physical inactivity is considered as an important but modifiable risk factor for the development of multiple chronic diseases. On the contrary, physical activity (PA) is primordial in the prevention of divergent chronic conditions, such as obesity, metabolic syndrome, type 2 diabetes, coronary heart disease and cancer. (2; 3) Furthermore, regular PA can reduce the severity of clinical manifestations. (4) Exercise can improve cardiorespiratory capacity, general functioning and strength. (5) In patients with systolic heart failure, regular physical activity shows an inverse correlation with mortality and hospital readmission. (6; 7) In patients with diastolic heart failure, regular exercise is correlated with a reduction in heart failure symptoms (like fatigue and dyspnea), better exercise tolerance, an increase in quality of life and improved diastolic function. (7)

Physical exercise should be considered as part of the treatment strategy in chronic diseases. However, the implementation of physical activity and sustained adherence remain a hurdle for many patients and caregivers and thus, adherence is generally low. (1; 4; 8; 9; 10) In 2020, the World Health Organization published specific physical activity guidelines for patients with chronic diseases like cancer, hypertension, type 2 diabetes and HIV. (1) Patients suffering from chronic disease(s) tend to be less active compared to the general population (1; 8), with a high proportion of them not meeting the recommendation of performing at least 150 min of moderate-to-vigorous physical activity (MVPA) per week. (4; 6; 11; 12; 13; 14) In line with the problem of physical inactivity in the general population, the explanation can be multifactorial. In patients with chronic disease, specific obstacles may occur, such as fear of an exacerbation, lack of knowledge about adjusted and safe activity types or inappropriate coaching. (1)

It is non-negotiable that an increase in physical activity also requires behavioral change. (15) Nevertheless, little is known about the determinants of PA adherence (16)- defined as barriers and facilitators - and the effectiveness of motivational strategies to improve activity levels in this patient population. (1)

Objectives

Firstly, the objective of this study is to provide an overview on motivational barriers and facilitators for physical activity in patients living with a chronic disease or multimorbidity. The second aim (and primary outcome) is to provide an overview of behavioral strategies to improve a patients' motivation to implement more physical activity as part of chronic disease management.

Methods

The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analysis) guidelines were used as backbone to define the methods of this review.

Eligibility criteria

Study designs

We included randomized controlled trials (RCTs), case-control studies, prospective and retrospective cohort studies, systematic reviews and meta-analyses. Case series and case reports were excluded.

Participants

We included studies examining the adult population (18 years or older) suffering from one or more of the following chronic diseases: hypertension, hypercholesterolemia, type 2 diabetes, chronic obstructive pulmonary disease (COPD), chronic kidney disease (CKD), obesity and heart failure. The concept "multimorbidity" was thus also considered. Because of the heterogeneity of this population, we did not exclude studies restricted to one of these specific diseases. The following medical conditions were excluded from further screening: pregnancy, gestational diabetes, pre-diabetes, renal dialysis, renal transplantation, bariatric surgery, non-alcoholic fatty liver disease and cancer.

Interventions

We focused on studies reporting (behavioral) strategies aiming to improve motivation for physical activity as part of chronic disease management. The focus of interest was motivational techniques, cognitive tools and supervised/guided training programs. We also considered other types of interventions, if assessed as relevant.

Comparators

The effect of motivational techniques, cognitive tools and supervised/guided training programs were compared with usual care (i.e. no specific attention to the role of physical activity or an unstructured approach to motivate patients), unless specified otherwise.

Outcomes

We focused on the following relevant outcomes:

- Barriers and facilitators for physical activity in patients with chronic diseases
- Motivation towards physical activity in patients with chronic diseases

Even though it is a very important outcome for patient and caregiver, we did not extensively report the effect of our intervention on disease control or progression, as this is beyond the scope of this review.

Timing

Only studies published between January 1st 2018 and December 29th 2023 were considered for further eligibility screening. Furthermore, we only reviewed studies with a finished publication status.

Setting

We focused on the primary care setting. Articles reporting data restricted to a hospital setting, were not eligible.

Language

Only articles reported in English were considered for inclusion.

Information sources

A literature search string was formulated using medical subject headings (MeSH terms) and text words related to motivation towards physical activity in patients with a chronic disease. The literature search was conducted in Medline (PubMed).

Search strategy

The transcript of the Medline search string is included below. Limitations concerning language and study design were not imposed at this stage of the search but were considered during the screening process (see "eligibility criteria"). The publication date filter was applied at this stage. Due to the format of this review as part of an individual master paper, the search strategy was not peer reviewed.
Draft Medline search – PubMed interface
((adult) AND ((chronic disease[MeSH Terms]) OR (hypertension) OR (hypercholesterolemia) OR (type 2 diabetes) OR (chronic obstructive pulmonary disease) OR (heart failure) OR (chronic kidney disease) OR (obesity))) AND (((physical activity) AND (motivation)) AND ((motivational strategy) OR (barriers) OR (enablers) OR (behavioral strategy) OR (cognitive tool) OR (training))) AND ((motivation) OR (confidence) OR (disease management) OR (adapted activity) OR (knowledge))

Study records

Data management

The obtained articles were manually screened and retrieved based on the eligibility criteria. For background articles providing information about barriers and facilitators for physical activity, eligibility criteria were less strict concerning study methodology.

Selection process

Since the review is carried out as an individual master paper, it was not possible to provide two independent reviewers for data selection. The initial screening was based on title and abstract, the final screening was based on the full text article. Double counting of articles was avoided by juxtaposing author names. Five hundred seventy-one studies were identified as potentially relevant after applying the above-mentioned search strategy. After screening based on title and abstract, 87 articles were retrieved. Reasons for exclusion in this phase were wrong outcome (n = 227), wrong study population (n = 234), wrong study design (n = 2), background article (n = 7) language other than English (n = 14). Following the completion of full-text screening, sixteen articles were included for primary outcome synthesis, of which one was performed in patients with "chronic health conditions" in general, three in a heart failure population, seven in patients with type 2 diabetes, five in obese patients. No studies describing motivational intervention strategies in patients with chronic obstructive pulmonary disease, chronic kidney disease, hypertension or hypercholesterolemia were included after full text screening. Of the sixteen retrieved articles, eleven were quantitative studies, three were qualitative studies and two were mixed studies. Among the eleven quantitative studies, one was observational and ten were interventional. Reasons for exclusion after full-test screening were wrong outcome (n = 34), wrong study population (n = 8), wrong study design (n = 10), background article (n = 2), wrong publication type (n = 1). A schematic representation of the selection process is depicted in table 1.

