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TITLE PAGE

Title

Using storytelling methodology to identify barriers and facilitators of sustained physical activity in patients with a chronic disease

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ABSTRACT

Objectives

To identify implicit and more profound barriers and facilitators for sustained physical activity for patients with a chronic disease, including their context. Understanding these barriers and facilitators may help develop future strategies to be used by healthcare professionals in primary care to support patients with a chronic disease to reach sustained physical activity (PA).

Design and methods

A qualitative, narrative research method – storytelling – was applied. Perspectives of both patients with a chronic disease (n=12) and involved healthcare professionals (n=11) were collected. Stories were audiotaped and retrieved from the transcriptions. Analysis involved a cyclic process of constant comparison. Main themes were arranged in the theoretical framework of the COM-B model.

Participants

Patients were adults with a chronic disease or at high risk of developing a chronic disease who participated in a PA promoting program. Eligible healthcare professionals were those involved in these PA promoting programs in primary care, such as physiotherapists, nurse practitioners or sports consultants.

Results

From 176 stories, 62 relevant and unique stories were selected for further analysis. Eleven main themes were identified and linked to the COM-B model. Trust in one's own capabilities and in the healthcare professional were relevant themes. Also, health literacy and coping with temporary interruption were important capabilities. Important motivators were customized PA, awareness, social aspects of PA, meaningful activities, success experiences and aversion to sports. Interprofessional collaboration and prerequisites can be beneficial or obstructing.

Conclusions

This study provides insight in deeper motivations, barriers and facilitators of sustained PA from both the patients' and healthcare professionals' perspective. Comparing these perspectives revealed different views and beliefs on some themes. Attention for temporary interruptions, aversion to sports and health literacy seems important.

Strengths and limitations of this study

- By using storytelling implicit factors important for sustainable PA are explored among patients with a chronic disease.
- Perspectives of both patients and healthcare professionals were included and compared, providing relevant clues for the improvement of support for sustainable PA.
- Researchers were trained to improve their storytelling skills, which is important to ensure a narrative climate during the interviews, in order to collect stories.
- Intersubjectivity was reached among 4 researchers, increasing the quality of the study.
- Patients participating in this study participated (at least once) in a PA promoting program, limiting the transferability of results to a population less motivated.

1. INTRODUCTION

The numbers of people living with a chronic disease, such as cardiovascular disease, diabetes and cancer, are substantial and increasing worldwide (World Health Organization., 2018). Living with a chronic disease has considerable consequences for one's health, quality of life and social involvement, and is the cause of 71% of premature death rates worldwide (Forouzanfar et al., 2016). Integrating physical activity (PA) into one's lifestyle decreases the risk of developing a chronic disease and reduces the severity of clinical characteristics (Anderson & Durstine, 2019; Booth, Roberts, & Laye, 2011; Bull et al., 2020; Forouzanfar et al., 2016; Hoffmann et al., 2016; Kohl et al., 2012; Lee et al., 2012; Rhodes, Janssen, Bredin, Warburton, & Bauman, 2017). Guidelines recommend that everyone engages in moderate intensity PA for at least 150 minutes every week, spread over several days, and strength enhancing activities at least twice a week. In addition, long periods of sitting are to be avoided (Piercy et al., 2018; Weggemans et al., 2018). Even though the positive effects of PA are evident, 30% of the world's population does not meet PA guidelines. For over 60-year-olds, this proportion is even larger; i.e.,45% (Hallal et al., 2012). In the Netherlands, more than 50%, of people with a chronic disease are not able to meet PA guidelines (Volksgezondheidenzorg.info, 2021).

Sustained PA is primarily the responsibility of people themselves. However, not everyone is able to initiate and maintain sustained PA, due to insufficient health literacy – and in spite of support from primary healthcare professionals (Greenaway, 2013). Various primary healthcare professionals, such as physiotherapists and nurse-practitioners, support people with chronic diseases to improve their PA. In many cases, the therapy plan includes more PA (Schuler, Adams, & Goto, 2013).

Major patient-reported reasons for not complying to PA guidelines are: low level of health literacy, low level of education, obesity and chronic disease (Hoffmann et al., 2016). Patient-reported barriers for integrating PA into one's lifestyle are: sedentary habits, lack of social support, competing priorities, limited access to PA and apathy. In addition, physical limitations, lack of self-confidence, financial problems, and lack of experiencing success have been described as barriers PA (Franco et al., 2015). Reported facilitators for PA are: accessible facilities, tailored training programs, attention for positive exercise experiences and beliefs, sufficient knowledge and social support (Hoogendoorn & De Hollander, 2017; Kanavaki et al., 2017). Additionally, education about the importance of PA and improving environmental and financial access appear to be helpful (Franco et al., 2015; Hoogendoorn & De Hollander, 2017; Martins, Marques, Sarmento, & Carreiro da Costa, 2015).

Most of the intervention studies on barriers and facilitators for PA show short-term effects only. Sustained effects have rarely been studied nor found (Baumann, 2015; Juul, Andersen, Arnoldsen, & Maindal, 2016; Magnée et al., 2013). Moreover, lack of detail in the description of promising interventions makes it difficult to replicate treatment (Hoffmann et al., 2014; Howlett, Trivedi, Troop, & Chater, 2019; Michie, Van Stralen, & West, 2011).

Therefore, it is important to distinguish between initial behavior change (short-term) and sustained behavior change (long-term), the latter of which is harder to achieve (Kwasnicka, Dombrowski, White, & Sniehotta, 2016). Evidence suggests that a personalized approach, including a person's context, is needed to reach sustained PA (Alageel, Gulliford, McDermott, & Wright, 2018). The personal context contains individual characteristics and physical, psychological and social functioning in one's own living environment (Michie et al., 2011).

To gain insight in personal context it is important not only to focus on explicit factors, but also gain knowledge about more implicit factors of importance to sustained PA (Greene, Hibbard, Alvarez, & Overton, 2016; Huber et al., 2011; Kremers et al., 2006; Michie et al., 2011). This study aims to identify implicit and explicit barriers and facilitators to sustained PA for people with a chronic disease, including their context. This study, therefore, employs a narrative research method. In addition, the Behaviour Change Wheel (BCW) framework is used to order and grasp a better understanding of the identified barriers and facilitators. The BCW summarizes current knowledge about behaviour change techniques. Its center is the Capability, Opportunity and Motivation (COM-B) model, which can be used as a starting point to understand behaviour (B) in its context (Michie et al., 2013; Michie et al., 2011).

2. METHODS

2.1 Research design

To gain understanding of barriers and facilitators to sustained PA and tacit and latent needs related to the context of patients with a chronic disease, a narrative research method – storytelling – was applied. Storytelling focusses on the perspective of the participants, who lived the experiences as an insider, and will therefore provide important insights and ideas, and a deeper understanding of barriers and facilitators. This presupposes a subjective truth in the social context of the participant and reveals implicit knowledge about the subject of the study (Lemley & Mitchell, 2012; Moezzi, Janda, & Rotmann, 2017; Riessman, 2008; Wang & Geale, 2015). To ensure rich and informative data, stories of both patients and healthcare professionals about a specific situation linked to experiences and emotions were collected. The Consolidated criteria for Reporting Qualitative research guidelines (COREQ) were followed (Tong, Sainsbury, & Craig, 2007)(appendix A).

2.2 Participants

Participants were selected by purposive sampling (Tong et al., 2007). Eligible patients were adults who participated in a PA promoting program focusing on supporting people with one (or more) chronic diseases or at high risk of developing a chronic disease, such as cardiovascular disease, diabetes mellites type II, or being overweight and/or of low socioeconomic status. Eligible healthcare professionals were those involved in these PA promoting programs in primary care, such as physiotherapists, nurse practitioners or sports consultants. Eligible patients were contacted by their primary healthcare professional to participate. Patients who had provided consent for participation were contacted by telephone or e-mail by a member of the research group (see below) to make an appointment for an interview.

2.3 Research group

The research group consisted of four primary researchers, experienced in conducting qualitative research (JB, AF, AH and PS) and eight trained students who assisted with the data collection. None of the members of the research group knew the participants before conducting the interviews. All had been trained on applying the storytelling method by an expert on storytelling, during three half-day sessions. The training included creating an interview guide, practicing interview skills, and analyzing data.

2.4 Data collection

The interviews were conducted individually, face-to-face, at a location chosen by the participant (participant's home, work or public place). An interview guide was used consisting of a short introduction, examples of narrative questions, and a list of narrative elements. A narrative question invites the participant to tell about a specific situation linked to an emotion around PA, either positive or negative (Riessman, 2008) (appendix B). To account for the difference in perspective, the narrative questions in the interview guide for the patients slightly differed from that for the healthcare professionals. All interviews lasted approximately one hour, were audio taped with consent, and the interviewer made brief field notes to aid later reflection. Participants received a gift voucher (worth 25 euros for patients, and 75 euros for healthcare professionals).

2.5 Theoretical framework

The COM-B model served as a starting point to understand behaviour in its context. The model assumes that human behaviour (B) is part of a system in which three central components affect each other: Capability, Opportunity and Motivation (Michie et al., 2013). Capability is a person's attribute referring to physical and psychological capability, for example body strength, knowledge or endurance to be able to execute PA (Michie et al., 2011). Opportunity is an attribute of a person's environmental system, and can be physical or social. The combination of capability and opportunity makes a behaviour possible or facilitates it. Motivation is an aggregate of mental processes that energize and influence behaviour, and may be reflective or automatic (West & Michie, 2020).

2.6 Data analysis

Data analysis was conducted in three phases (table 1). In phase 1, the audio recordings were transcribed ad verbatim and anonymized. Stories were retrieved from the transcripts using a consensus-based format (appendix C) (McCall, Shallcross, Wilson, Fuller, & Hayward, 2019; Moezzi et al., 2017; Riessman, 2008; Tesselaar & Scheringa, 2008). Member checks were done. In phase 2, the primary researchers continued further analysis in a cyclic process in which constant comparison was done between the analysis steps and the stories. Conclusions on how to integrate the findings in healthcare were discussed. In phase 3, main themes were arranged into the COM-B model.

2.7 Patient and public involvement

In this study, participants were both healthcare professionals and patients. Storytelling is part of a larger project in which a method was developed in cocreation with patients and healthcare professionals that is more customized in its support to sustained PA. Before the

start of the project, healthcare professionals were interviewed about their lack of competence in supporting people with chronic conditions. The research question was formulated based on their input.

- INSERT TABLE 1 AROUND HERE-

3. RESULTS

Twelve patients and eleven healthcare professionals participated (seven physiotherapists, three nurse practitioners and one sports consultant). Their ages ranged from 36 to 92 years. (table 2).