Besides from the sixteen "main" articles providing primary outcome data, another sixteen articles were included as background articles, describing relevant barriers and facilitators for PA without reporting motivational or behavior change interventions. The distribution of study populations is as follows: one article in patients with "chronic disease" in general, three in heart failure population, six in patients with type 2 diabetes, two in obese patients, two in patients with chronic obstructive pulmonary disease (COPD) and two in chronic kidney disease (CKD). No studies representing patients with hypertension or hypercholesterolemia as primary health conditions were suitable for inclusion.

Another five articles (article 1, 2, 3, 5 and 15 in the reference list) were used in the preliminary phase to provide the background information used in the introduction of this paper. These articles were not included in table 1 as they were not used for further analysis. Thus, a total of 37 articles are mentioned in the reference list.

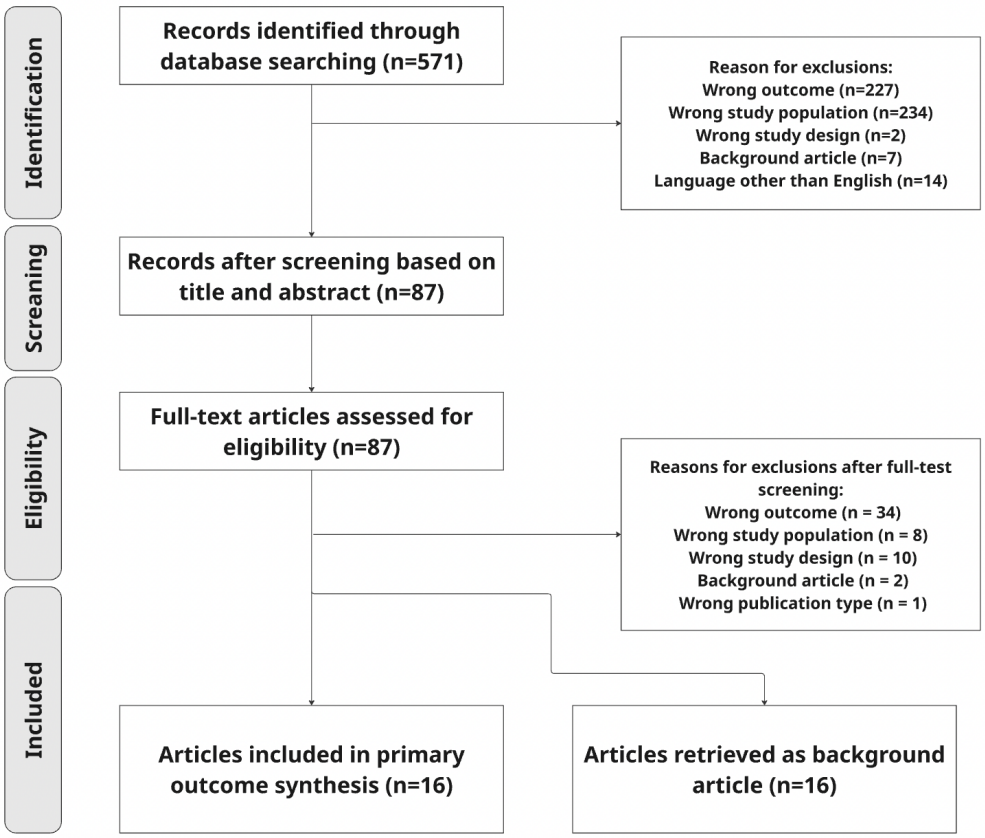


Table 1: Overview of the data selection process

Data collection process

Data retrieved from the articles included methodology, intervention data and patient-related outcomes. In line with the execution of the selection process, single data extraction was carried out. Due to format characteristics (i.e. individual master paper), it was not possible to perform this process in duplicate or independently.

Data items

We extracted disease characteristics (type of chronic disease, including multimorbidity), intervention type and duration of follow-up.

Outcomes and prioritization

The primary outcome of interest is defined as follows: the motivation towards physical activity (whether qualitatively or quantitatively measured) as part of the treatment plan. Motivational barriers and facilitators to physical activity were investigated prior to the primary outcome, to provide the background information currently available in the literature.

Data synthesis

Criteria for quantitative data synthesis

We planned to conduct a meta-analysis if the diversity in study population, interventions and outcomes was sufficiently low. Since we established a substantial heterogeneity, no meta-analysis but a systematic narrative review based on qualitative analysis was conducted.

Measures of intervention effect

Motivation towards physical activity, confidence in physical activity and knowledge about appropriate activities were processed as continuous outcomes. Since different measurement scales were used, data was non-comparable on a quantitative basis.

Bias and meta-bias

Selective reporting bias

Selective reporting was detected by determining whether the protocol of the studies was published beforehand and whether the outcomes were reported as mentioned in the protocol. If no protocol was available, the outcomes of the methods section and the results section were compared.

Small sample bias

We expected some studies to have small sample sizes. This can lead to small sample bias and thus overestimation of the intervention effect.

Results

A. Motivational barriers to physical activity

A.1) Barriers in patients with a chronic disease (in general)

Not complying to PA recommendations in patients with a chronic health condition is associated with poor health literacy and education levels. Frequently reported barriers for PA in this patient population are: experiencing physical limitations or negative exercise experiences, having sedentary lifestyle habits, having other priorities, experiencing financial issues and having limited access to sports facilities. Some patients find it difficult to restart PA after a temporary interruption (whether for medical or social reasons). Low self-confidence and poor social support are important obstacles for both initiation and maintenance of PA. (4)

A.2) Barriers in patients with heart failure

Regular PA can improve heart failure symptoms, exercise tolerance and clinical outcomes. Nevertheless, the general uptake of exercise training in the heart failure population is low. (17) Commonly described barriers for performing physical activity are main heart failure symptoms like fatigue and dyspnea. (18; 19) They reduce the ability to exercise and lower a patient's confidence in behavior change by the anticipation of a negative outcome. Dyspnea is an unpleasant physical sensation that can induce fear for further physical activity, thus resulting in poor adherence (fear-avoidance model). (19) A habitual sedentary lifestyle forms a barrier to perform more physical activity. (17) Anxiety and depression were also frequently mentioned barriers. Patients suffering from multimorbidity or comorbidities are less likely to participate in physical activity as part of their treatment plan (6; 7; 17), as were heart failure patients with longer disease duration (6), lower left ventricular function and older age. (17; 19). Cardiac events like heart attack, heart decompensation and subsequent hospitalisation are other impactful barriers for PA adherence as they interfere with the habit formation process. (19)