-INSERT TABLE 2 AROUND HERE-

3.1 Themes

The interviews with patients and healthcare professionals resulted in 84 and 83 unique stories, respectively. The researchers selected 26 stories from the patient's perspective, and 36 stories from the healthcare professional's perspective (step 4, table 1 + figure 1). Rereading the stories resulted in the emergence of 23 themes in the patients' stories and 36 themes in the healthcare professionals' stories (step 5, table 1). After discussion, these themes were clustered into 11 common main themes (figure 1). The main themes were arranged in the COM-B model (step 7, table 1 + figure 2). Exemplar stories are embedded in the text.

-INSERT FIGURE 1 AND FIGURE 2 AROUND HERE-

3.2 Capability

3.2.1. Trust

Three themes seemed to be connected to one's capability to be physically active: trust, health literacy and temporary interruption. Trust encompassed several aspects. Firstly, patients indicated that the lack of confidence in oneself can be an obstacle to be physically active. Limitations in bodily functioning or lack of money were mentioned as reasons, as well as feeling ashamed of lack of physical fitness or one's bodily physique. These aspects sometimes made them feel anxious and inferior – and affected their self-confidence negatively. Healthcare professionals pointed out that they take a patient's lack of confidence into consideration by approaching the patient in a positive way and proceeding step-by-step, thereby increasing the patient's self-confidence (stories 1 and 2). Secondly, both perspectives indicated that trust in the treatment program is important for successful maintenance of PA. Lastly, the patients described that trust in the professional and the treatment program strongly depends on the feeling of being understood, the social relationship and also experienced expertise of the healthcare professional. The healthcare professional is consciously engaged in gaining trust because its importance is recognized (story 3).

Story 1 'Do your own shopping again'

Mara, physiotherapist narrates:

A nice example of what exercise can do to you is my patient, a single man. He has diabetes, his lungs are not good, he has chronic back pain and doesn't walk easily. In the beginning he was very reluctant to exercise. He was unhappy in his body. Our practice is not a gym. If you approach someone in a positive way and show him that there is a potential improvement you can achieve so much. dares to cross the street again, walks outside with his walker and visits us every time he does his groceries to treat us and have a chat. It's nice to see that you can do something for someone in his life. That's why you try to persuade them to go and keep moving. goes out much more often, has a totally different self-image and feels appreciated again. That's a nice side effect of being physical active.

Story 2 'Yes, I've done it again'

Mable, patient, narrates:

This summer, for the first time, I managed to swim 40 lanes again. I built it up from four lanes; each time one more lane. At one point I was back on the 40 lanes. At the end of those 40 lanes, in the water, I was like, 'Yes, I've done it again'. I also told the lifeguard, "I've got them again! Of course, he was enthusiastic. And on the way to the dressing room, I also told some people who were standing there. They also reacted: "Very nice!" They knew I was working on it. They often asked, "Where are you now?" "20 lanes. "So, you only need 20 more." "Where are you now?" '25'. I expanded it to 70 lanes and then I was set back by my knees, so I went back to 50-60 lanes. When the pool closed, I did not swim for two weeks. When I started again, I felt like I had loose bones in my knee, that does not swim well... I built that up again and this week I had 40 lanes again. That went smoothly, then I thought: "I can do it again".

Story 3 'It comes down to trust every time'

Andy, physiotherapist narrates:

I am a physiotherapist and started with a new patient last week who has a connective tissue disorder. He already had 14 umbilical fractures and they can't operate anymore. If he goes beyond his limits he is quickly exhausted. He was like: "well, let's talk first because I don't know if it's going to work out and I don't know what I can do". I've mainly been talking about that for an hour. And he went away with the outcome that he wanted to try. And that's what I like to hear. I first asked, "what have you done in the past"? "Then we're going to build on that, we'll start and take one step at a time. And he left with the feeling: "ok I'm confident I can build up here". So I think that's an example of what I stand for when it comes to stimulating healthy exercise behavior. It comes down to trust every time, that's funny.

3.2.2. Health literacy

Healthcare professionals expressed their inability to help patients who had insufficient health literacy. According to them, this inability can originate from the patient (cognitively) or from the framework of the healthcare system (story 4). Patients themselves seldomly addressed this topic, and may not be aware that healthcare professionals expect some degree of self-management.

Story 4 'We just can't do everything'

Jake, physiotherapist narrates:

A Moroccan man with four children, who is unemployed and deals with a lot of pain, participated in two PA programs within my practice. He speaks Dutch very well so we could talk about his functional impairments. Both programs lasted three months. In between the programs he didn't do anything and his physical functioning deteriorated rapidly. We discussed to see what he wanted and I even contacted some people that could help him. I said to him "you have to take that step yourself, I'm really not going to do that for you". And he didn't do it. And this really has to do with health literacy. I don't know if it has to do with Moroccan culture, but in this group I see more often that they do not dare to take the step. Maybe out of pride? We can't take this step for them either. If I want to go to a gym, I have to go there myself. We as physiotherapists don't get paid to take this step together with someone. We've discussed this extensively within the practice and I've already discussed it with the insurance company almost twenty times. We only get paid for the patients who are treated here. Nobody who is outside our profession understands that. We just can't do everything.

3.2.3. Temporary interruption

Patients said that a temporary interruption of PA, for instance for medical or social reasons, can be disastrous for sustained PA (stories 5, 6 and 9). They find it difficult to take it up again after an interruption. Healthcare professionals did not specifically mention this as an important theme.