A.3) Barriers in patients with type 2 diabetes

Up to 70% of patients with type 2 diabetes fail to meet the exercise recommendations, despite the non-debatable advantages of regular PA on disease management and progression. (13) Fear of hypoglycemia (10) and impaired physical function linked to comorbidities (for example neuropathy, cardiovascular disease and obesity) are described as common barriers for physical activity in diabetic patients. (8; 14; 20) A longer disease duration is associated with lower perceived social support (10) and more comorbidities, which can explain lower exercise participation in patients with longer existing diabetes. Fatigue, depressive symptoms and emotional distress due to diabetes self-management can also hinder exercise implementation. (10; 21) A preference for sedentary activities (16) and the experience of pain or discomfort during PA (10; 16; 20) are other commonly stated barriers in this population. Some patients admit having poor knowledge about suitable PA or attribute low importance to PA. (10) Time constraints and having other responsibilities (family, work) are, just as in the general population, major obstacles to tackle. (14; 22) Older age and female sex are associated with poorer PA adherence but are non-modifiable barriers. (10; 14)

A.4) Barriers in patients with obesity

Physical activity is a cornerstone in obesity management, as regular PA can promote weight management, improve body composition and cardiometabolic health. However, most obese patients remain insufficiently active. (23) Time constraints are often cited as important barriers to exercise. (23; 24) Poor PA adherence is more frequent in younger patients, those with a higher BMI and lower socio-economic status and those experiencing depressive symptoms (24) or physical discomfort (musculoskeletal pain, fatigue). Indeed, excessive weight, low physical fitness level or musculoskeletal pain can all form a major initial threshold to start exercising, even though exercise as such can improve these determinants over time. (23) Carrying negative experiences with PA in the past can negatively impact the willingness to participate in PA. (24) Experiencing low social support, having a lack of motivation for PA (an early stage in the transtheoretical model, see further) and poor self-discipline are detrimental as well. (23; 24)

A.5) Barriers in patients with chronic obstructive pulmonary disease (COPD)

Even though pulmonary rehabilitation is linked to better quality of life, symptom control, less exacerbations and an improvement in exercise tolerance, the adherence to these initiatives remains low. Health limitations are the most frequently reported barriers for PA in this population. (25) Commonly encountered disease-specific barriers in COPD are dyspnea and dyspnea-related kinesiophobia. A sudden increase in PA can lead to increased dyspnea. Dyspnea-induced avoidance of exercise can cause a downward spiral resulting in a sedentary lifestyle and social isolation. (26) Low social support, financial issues and transportation difficulties negatively impact the ability to adhere to pulmonary rehabilitation even more. Those who smoke, those who belong to lower socio-economic groups and those with poor functional health, are less likely to incorporate sufficient PA in their daily life. (25)

A.6) Barriers in patients with chronic kidney disease (CKD)

Despite the multiple benefits of exercise on disease progression and cardiovascular comorbidities, PA levels in patients with advanced chronic kidney disease are generally low. (27) Health-related concerns are an important threat to exercise participation. Fatigue and comorbidities like gout, diabetes, hypertension, obesity, neuropathy and mental health issues are common in this population, putting them at higher risk to live a sedentary lifestyle. Time, cost and environmental (weather, transport, safety of neighborhood) constraints also arise as common barriers. A remarkable finding is that most participants of the mentioned studies claim to have received only limited information about PA from their HCP, neither about the benefits of PA on kidney health, nor about suitable exercise type, frequency or intensity. This reveals an unmet need in the care for this patient population. (12; 27)

B. Motivational facilitators to physical activity

B.1) Facilitators in patients with a chronic disease (in general)

Adequate knowledge about the importance of PA is an obligate requirement to be able to adhere. Education can therefore be helpful to increase health literacy. Additionally, receiving social support and customized training recommendations (based on capabilities, preferences and goals) are promoting factors, not just for the initiation of behavior change, but also for the long-term maintenance of PA. Experiencing positive effects on health and well-being can boost perseverance. Physical activities that are considered meaningful and can be integrated in daily life, are more likely to be incorporated. Accessibility of training facilities and financial access are other patient-reported themes in the context of exercise facilitation. (4)

B.2) Facilitators in patients with heart failure

In this population, shorter disease duration (i.e. recent diagnosis) (6; 28) and social support (from HCPs and peers) are related to better adherence to physical activity. (6; 17; 19) Younger age and male gender are patient characteristics with a facilitating effect. Furthermore, those with lower BMI and higher education level are more likely to adhere to PA. Those with better functional capacity (NYHA I compared to NYHA II) are more likely to be active. (28) The wish to remain functionally independent can strengthen motivation to adhere to PA. (19) The establishment of physical and psychological improvement can further boost motivation and adherence. (17)

Contextual factors (environment, exercise facilities and equipment) can be facilitators if they are home-based, tailored and safe. (17; 19) In a systematic review, Ashley et al underlined the importance of health care providers to encourage patients to adhere to PA. (18) Their main role is to provide education, enable and motivate patients to participate in PA and provide support during the changing process. (17; 18) Exercise recommendations should be personalised, not only considering the diagnosis of heart failure, but also the existing comorbidities and functional capacities. Supervision during exercise, accompanied with regular physical and psychological monitoring, can create a sense of safety, which is a highly valued parameter in this population. (17)

B.3) Facilitators in patients with type 2 diabetes

Adequate social support of family/friends and coaching by a health care provider (HCP) are linked to better higher exercise implementation in diabetic patients. (10; 16; 22; 29) The quality of the relationship between HCP and patient has a core impact on PA adherence. (16) It should be autonomy-supporting, since high autonomy is linked to better autonomous motivation for behavior change. (10) It also seems beneficial to underline the health benefits of PA, to provide personalised PA recommendations and set feasible goals. (16) Exercise should feel manageable, while also providing some sense of challenge. (10) Patients tend to be more motivated for (sustained) PA if they are encouraged to build a routine (16) and if they experience some health benefits of increased PA, such as improved sleep quality, glycemic and weight control, digestion, strength, flexibility, energy levels, mental alertness and general well-being. (16; 22) Exercise can be a source of social interaction, which is often considered as an encouraging factor by patients. (22) Indeed, social support provides encouragement and accompaniment, reducing barriers to exercise. (10) Being recently diagnosed with type 2 diabetes can result in high internal motivation. However, maintenance of internal motivation is complex. Patients with a longer existing diagnosis often require more continuous external stimulation and support to adhere to PA. (30)

Blicher-Hansen et al analysed the attitudes, beliefs and experiences needed to evolve from behavioral intention into behavior adoption and further into long-term adherence in diabetic patients who succeeded to maintain adequate PA levels for at least six months. They found that intention formation mainly required reflective processes, like weighing the pros and cons of behavior change and

evaluating one's capability to change. The decision to take action is often driven by negative affective responses (fear, grief, despair) to the chronic character of the disease and the possible complications linked to poor diabetes control. Positive experiences of peers can provide strong inspiration and motivation to change. Behavior adoption is mainly stimulated by regulatory processes, like setting achievable goals, self-monitoring of progress and formulating implementation intentions. The experience of physical (glycaemic control) and psychological (stress reduction, mood elevation and pride) advantages linked to behavior change plays a supportive role during this phase. The maintenance phase generally requires minimal effort and is mainly subconsciously driven by habit formation, positive affect (the experience of pleasure and joy during and/or after exercise, better mental well-being) and the establishment that "being physically active" became an integral part of one's identity. (13)

B.4) Facilitators in patients with obesity

Weight management is by far the most recurring facilitator of PA in obese patients. Since weight loss from exercise adaptations alone is often modest, disappointment can lead to discontinuation. Therefore, counseling on realistic expectations is important, with the emphasis on the positive effect of PA mainly on weight loss maintenance. (23) Other frequently reported motives for PA are improvement of physical fitness (23; 24), improvement/maintenance of general health and psychological well-being. (24) Patients experiencing a higher degree of social support from HCPs, friends/family and peers were more likely to adhere to PA. In line with this finding, group sessions with other obese patients are often rated positively. (23; 24) Other facilitators for PA in this population are older age, higher socio-economic status and education level. (24)

B.5) Facilitators in patients with chronic obstructive pulmonary disease

Just like in the other populations discussed above, social support by HCPs, peers, family and friends promotes participation in exercise in COPD patients. Once patients start to experience health improvements from being physically active, their motivation to adhere generally augments. (25)
Scheermesser et al classified COPD patients in four patient types based on their coping strategies and motivational quality for PA. Type 1 patients have high self-reported activity levels and high intrinsic motivation. In this subgroup, having extensive knowledge and positive experiences (like enjoying PA, experiencing positive physical or psychological outcomes) can help to gain confidence in their ability to exercise despite their disease. Type 2 patients are characterised by being moderately active in daily life and depending on both intrinsic and extrinsic motivation, such as social support/control. Incorporating PA in their daily (household) activities can help them to overcome external barriers. Type 3 patients are described to have low to moderate self-reported activity levels and to depend mostly on extrinsic motivation to cope with exercise barriers. These patients may benefit from participating in exercise programs, where they can experience social support. They can benefit from receiving continuous behavioral interventions, mainly based on goal-setting and self-monitoring to improve their PA adherence and motivational quality. Type 4 patients tend to report low activity levels and have poor motivation and coping skills to improve PA. They feel ambivalent about behavior change. Participation in exercise programs can help them to improve physical activity, but mainly based on external influences and obligations. Interventions should therefore focus on raising consciousness and eliciting change talk. (26)

B.6) Facilitators in patients with chronic kidney disease

In patients with (advanced) CKD, the most common motivators for PA are improvements in general health, both physical (higher energy levels, better functional capacity, lower blood pressure, weight loss, cardiovascular protection) and psychological (stress reduction, general well-being). (12; 27) The wish to remain mobile and independent is another great motivator to incorporate exercise in daily life. (12) Since social interaction and support from peers seems to be an important value, provision of group

interventions may be suitable for this patient population. (12; 27) In addition, support from family and HCPs are also highly valued as facilitators to behavior change. (27)

C. Motivational techniques, cognitive tools and training programs

A combination of knowledge, motivation and self-efficacy (confidence in one's ability to overcome impeding barriers) is needed to execute a behavior like PA. (20) Therefore, education alone does not guarantee behavioral changes, as readiness for PA is an obligatory requirement. (10; 28) Readiness for PA is influenced by both self-efficacy and motivation. (28) Moreover, motivation can predict PA participation through self-efficacy. (20) Motivation is a complex concept and can be subdivided in social motivation (i.e support of friends and family), physical motivation and psychological motivation. (6)

Based on the self-determination theory, a person's motivation can be either intrinsic or extrinsic. Intrinsic motivation implies that pleasure and satisfaction linked to an action are the major incentive to perform it. Extrinsic motivation can be further subdivided into "external regulation" (i.e the driving force behind a behavior is to get a reward or avoid punishment), "introjected regulation" (i.e the aim is to gain approval or avoid disapproval, guilt and self-imposed sanctions), "identified regulation" (i.e the behavior is a consciously valued goal, such as the conviction that PA is important for health) and "integrated regulation" (i.e the value of the behavior is acquired as a central value). (10; 28; 29) Autonomous (= intrinsic + integrated) motivation is the most valuable type of motivation in a behavioral change setting, as it is linked to long-term adherence to PA. (10; 11; 28) Identified regulation plays an important role in the initiation of behavior change, whereas autonomous motivation is primordial to persevere behavior changes in the long term. (28)

Feelings of internal pressure, obligation and guilt do not contribute to PA adherence. Since patients who lack (autonomous) motivation are less receptive to implement behavior change strategies, the goal of interventions should be to tackle barriers and manage competing priorities, while promoting self-motivated reasons for change (facilitators). (10) In the following section, different concepts and motivational intervention constructs are discussed, based on the underlying theory.

C.1) Acceptance-based and mindfulness-driven approaches

Godfrey et al performed a randomised controlled trial on the effect of an acceptance-based weight loss intervention on PA intentions and motivation in obese patients (n = 189, follow-up duration = 1 year). They compared *acceptance-based treatment* (ABT) with *standard behavioral treatment* (SBT). Although ABT and SBT have some intervention strategies in common, both strategies have their own main features. ABT and SBT both focus on goal setting, self-monitoring of behavior (in this case registration of physical activity), promoting stimulus control and problem solving, behavior analysis, relapse prevention and seeking social support. Additionally, SBT focuses on identifying and restructuring cognitive distortions, while trying to improve self-efficacy and self-confidence to perform PA. ABT specifically aims to determine a person's values and address the multiple motivational and self-regulatory challenges linked to long-term behavior change by improving psychological flexibility. *Psychological flexibility* implies that a person keeps engaging in an action, despite uncomfortable internal sensations arising (for example: exercising despite feeling tired). It tends to increase awareness and tolerance of these unpleasant experiences and helps in revealing how these internal experiences can influence (non)value-consistent behaviors. The aim of ABT is to set goals resonating with a person's values, while coping with the associated discomfort of the therefore needed actions. The authors concluded that ABT is more effective in improving PA intentions and motivation, when compared to SBT. In contrast, MVPA minutes improved in both groups and the difference remained non-significant. Thus, an *intention-behavior gap* or discordance was non-negligible, implicating that

the correlation between exercise motivation/intention and improvement in exercise adherence is not linear. (31)