Story 5 'In winter it collapses'

Rose, patient, narrates:

In summer, I manage to move around very well. I go to work cycling, it's nice, warm and sunny. In the autumn or winter, it all collapses with me. I don't really have the inspiration or the desire to do anything. Then I would like to lie in my bed all day, watch TV or read. And you also eat differently, a bit heavier. Spring and summer is really the best time for me. When it rains I don't feel like going to the gym. And in winter I don't like it either because I'm a person who falls easily. Somehow I can't motivate myself, it's just not easy for me in the winter. Until January it's usually okay, and after January it usually gets worse with motivation and energy. That's when I'm the least comfortable in my skin.

3.3 Opportunity

3.3.1. Prerequisites and good collaboration

Two main themes linked to 'opportunity' were prerequisites and good collaboration, which can contribute to or have a negative effect on sustained PA. The importance of prerequisites for sustained PA is identified in both perspectives. Patients did not always experience that healthcare professionals are aware of the importance of prerequisites for PA. Suboptimal prerequisites and collaboration between healthcare professionals negatively influences their PA. They underlined the importance of communication (making and keeping appointments) and personal contact (group size, personal attention in group) (story 6). The healthcare professionals mainly mentioned financial, material, and logistical prerequisites. Healthcare professionals are aware of the importance of these prerequisites (stories 4 and 7). They describe the importance of good collaboration between several healthcare disciplines for optimal support of the patient (stories 6 and 9).

Story 6 'Do something you like'

Fariza, patient narrates:

The nurse practitioner said "you should do something you like". And walking is something I really like. Then I approached the sports consultant again to maybe find a walking group or something but somehow I haven't heard about it. That was also my mistake because I got very ill at that time and then I just couldn't respond to messages from the sports consultant among others. After that it hasn't really been discussed anymore by the sports consultant or something like that.

Story 7 'Funds & foundations'

Nathan, sport consultant, narrates:

I've helped a man with a mild intellectual disability. He's in a wheelchair because of an amputation of his right leg and right arm. He had been in military service, and also had PTSD. At first he had to go to the physiotherapist. By doing so, we have tools to eventually move on to a gym. Through some funds and foundations from the military service and rehabilitation I was able to raise money so he could become a member. He owes his membership to that, so it helped him.

3.4 Motivation

3.4.1. Customized PA

We found six themes linked to motivation that can influence sustained PA positively or negatively. The importance of customized PA as a motivator was mentioned from both perspectives. Customized PA should match the capabilities of people (physically and cognitively) and their wishes and preferences. Besides, the healthcare professional should also consider that some people do not like exercising and adapt to that (stories 3, 8 and 9).

3.4.2. Increasing awareness

Another motivation that the healthcare professional often focuses on is increasing awareness for the patient, by using education or confrontation.

3.4.3. Meaningful purpose

Some patients said that having a meaningful purpose motivates them to keep moving (stories 2 and 8). Healthcare professionals also said they often use this as a strategy. They link goals to a patient's meaningful activities, and find that this motivates a patient to persevere (story 1).

3.4.4. Exercising in a group

According to patients and healthcare professionals, exercising in a group can be a motivator (story 9). Some patients exercise to be among people and not primarily to achieve sustained PA. This knowledge can be used by the healthcare professional in the treatment. By contrast, several patients stated they do not want to exercise in a group.

3.4.5. Success experiences

The importance of success experiences, such as experiencing health benefits, as a motivating factor is endorsed from both perspectives (stories 1, 2 and 8). Patients also talked about the negative effect of failure experiences (story 10).

Story 8 'Climbing for my granddaughter'

Wilda, patient narrates:

I try to stay as mobile as possible. I don't experience pain, I just get so stiff. When my granddaughter turned 35, I really wanted to go to her birthday. She lives alone in an old house in Amsterdam, with enormous steep stairs. To get to her apartment I had to climb 3 steep stairs and I had been sick just before her birthday and hadn't fully recovered yet. But I did it. I went up all 50 steps and went to her birthday. She is my 1st grandchild and will always have a special place in my heart.

Story 9 'Club '

Eddy, nurse practitioner, narrates:

A lady was at an aquarobics club. She liked this very much but unfortunately she got sick and had some problems in her personal environment. Because of this she didn't go a few times and then she felt the step to go again was too big. Then she came back to me because she thought she didn't exercise enough. I contacted the sports consultant and together took the step to go back. She was very kindly received by the aquarobics club and ever since she goes back again.

3.4.6. Aversion to sports

Aversion to sports, is related to patients not liking sports or talking about sports with the healthcare professional – it scares them. They may not like this, but still want to be more physical active in daily life. The aversion to sports was sometimes described as the unpleasant experience of body signals during intensive exercise and also as being related to negative exercise experiences in the past (story 10). Healthcare professionals did not address this topic.

Story 10 'Born without an activity-gene'

Vera, patient, narrates:

I like riding my bike, but if I don't move I like it too. Reading a book on the couch is something I can do for hours. I don't like anything about moving, to be honest. Out of everything, I like cycling the most. As a child it was terrible. Holidays with my parents in the mountains in Switzerland everyone liked to walk up mountains, except me and that ended in crying and tantrums. I was tired, experiences painful feet of that constant upward walking. I notice that I don't like being out of breath at all or having soured legs. I think that's terrible, really. Getting out of breath, sweating, your heart rate going up, I find it terrible, a very uncomfortable feeling, really awful. Fun in moving is very difficult for me, because I always say 'I was born without a movement-gene'. In other words, I don't like moving at all.