In a preliminary study, Lillis et al tested the efficacy of a one-day *acceptance and commitment therapy* (ACT) workshop in improving PA motivation and the amount of MVPA in obese and overweight patients (n = 41, follow-up duration = 6 months). ACT combines *mindfulness techniques* (acceptance of unpleasant thoughts, feelings and sensations) and *value-based strategies* (behavior change goals based on a person's values) to aim for behavior change through the increase of autonomous motivation. Participants were invited to map their personal values and explore how regular MVPA can fit in a value-consistent way of living. Furthermore, they received education about PA, were taught acceptance skills and were coached in goal setting. Autonomous motivation before and after the intervention was measured by the Exercise Self-Regulation Questionnaire. PA-related acceptance, defined as acceptance of discomfort related to PA, was measured by the PA Acceptance Questionnaire. They concluded that the provision of an ACT workshop leads to increased autonomous motivation and involvement in moderate to vigorous exercise, which was maintained after six months. (11)

To conclude, Acceptance-Based Treatment (ABT) and Acceptance and Commitment Therapy (ACT) aim to foster psychological flexibility and align actions with personal values. These approaches emphasize acceptance of discomfort, value clarification, and mindfulness, enabling patients to act in accordance with long-term goals despite unpleasant internal experiences (e.g., fatigue or pain). These interventions seem to increase autonomous motivation and moderate-to-vigorous PA levels in obese and overweight populations, though the intention-behavior gap remains evident. (11; 31)

C.2) Behavior change interventions based on the Behavior Change Wheel framework

The Motiva.DM2 intervention in the pilot study of Martín-Payo et al focused on improving motivation, competence, autonomy and social support in a type 2 diabetes population (n = 111, follow-up duration = 6 months). The intervention was based on the Behavior Change Wheel Framework, of which the COM-B acronym is the backbone. (32) COM-B stands for *capability*, which refers to the physical and psychological ability to execute PA; *opportunity*, which is the promoting or impeding impact of the context; *motivation* and *behavior.* (4; 32) The intervention provided both written information and in-person interventions. These included educational sessions about the importance of exercise, conversations about psychological capacity and interventions to encounter facilitators and barriers for exercise. They used the Motiva.Diaf-DM2 questionnaire to measure physical activity adherence and motivation at baseline and post-intervention and found an increase in *competence* and *autonomy,* which are indicators of *capability* and *motivation* in the COM-B model. Furthermore, adherence to physical activity improved significantly. Participants emphasized personal interaction with a HCP as an important contributing factor to higher motivation scores and exercise adherence. (32)

To summarize, encompassing capability, opportunity, and motivation as drivers of behavior effectively enhances psychological capability for PA and exercise adherence, with patients highlighting interpersonal interaction with HCPs as a key factor. (32)

C.3) Behavior change interventions based on the transtheoretical model (Prochaska & DiClemente)

The TTM conceptualizes behavior change as a dynamic process involving six stages from precontemplation to maintenance. Patients are invited to make a decisional balance; this involves all the "pros and cons" to change behavior or obtain a current habit. Psychological constructs are used to support the process of behavior change by defining the activities that are going to be used to change the behavior. Physical self-efficacy is needed to convert plans into action. (9)

In a study of Hidrus et al, the TTM was used as a backbone to examine motivational aspects of PA adherence in patients with type 2 diabetes (n = 331, no follow-up period). They did not perform a

specific intervention, but aimed to reveal the useful aspects of the TTM to apply in this patient population in order to improve motivation for PA. They included different questionnaires to map these parameters. The *Physical Activity and Leisure Motives Scale* (PALMS) is a validated questionnaire to score motivation for PA, based on 8 motivational subdivisions (i.e: "enjoyment", "mastery", "competition or ego", "appearance", "affiliation", "expectations of others", "psychological condition" and "physical condition"). The Processes of Change (POC) and Decisional Balance (DB) scales help map readiness and barriers, while the Exercise Self-Efficacy (ESE) scale identifies internal resistance. They found that constructs like *expectations of others* and *psychological condition* of the patient could directly affect PA adherence. On the other hand, a variety of constructs had an indirect positive impact on PA participation through the awareness of the positive effects of PA on disease control. This reveals the need to reinforce both cognitive and affective components of readiness, by counseling on the benefits of PA on disease management and by promoting self-efficacy. (9)

C.4) Behavior change interventions based on motivational interviewing

Motivational interviewing (MI), initially developed for addiction treatment, is now widely employed in chronic disease management. This technique aims to improve intrinsic and identified motivation for behavior change. (7)

Huebschmann et al conducted a pilot study on the Be ACTIVE coaching intervention in sedentary patients with type 2 diabetes in a primary care setting (n = 50, follow-up duration = 12 weeks). This intervention consisted of step count tracking, six theory sessions based on the *social cognitive theory* and three in-person consultations using *motivational interviewing* techniques. The *social cognitive theory* includes the following behavior change techniques: goal setting, self-monitoring, problem-solving and seeking social support (cfr the before-mentioned techniques of ABT and SBT). In line with the Motiva.DM2 participants (see section C.3), patients in the intervention group reported personal interaction with their HCP and tailored exercise recommendations as main facilitators of PA adherence. The control group received printed education material (for example PA guidelines) at baseline and an educational email every three months. The authors reported a significant increase in self-efficacy and social support in the intervention group. However, both groups showed an increase in PA participation, with the difference between both groups being non-significant. (8) This is another proof that a higher degree of behavioral PA predictors does not linearly correlate with behavior change execution, as defined by the *intention-behavior gap*.

Another pilot study in patients with diastolic heart failure (n = 39, follow-up duration = 6 months) examined the effect of supervised endurance and resistance training (3 times per week), combined with a motivational interviewing intervention on motivational parameters. MI intervention sessions focused on goal setting, planning and implementing these plans to increase exercise participation, while overcoming barriers. Motivation was measured using the *Sportbezogene Selbstkonkordanz Scale* (SSS, translated: sports-related self-concordance scale). The SSS measures different aspects of motivation; intrinsic motivation, identified motivation, introjected motivation and extrinsic motivation. Around 90% of participants in this study functioned in NYHA II. Dyspnea, exercise intolerance and fatigue were commonly occurring barriers for exercise participation in this population. There was a tendency towards an improvement in intrinsic and identified motivation and sports-related self-efficacy, but these observations remained non-significant. Thus, they could not prove a significant effect of the MI intervention on motivation nor self-efficacy, compared to the control group receiving usual care. Nevertheless, the MI intervention turned out to be effective in goal setting and overcoming barriers for PA, leading to an increase in PA participation. (7)

The Diabetes Community Exercise Program (n = 29, follow-up duration = 12 weeks) combined exercise classes with education sessions to promote self-efficacy and long-term PA adherence. The main MI constructs of this intervention were partnership, acceptance, compassion, avocation and person-

centered goal setting, while taking into account personal barriers for PA implementation. The study results showed an increase in long-term PA adherence in patients receiving person-centered care delivered by HCPs who are trained in MI. Person-centered care includes monitoring of a patient's health status, providing tailored exercise options and adapted education (based on pre-existing knowledge and specific needs). Person-centered care and MI techniques are invigorative concepts in PA promotion. (30)

To conclude, MI fosters autonomy and self-directed change through goal setting, eliciting change talk, and addressing ambivalence. It has shown utility in various formats, whether combined with social cognitive theory (8), supervised training (7), or community-based group sessions (30). While studies indicate mixed effects on psychological metrics like motivation or self-efficacy, MI consistently facilitates behavioral goal setting and adherence, often by enhancing social support and HCP engagement.