4. DISCUSSION

The objective of this study was to identify implicit and more profound barriers and facilitators of sustained PA in patients with a chronic disease, including the patient's context. Additionally, we compared perspectives of participating patients and healthcare professionals, and linked barriers and facilitators to the COM-B model. In line with findings of Franco and colleagues, trusting oneself – both physically and mentally – and trusting the healthcare professional, were aspects linked to the capability to show a certain behaviour (Franco et al., 2015). The literature reports that financial, material and logistical conditions and collaboration among healthcare professionals can contribute to or have negative effects on maintaining healthy exercise behavior (Franco et al., 2015; Hoogendoorn & De Hollander, 2017; Kanavaki et al., 2017). Important motivators were customized PA, awareness of the importance of PA, social aspects of PA, meaningful activities and success experiences. These motivators are comparable to motivators reported in literature (Franco et al., 2015; Martins et al., 2015).

Comparing the perspective of patients with that of healthcare professionals revealed different views and beliefs regarding the main themes of temporary interruption, aversion to sports and health literacy. Firstly, patients may find it difficult to pick up activities after an interruption, which obstructs sustained PA. Such interruptions included medical (e.g., surgery) or social interruptions (e.g., holiday). In addition, seasonal changes were brought up as possible interruptions. It seems as if patients struggle to cope with setbacks, which is an element of self-management skills (stories 5, 7 and 9 (Rootman & Gordon-El-Bihbety, 2008)). Raising healthcare professionals' awareness of this struggle may provide a valuable lead for improvement of their coaching and interventions (Wetenschappelijke Raad voor het Regeringsbeleid, 2017). Secondly, patients' stories often revealed an aversion to sports, originating from unpleasant bodily reactions or negative past experiences. Healthcare professionals did not describe this explicitly. Recognizing that some patients do not like PA and may prefer talking about 'moving/movement' instead of 'sport/exercising' could help (story 10). Also, healthcare professionals should be more aware of a patient's perception of unpleasant bodily reactions and explore how best to accommodate for this in the choice of activity, advice or intensity of training. To increase the probability of achieving a sustained effect, healthcare professionals could focus on meaningful PA and integrating PA into the patient's general daily life as much as possible. A theme only mentioned by the healthcare professionals is health literacy. They argued that the Dutch healthcare system does not provide for the extensive support that some patients need due to low health literacy, resulting in more consultations (story 4). Perhaps, these patients were not able to reflect or verbalize the limits of their health literacy, or the healthcare professional is not able to adjust to the needs of the

patients. It is important to realize that if a main theme does not emergence from the stories of either patients or healthcare professionals, this does not mean that the persons in question do not have an opinion on that theme. However, because the importance of the themes for maintaining PA is indicated from one perspective, it may provide important insights for PA promoting programs. In future studies, these themes should be studied more explicitly.

The patients participating in this study all participated, or had participated at least once in a PA-promoting program, which goes say they were motivated to change their PA behaviour. We specifically chose to include these patients because they could tell about attempts to reach sustained PA. However, this selection of participants limits the transferability of results to a population not participating in a PA-promoting program. The healthcare professionals selected for this study represent the variety of healthcare professionals in the Dutch primary healthcare system that play a role in the support of patients with chronic diseases to reach sustained PA (Weggemans et al., 2018). Although the sample sizes were relatively small, similar themes were found in the analysis (data saturation was reached). By conducting member checks, our interpretation of the stories was verified by the participants, which positively influences the validation of our data (Boeije, 2005; Guba & Lincoln, 1994).

The storytelling method allows participants to talk about their own experiences in their context, without external constraints (Riessman, 2008). Because stories provide an emphasis to the relationship between experiences and emotions, action and consequences, we obtained implicit knowledge about the subject of this study (Lemley & Mitchell, 2012; Moezzi et al., 2017; Riessman, 2008; Wang, Andre, & Greenwood, 2015; Wang & Geale, 2015). By linking the main themes to the COM-B model we not only structured our results and compared it to previous literature, but also could analyze the relevant themes in light of the context of the participants. Thus, by choosing storytelling as our research method and utilizing the COM-B model as a framework, the study provides insights that could successfully lead to more sustained PA (Alageel et al., 2018; Michie et al., 2011).

Although most of the researchers who contributed to this study were experienced in conducting qualitative research, the storytelling training helped to develop the skills to jointly construct narrative and meaning (Riessman, 2008). Attention was given to creating an optimal narrative climate, by establishing a relationship prior to the interview, being interested and explaining that there was no right or wrong response. A sensitizing question was asked at the start of the interview. Thereafter, narrative questions were asked. Of importance was that the interviewer focused on the storytelling, so as to facilitate appropriate follow-up questions about missing narrative elements (appendix B) (Riessman, 2008; Tesselaar & Scheringa, 2008).

In qualitative research, important considerations are the researchers' professional experience and reflexivity. All four primary researchers were female, worked as researchers and teachers at a University of Applied Sciences for physical therapy, and two had worked as physiotherapists in primary care in the past. Being aware of the importance of PA for individual health, as well as having opinions and knowledge about the healthcare system might mitigate regarding the data with an open view, influencing/limiting the interpretation of the data (Berger, 2015). On the other hand, the interviewers being experienced healthcare professionals may have been an advantage in that the participants might have been more willing to share experiences (Drake, 2010). Conducting a constant comparative analysis method ensured that the main themes found were rooted in the data (Pope, Ziebland, & Mays, 2000) and that intersubjectivity was reached among the four researchers, thereby increasing the quality of the analysis.

Attention to a possible future temporary interruption and less focus on sports participation were important themes for patients. The results of the study underline the importance of taking the patient's context of the into account in providing personalized support of sustained PA. While this may cost time during the treatment program, it might be more efficient in the long run.