C.5) Behavior change interventions based on the Health Action Process Approach and the dual models

The *Health Action Process Approach* (HAPA) is a stage-based model that consists of two phases to help patients moving through the process of behavior change. Phase 1 focuses on *intention setting* by mapping and influencing action self-efficacy, outcome expectancies and risk perceptions (i.e. perceived health risk of (not) being active). Phase 2 is the *volitional phase*, in which patients are encouraged to set concrete goals for behavior change and identify strategies to overcome barriers. During this volitional phase, skills like *barrier self-efficacy*, *recovery self-efficacy* (i.e. restarting PA after procrastination or stop), *action planning* and *coping planning* are primordial. *Implementation intentions* are self-regulatory constructs to make behavioral change constructs more concrete; they concretise the "when", "where", "how" and "with whom" of a plan and consider the goal-directed response on situational context changes ("if …, then …"). The *impulsive-reflective model* is a dual model, stating that both a *reflecting* and an *impulsive system* are involved in information processing leading to cognition and behavior. Thus, health behaviors like PA are not only influenced by explicit motivation, but implicit and unconscious processes (automatic affective responses, habits and attitudes) also play a crucial role. For example, sedentary patients can have strong intentions for PA but also strong positive associations with sedentary behavior, resulting in not succeeding to incorporate more exercise into daily life. The HAPA model was found to be a useful construct to predict PA in a type 2 diabetes population. (21)

Wilczynska et al performed a randomised controlled trial testing the "eCoFit" intervention in patients with type 2 diabetes (n = 84, follow-up duration = 20 weeks). It was a multi-component intervention based on three theoretical constructs; the *HAPA model*, *cognitive-behavioral therapy* and the *social-cognitive theory*. It consisted of a 10-week intervention period during which exercise sessions, the use of an app (providing workout suggestions, barrier management and tracking of goals and progress) and cognitive mentoring sessions were provided. Afterwards, the participants were offered use of the app for another ten weeks. They found a significant mediation effect of *implementation intentions* on PA participation, through the increase of *self-efficacy*. The intervention improved PA participation through increased self-efficacy and implementation intentions in patients with type 2 diabetes, although implicit attitudes remained unchanged. This underscores the challenge of modifying unconscious preferences for sedentary behavior, which may persist despite explicit intentions. (21)

In concrete terms, the HAPA model delineates intention formation (driven by risk perception and outcome expectancy) and volitional execution (driven by planning and self-regulatory skills). Improvement of implementation intentions, or "if–then" strategies, can narrow the intention-behavior gap by concretizing when, where, and how to act.

C.6) Combined multi-component behavior change interventions

In a systematic review (n = 62 articles) and meta-analysis, Carraça et al examined the effect of different (combinations of) behavior change techniques on PA participation in overweight and obese patients. They concluded that interventions based on the *control theory*, the *self-determination theory* and on *motivational interviewing* are most effective and that the use of a combination of behavior change techniques tends to have a stronger influence on health-related behavior. They found different moderator effects based on the intervention method (whether face-to-face or digital). In *face-to-face interventions*, the execution of "behavioral practice and rehearsal" was associated with improved PA adherence. In *digital interventions*, the use of "goal setting", "graded tasks" and "social incentives" was found to have significant positive effects. However, only the first and last one remained significant in multivariate meta-analysis. Person-centered care and autonomy-promoting counseling were highlighted as important factors to motivate patients to implement behavior changes and help them to persevere. (33)

Leung et al examined the psychological predictors of long-term PA adherence in an obese population (n = 140, follow-up duration = 10 months) following a PA (and diet) counseling program. Secondary outcomes of this cohort study were *knowledge*, *self-efficacy*, *motivation* for behavior and the *stage of change* (cfr TTM). The program consisted of PA education and sessions on realistic goal setting, creating a tailored action plan and self-monitoring of PA using a diary. Adherence to PA was measured by the IPAQ questionnaire and the Stage of Exercise Scale. PA adherence is complexly influenced by psychosocial, socio-demographic, behavioral and physical factors. In this study population, *knowledge* and *self-efficacy* increased after completion of the program, but *motivation* did not. Knowledge was not a significant predictor of PA adherence; which may be explained by limited knowledge retention and the lack of behavior execution based on gathered knowledge. High motivation, habit formation, stable contextual factors, satisfaction with the outcome of behavior change and good self-regulation skills were found to be important predictors of PA adherence. Thus, patients with an increase in self-efficacy and improvement in stage of change were more likely to show greater adherence after 10 months. However, long-term PA adherence after 10 months was generally low in this study population. (34)

Scott et al performed a feasibility study to test the effect of a 12-week combined *motivational interviewing* and *cognitive-behavioral intervention* (MI-CB) on PA maintenance in patients with chronic health conditions (n = 37, follow-up duration = 6 months). The cognitive-behavioral techniques focused on *action planning* and *problem solving*, whereas motivational interviewing was used to motivate participants for behavior change by eliciting *change talk*, promoting *commitment* and paying attention to *relapse prevention*. Based on these constructs, the following determinants were targeted during the intervention: PA "outcome expectations" (measured by the Outcome Expectations and Realizations for PA Scale, OERS), PA "outcome experiences" (measured by OERS), "expectation-experience discrepancy", "personal values", "barrier self-efficacy" (measured by the Barrier Self-Efficacy for Exercise Scale, BARSE), "social support" and (mal)adaptive "coping skills" (measured by the COPE scale). Some of these factors are similar to those described in the HAPA model (cfr supra). The study results showed increased *barrier self-efficacy* (i.e. the perceived ability to participate in regular PA even though barriers arise) and PA *outcome experiences* three months after the intervention. Both barrier self-efficacy and outcome experiences scores were significantly higher in the intervention group, compared to the control group receiving usual care. However, this difference didn't remain significant after six months; there was no long-lasting difference between both groups in terms of any psychological outcome. Nevertheless, energy expenditure did increase after both 3 and 6 months and was significantly higher in the intervention group than in the control group. Energy expenditure is a substrate for PA execution. They concluded that a combined MI-CB intervention can support PA initiation and maintenance, hence the finding of an increased energy expenditure in the intervention

group. However, the study lacked power since it was a feasibility study. Furthermore, they were not able to demonstrate improved long-term psychological outcomes. (35)

The Coaching on Lifestyle (CooL) intervention is a combined lifestyle intervention addressing PA, diet, sleep and stress in an obese population (n = 138, follow-up duration = 18 months). The *client-centered approach* started with mapping the current lifestyle factors and habits. Subsequently, it focused on feasible goal setting and finding alternative healthy behaviors for unhealthy ones. Since *autonomous motivation*, general *well-being* and *resilience* are important predictors of long-term lifestyle changes; these determinants were targeted during the intervention. At the 8-10 months follow-up visit, the CooL intervention resulted in an increase in perceived *autonomy* and *autonomous motivation*, higher *quality of life* and a reduction in perceived *barriers*. These findings were accompanied by an increase in PA levels and reduction in sedentary time. Sustained behavior changes were preserved during the total follow-up period of 18 months, even though motivation declined over time. Motivation quantity and quality are important mediators of sustained behavior changes, but especially in the induction of it. Maintenance of behavior changes seems to require a more complex structure in which habits and routines become more impactful than motivation. (36)

To summarize, integrative interventions appear particularly effective when tailored to individual needs and delivered face-to-face. Components such as goal setting, graded tasks, social incentives, and person-centered counseling are consistently linked to improved PA adherence. Nevertheless, while psychosocial predictors like knowledge and self-efficacy may improve, long-term motivation often declines, suggesting a critical role for habit formation and contextual stability in sustaining PA. (33; 34; 35; 36)

C.7) Digital and technology-based interventions

In a randomised controlled trial, Klompstra et al analysed the effect of *exergaming* (i.e. digital games requiring physical activity, performed at home) on exercise motivation, self-efficacy, PA and sedentary time and exercise capacity in a heart failure population (n = 64, follow-up duration = 12 weeks). Although sedentary time was reduced, no significant difference could be described on motivation parameters between the intervention group and the control group, receiving standard cardiac rehabilitation. (6)

Brain Breaks Videos (BBVs) are 10-minute exercise videos, designed to stimulate interest in PA and promote health behavior. In a randomised controlled trial (n = 70), Hidrus et al examined the impact of this weekly intervention on PA motivation and PA quantity in a diabetic population (n = 70, follow-up duration = 4 months). They compared the results of the intervention group with those of a control group, who received written information about the benefits of PA. They found an increase in all eight subdivisions of the PALMS in the intervention group, of which four components (“mastery”, “appearance”, “expectations of others” and “physical condition”) were significantly different from the results in the control group, who showed a downward trend for all eight items. Furthermore, PA quantity scores showed an increase in the amount of PA in the intervention group, but not in the control group. The authors concluded that BBVs are effective and feasible interventions to improve both motivation and PA involvement in a diabetic population. (37)

Digital innovations, including exergaming and exercise video programs, show promise in increasing PA engagement. However, the long-term impact of these tools on intrinsic motivation and PA maintenance remains unclear. (6; 37)

Discussion

Study findings on barriers and facilitators

Across chronic disease populations, a multitude of interrelated barriers hinders engagement in PA, despite its well-documented health benefits. These barriers can be broadly categorized into physical, psychological, behavioral, and contextual domains. Conversely, several facilitators can enhance PA engagement when appropriately leveraged. Central among these facilitators is adequate *education* on the health benefits of exercise. Improved *health literacy* not only elevates awareness, but also strengthens *self-efficacy*, which is a prerequisite for behavioral change. *Social support* from family, peers, and healthcare providers (HCPs) emerges consistently as a key determinant of PA uptake and sustainability. The quality of the HCP-patient relationship plays a critical role, especially when grounded in autonomy-supportive, individualized counseling. HCPs are expected to provide information, support and feedback, while affirming the patient's autonomy and responsibility for their own behavior. (36) *Tailored exercise prescriptions*, taking into account the patient's clinical profile, preferences, capabilities, and comorbidities, tend to increase exercise adherence. Additionally, the experience of tangible physical or psychological improvements reinforces participation through intrinsic motivation. In some patient subgroups, the desire to maintain independence and prevent functional decline seems to be a prominent motivator. Meanwhile, *positive identity formation*, where being "physically active" becomes internalized, marks a key transition from behavior adoption to maintenance. This process is facilitated by repeated positive affect during and after exercise, alongside habit formation.

The mapping of barriers and facilitators revealed that motivational dynamics related to PA in chronic disease are both condition-specific and universally overlapping. While symptomatology and disease burden shape individual barriers, facilitators such as education, support systems, and personalization of interventions transcend diagnostic boundaries. Considering these frequently reported determinants of motivation and readiness to physical activity in patients with chronic diseases may broaden the view on health behavior promotion in primary care.

Study findings on interventions

Effective promotion of physical activity in patients with chronic diseases requires a multidimensional approach encompassing knowledge, motivation, and behavioral skills. While education is a core requirement, it is insufficient on its own. Behavior change is dependent on *readiness* to act, which is strongly influenced by *motivation* and *self-efficacy*. Motivation is a complex concept and can be categorized into social, physical, and psychological domains, with further subdivision into intrinsic and extrinsic types. (20; 28)

Autonomous motivation (i.e. intrinsic motivation and integrated regulation) has shown the strongest association with long-term adherence to PA. (10; 11; 28) In contrast, extrinsic forms driven by obligation or guilt (introjected regulation) often undermine sustainability. As such, motivational interventions should focus on promoting value-based engagement and internalized reasons for behavior, rather than merely reinforcing external expectations.

Our synthesis of the literature reveals that no single intervention is universally recommendable across all patient populations or stages of behavior change. Instead, success seems to lie in the strategic integration of complementary methods, informed by theoretical models such as the self-determination theory, the transtheoretical model, the health action process approach and the behavioral change wheel framework. Behavioral regulation strategies such as *goal setting* and *action*

planning, *self-monitoring*, and *implementation intentions* are associated with sustained PA engagement.