5. CONCLUSION

This study identified barriers and facilitators concerning sustained PA in primary care. Building upon one's individual context and comparing the perspectives of both patients and healthcare professionals helped us draft clues for improvement of the support of sustained PA for patients with chronic diseases. Trust in one's own capabilities and in the healthcare professional, as well as health literacy were main themes emerging from the data. Motivators for sustained PA were customized PA, increasing awareness, social aspects of PA, meaningful goals and activities, success experiences and coping with temporary interruption. Interprofessional collaboration and prerequisites such as financial or materialistic needs can be beneficial or obstructing. We found that paying attention to possible future temporary interruption and less focus on sports participation could be important elements in developing personalized guidance programs for sustained PA in primary health care. Using a narrative method such as storytelling seems appropriate for studies in which context is important.

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Contributors All authors contributed to conceiving and designing the study. JB, AF, AH and PS contributed to the data collection and conducted the data analysis. Initial drafts of the manuscript were written by JB, which were reviewed and edited by the other authors. All authors approved the manuscript.

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Supplemental material

Supplement 1. COREQ check

Supplement 2. Interview guide

Supplement 3. Template stories

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TABLES

Table 1. Analysis process

Phase 1: collecting and checking stories	
Step 1: transcription	Transcripts were made ad verbatim of each interview using audio recordings by the interviewer.
Step 2: stories	The interviewer collected stories from the transcripts using a consensus-based format, containing agreements on narrative elements and lay-out (appendix C).
Step 3: member check	Participants were asked whether they recognized their stories derived from the interview, small adjustments were made in the stories.
Phase 2: analyzing by main research group	
Step 4: choosing relevant stories per perspective	After the stories were established, the main researchers continued further analysis. Stories were read and reread to familiarize with the data. Stories that where of relevance and were unique for the research question were independently chosen. Duplicates were included automatically in further analysis; inclusion of other stories were discussed, and consensus was found within duos.
Step 5: themes	Themes were linked to each story; consensus on the themes and their contents was reached in duos per perspective. Related themes were grouped together into main themes. We asked ourselves what the essence of the stories per main theme was and created a story web using Microsoft Excel.
Step 6: comparing perspectives	Both duos presented the main themes from both perspectives. Themes, insights, similarities, and differences were discussed. If applicable, themes were renamed and consensus was reached in the main themes. Thereafter, constant comparison method was carried out in which conclusions were checked by going back to the stories. Differences between the perspectives were noted.
Phase 3: integration to framework	
Step 7: integration COM-B model	To increase understanding of the main themes, they were arranged in the COM-B model (figure 2).

Table 2. Characteristics participants

Patients				***Healthcare professionals***			
Name*	***Sex***		***Chronic disease***	***Name****	***Sex***		***Profession***
Fariza	Female		Type-II diabetes, obese	**Lisa**	Female		Nurse practitioner
Paula	Female		Asthma, stroke	**Niki**	Female		Physiotherapist
Bert	Male		CVD^, stroke	**Andy**	Female		Physiotherapist
Myra	Female		Obese	**Jacky**	Female		Physiotherapist
Theo	Male		Frailty	**Hope**	Female		Physiotherapist
Pete	Male		Stroke	**Eddy**	Male		Nurse practitioner
Vera	Female		Obese, osteoarthritis	**Nathan**	Male		Sport consultant
Riki	Male		Obese	**Barbra**	Female		Physiotherapist
Wilda	Female		Frailty	**Mara**	Female		Physiotherapist
Mable	Female		Osteoarthritis, obese	**Gaby**	Female		Nurse practitioner
Rose	Female		Obese, Turner-syndrome	**Jake**	Male		Physiotherapist
Anne	Female		Osteoarthritis, obese				

**names are fictitious; ^ Cardiovascular disease*

FIGURES

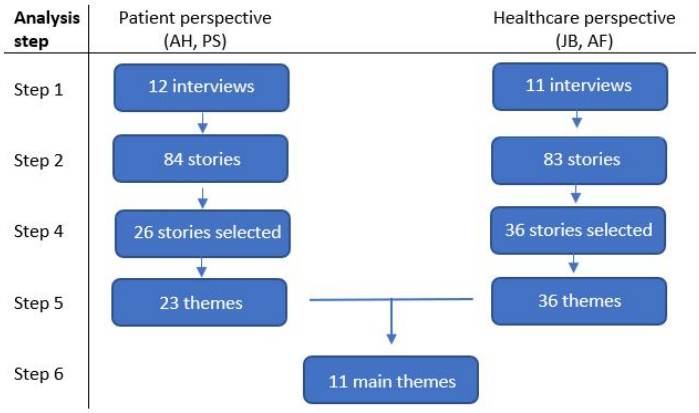

Figure 1. Results analysis process

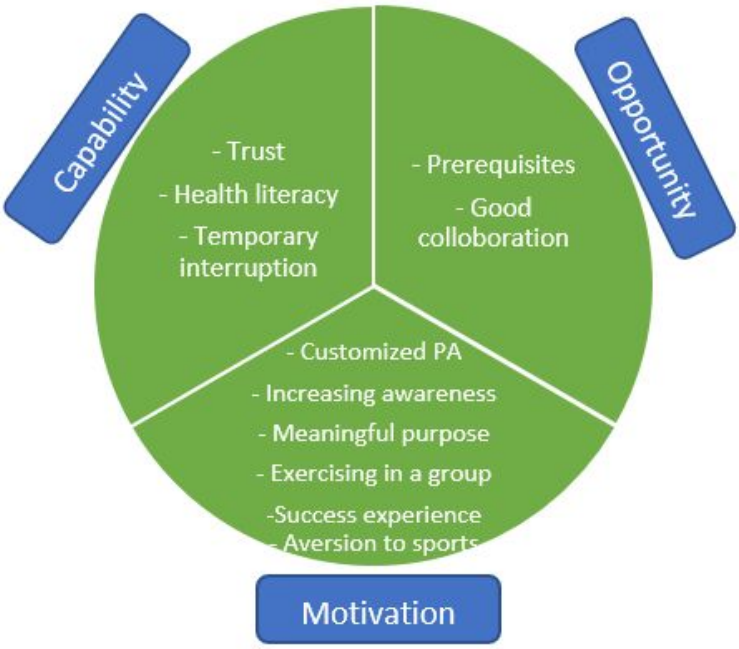

Figure 2. Main themes organized according to COM-B model

Additional file 1

Consolidated criteria for reporting qualitative studies (COREQ): 32-item checklist

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. Int J Qual Health C. 2007; 19(6): 349–357. http://dx.doi.org/10.1093/intqhc/mzm042

Topic	Item no.	Guide question/description	Reported on page no.
Domain 1: Research team reflexivity			
Personal characteristics			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	Paragraph 2.3
Credentials	2	What were the researcher's credentials?	Paragraph 2.3 + chapter 4
Occupation	3	What was their occupation at the time of the study	Chapter 4
Gender	4	Was the researcher male or female?	Chapter 4
Experience and training	5	What experience or training did the researcher have?	Paragraph 2.3 + chapter 4
Relationship with participants			
Relationship established	6	Was a relationship established prior to study commencement?	Chapter 4
Participant knowledge of the interviewer	7	What did the participants know about the researcher? E.g. personal goals, reasons for doing the research	N/A
Interviewer characteristics	8	What characteristics were reported about the interviewer? E.g. bias, assumptions, reasons and interests in the research topic	Chapter 4
Domain 2: Study design			
Theoretical framework			
Methodological orientation and Theory	9	What methodological orientation was used to underpin the study? E.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	Paragraph 2.1 + 2.5
Participant selection			
Sampling	10	How were participants selected? E.g. purposive, convenience, consecutive, snowball	Paragraph 2.2
Method of approach	11	How were participants approached? E.g. face-to-face, telephone, mail, email	Paragraph 2.2
Sample size	12	How many participants were in the study?	Chapter 3 (table 2)
Non-participation	13	How many people refused to participate or dropped out? Reasons?	N/A
Setting			
Setting of data collection	14	Where was the data collected? E.g. home, clinic, workplace	Paragraph 2.4
Presence of nonparticipants	15	Was anyone else present besides the participants and researchers?	Paragraph 2.4
Description of sample	16	What are the important characteristics of the sample? E.g. demographic data	Chapter 3 (table 2)
Data collection			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	Paragraph 2.4 + appendix B
Repeat interviews	18	Were repeat interviews carried out? If yes, how many?	N/A
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	Paragraph 2.4
Field notes	20	Were field notes made during and/or after the interview or focus group?	Paragraph 2.4

Duration	21	What was the duration of the interviews or focus group?	Paragraph 2.4
Data saturation	22	Was data saturation discussed?	Chapter 4
Transcripts returned	23	Were transcripts returned to participants for comment and/or correction	Paragraph 2.6
Domain 3: analysis and findings			
Data analysis			
Number of data coders	24	How many data coders coded the data?	Paragraph 2.4
Description of the coding tree	25	Did authors provide a description of the coding tree?	Chapter 3 (Figure 2: represents the themes)
Derivation of themes	26	Were themes identified in advance or derived from the data?	Paragraph 2.6 (table 1)
Software	27	What software, if applicable, was used to manage the data?	Paragraph 2.6 (table 1)
Participant checking	28	Did participants provide feedback on the findings?	Paragraph 2.6 (table 1)
Reporting			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? E.g. participant number	Chapter 3
Data and findings consistent	30	Was there consistency between the data presented and the findings?	Chapter 3
Clarity of major themes	31	Were major themes clearly presented in the findings?	Chapter 3
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	Chapter 3

Additional file 2

Interview guide: patients

Introduction

Getting acquainted, organizing materials.

- Ensure to create a narrative climate. Consider:
  - Safe environment
  - Being patient, emphatic and curious
  - Create space for listening and narrating (even when you experience time pressure)
- Connect with the participant by (for example):
  - Complimenting about their home, interior design or surroundings
  - Talking about your commute
- Important: sincere intention to listen to the participant's experiences

Transition to the conversation by explaining the order of the conversation. Give the participant the opportunity to ask questions about any vagueness.

Introduction to the conversation

Do you give permission to record this conversation, so I can focus on listening?

<confirm, sign Informed consent form and start tape recorder>

Thank you that I can record this conversation. This makes it possible to re-listen and transcribe it. After the transcription has been made, the audio recording will be deleted. In the report, I will use a fictitious name, although your real age will be used. So, your story cannot be traced to you. Please, could you state your age?

In this study, we will collect stories on how different people experience physical activity. We want to know more about what motivates people to initiate, maintain, and perhaps obstructs them to be physical active. The results will be used to improve the support of physical activity in primary care. The primary healthcare professionals could be a physical therapist, family doctor or nurse practitioner. I have scheduled an hour for this conversation; does that suit you as well? Everything you tell about your experiences, good or bad, is helpful. I am very curious about your experiences about being physical active.