According to our findings, interventions to stimulate PA incorporation in treatment plans are often theory-based and mainly focused on behavior initiation, rather than continuation. (13) Self-efficacy and motivation are important mediators of behavior change initiation. (13; 36) However, different studies observed a significant *intention-behavior gap*, implicating that the correlation between exercise motivation/intention and improvement in exercise adherence is not linear. Thus, motivation for PA is an important predictor of physical activity behavior, but improving motivation does not always result in a similar degree of activity participation augmentation and thus better clinical outcomes. (31) Furthermore, *maintenance* of behavior changes seems to require a more complex structure in which *implicit processes* (affective responses, underlying habits, routines and subconscious attitudes) and internalisation of the behavior become more impactful than motivation. (10; 13; 36) In addition, some studies failed to demonstrate improved motivation following an intervention, while they did find improved physical activity adherence. Motivation quantity might thus be subordinate to motivation quality.

Despite the well-understood importance of the HCP-patient interaction in exercise promotion, HCPs often declare they lack time and confidence to prioritize these behavioral change interventions in their patients. (18; 36) This seems acceptable, since HCPs in primary care (like general practitioners) need to cope with complex health conditions. The provision of exercise advice and the accompanied coaching needs are just one aspect of often extensive treatment plans. HCP training may be useful to improve skills, knowledge and confidence in the administration of behavior change interventions. (18) The concrete elaboration of these training programs could be subject of future research.

Future interventions should adopt a modular, adaptive structure. Interventions should be tailored to the patient's motivational readiness, disease burden, and environmental context. Personal interaction with the health care provider is crucial in this setting. Incorporating digital tools into a hybrid care model could enhance scalability. However, these strategies may better be complemented with human interaction and value-based coaching. The translation of motivational insights into sustained behavioral change remains a critical pitfall in effective PA promotion in chronic disease care.

Remarks on clinical applicability in primary care

Simply telling patients to become more active is not sufficient; general practitioners (GPs) should also consider knowledge, behavioral skills and motivation when promoting physical activity. Thus, brief interventions during consultations can include assessing the motivational stage, exploring intrinsic motivators (such as personal values, health goals and enjoyment) and identifying existing barriers in a specific patient. A stage-based approach seems to be recommended, where the intervention intensity aligns with the patient's readiness to change. Questions like: "What is the likelihood that you will become more active in the next month?" may help determine the motivational stage. Since autonomous motivation is strongly linked to sustained behavior change, it is important to focus on intrinsic reasons rather than guilt or external pressure. Asking simple questions like: "What does being physically active mean to you personally?" may help uncover meaningful motivators for the patient. Additionally, exploring factors that influence self-efficacy, such as past successes and strategies to overcome barriers, can increase the likelihood of follow-through. GPs and patients should be aware of the existence of an intention-behavior gap, where motivation does not always lead to action. Discussing realistic goal setting and concrete action planning (including implementation intentions, in the form of "if-then" planning) can be helpful to close this gap.

The GP's role is to initiate and support the behavior change process. This can be done during consultations with the GP, incorporating brief but repeated interventions. Techniques form motivational interviewing, such as asking open-ended questions that encourage reflection on behavior change and motivation processes, can be used efficiently within the time-limited consultations. Furthermore, the administration of tailored care and advice - adjusted to the disease type and severity, a patient's functional capacity and contextual factors – may enhance patient engagement.

However, GPs should not necessarily be the sole provider of support. Patients may benefit form referral to other professionals, such as physiotherapists, exercise psychologists, personal coaches or programs like "Bewegen op verwijzing" in Belgium. A collaborative, multidisciplinary approach may increase the chances of long-term success in promoting physical activity in patients with chronic conditions.

Quality of the evidence

Patients with chronic health conditions form a highly heterogenous population reflecting various patient characteristics and complex health care needs. This can contribute to different effect sizes of implemented strategies to improve physical activity in chronically ill patients. (35) We allocate limited transferability of data to the individual patient with one or more chronic conditions in primary care, as the cited interventions and constructs are described in specific patient populations (typically one specific disease) and are thus not automatically generalizable to all chronic diseases. Additionally, in-population heterogeneity exists; results of a study performed in heart failure patients functioning in NYHA class I or II are non-generalizable to all heart failure patients. (6) Furthermore, not all patient populations were represented; we found no suitable articles describing primary outcome data in patients with chronic obstructive pulmonary disease, chronic kidney disease, hypertension and hypercholesterolemia. However, the review gives some valuable insights in useful concepts and points of interest that can be used in a primary care setting.

We noted a high heterogeneity in the measurement and reporting of outcomes (different scales to measure motivation, subjective vs objective reporting of PA, …). Thus, outcome measurements could not be meaningfully compared. The duration of follow-up varied greatly between studies. Since long-term PA adherence is more relevant than PA initiation in the modification of disease management outcomes, a short follow-up period can lead to non-relevant conclusions. (18)
Since the observed heterogeneity in study population and intervention type was high and the methods to measure motivation parameters were highly diverse, the results should be interpreted considering the limitations of the available evidence. The conduction of a meta-analysis was rated as inappropriate, due to factors mentioned above. We conducted a systematic narrative review instead.

The risk of bias was approached as follows:
1. Multiple incorporated articles were pilot trials or preliminary studies. Due to small sample sizes in these studies, statistical power is low. (8; 11; 35) Small study samples are also related to a higher risk of selection bias. (6);
2. Recall biases are considered to be existing due to the (often) subjective measurement of the degree of physical activity, generally leading to over-estimation of the effect (6; 35)

Conclusion

Our synthesis of the literature reveals that no single intervention is universally recommendable across all patient populations or stages of behavior change. Instead, success seems to lie in the strategic integration of complementary methods, informed by theoretical models such as the self-determination theory, the transtheoretical model, the health action process approach and the behavioral change wheel framework. While knowledge enhancement is frequently achieved, knowledge alone does not predict adherence. Long-term engagement depends on psychological flexibility, social reinforcement, contextual enablers, and eventually, habitual integration of PA into daily life. Interventions should therefore focus on bridging the gap between intention, action, and habit. Important commonalities across successful interventions include the following aspects: 1. facilitating autonomous motivation and adapting PA to personal values, 2. enhancing self-efficacy by pursuing positive experiences and supportive coaching, 3. strengthening self-regulation skills like planning, problem-solving and relapse prevention, 4. feasible goals setting and action planning to reduce the intention-behavior gap and 5. providing patient-centered care.

Intervention design should adopt a multilevel behavioral framework, addressing not only individual and interpersonal factors but also broader systemic and environmental determinants. Health care providers should be familiar with delivering tailored exercise advice and sustained motivational support. In parallel, public health policies should aim to reduce structural inequities, such as financial barriers, that disproportionately affect the most vulnerable groups.

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Appendix

- Plagiarism screening report
- Medical Ethics Committee approval