Do you have any questions?

Conversation

Introduction question (sensitizing).

To start, I am very curious to know what you think about being physical active. Please can you tell me something about that?

<make sure the participant does not merely think about exercising/sports, but about physical activity in a broader context>
<remember being silent to provide enough space for the participant, confirm non-verbally while listening to encourage him or her to go on>

Narrative questions: (these are exemplary questions, you need not to ask all the questions. More important is to ask follow-up questions about missing narrative elements)

1. *Could you tell me about a specific situation when you were physical active and thought: 'Right now I really am having fun!'*

2. *Could you tell me about a specific moment you look back on with pride because you succeeded in having enough physical activity? What made you succeed then?*
3. *Could you describe a specific situation in which you thought: 'I don't enjoy being physical active anymore, I quit right now'.*
4. *Could you describe a specific situation in which a person or circumstance really discouraged you to maintain being physical active?*
5. *Do you have an example of a situation when you thought: 'Maintaining being physical active is really difficult, but I still did it! What helped you in that situation?'*
6. *Could you give an example of a situation in the past year when you noticed that a healthcare professional helped or motivated you a lot? What happened, how did that go?*
7. *You participated in a PA promoting program. Could you take me to a specific moment when you felt really motivated to maintain being physical active, also after the program had ended?*
8. *If you could decide what the optimal support program for PA would look like? How would it look like then?*

During the conversation, remember: careful listening, following and confirming non-verbally, falling silent to give opportunity to narrate more. Only ask questions about specific situations linked to a (positive or negative) emotion.

Be aware of stepping stones to a narrative question. For example, if someone says 'that really disappointed me', there is an opportunity to connect by asking a narrative question such as: 'What exactly disappointed you so much? What happened exactly and who was involved? Be aware not to judge, or being positive (compliment). You need not give feedback or a solution. After the answer, thank the participant for telling this.

When a narrative element is missing in the story, you may ask additional questions about:

- Supporters: '*Where there people or things helping you in that situation?'*
- Opponents: 'Where there people or things getting in the way or obstructing you?'
- Struggle: 'What did you struggle with? What was the main struggle?
- (Plot) twist: '*What happened? What was the turning point?*'
- Main character: '*About who is it?'*
- Time, place and person: '*Where exactly did it happen? When was this? Who were involved?*

Closing

Thanks you very much for all the stories about you being physical active. Great that you shared these stories. This provides a valuable contribution to our study. To thank you we have a small gift for you <hand over the gift voucher>

Thanks again for sharing the stories about your experiences on being and maintaining physical active.

<Let the recorder run a bit longer. Sometimes extra relevant information comes up>

Interview guide: Healthcare professionals

Introduction

Getting acquainted, organizing materials.

- Ensure to create a narrative climate. Consider:
  - Safe environment
  - Being patient, emphatic and curious
  - Create space for listening and narrating (even when you experience time pressure)
- Connect with the participant by (for example):
  - Complimenting about their home, interior design or surroundings
  - Talking about your commute
- Important: sincere intention to listen to the participant's experiences

Transition to the conversation by explaining the order of the conversation. Give the participant the opportunity to ask questions about any vagueness.

Introduction to the conversation

Do you give permission to record this conversation, so I can focus on listening?

<confirm, sign Informed consent form and start tape recorder>

Thank you that I can record this conversation. This makes it possible to re-listen and transcribe it. After the transcription has been made, the audio recording will be deleted. In the report, I will use a fictitious name, although your real age will be used. So, your story cannot be traced to you. Please, could you state your age? And what is your function/occupation in the work situation? In this study we will collect stories about healthcare professionals' experiences supporting patients to sustain physical activity. Besides, we collect stories about how healthcare professionals motivate their patients to be and maintain physical active and what barriers they experience. We would like to know what drives people to start being physical active, what it takes to maintain it and what obstructs them. By collecting stories of healthcare professionals we could, in the end, develop an effective method to increase sustained physical activity.

I have scheduled an hour for this conversation, does that suit you as well? Everything you have experienced and narrate, good or bad, is helpful. We are curious about your experiences of physical activity of your patients and your strategies to keep them physical active.

Do you have any questions?

Conversation

Introduction question (sensitizing).

To start, I am very curious what you think about supporting sustained PA, in for example <name intervention they were involved in>. What did you experience? Please could you tell something about that? What moment impacted the most?

<Remember: we want to know about what the healthcare professionals do themselves, not what patients do>

<Remember being silent to provide enough space, confirm non-verbally while listening to encourage the participant to continue narrating>

Narrative questions: (these are exemplary questions, you need not ask all the questions. More important is to ask follow-up questions about missing narrative elements)

1. *Could you tell me about a specific situation of a client in which you thought:' in that moment I really helped a patient, I was really happy about that, I wish every time it would go like that?'*

2. *Could you tell me about a specific event you regard as: 'this is why I enjoy to work with this patient group so much?'*

   <try to invite a specific example of one patient. When the narrator states to really have added something, ask: could you give an example?>

3. *Could you describe a specific moment when you thought: 'It is really difficult to motivate this client'? What made it difficult for you? What did you do? Who were involved?*

4. *Could you describe a specific situation in which you were concerned about permanent effects of the PA promoting program and your support within this program? What made you being concerned?*

5. *Do you have an example of a situation when the support of a patient to sustained PA was frustrating or even unwanted?*

6. *Could you tell your dream image/nightmare in supporting sustained PA? Please be as specific as possible.*

7. *Could you tell about a situation that represents what you stand for concerning sustained PA? Please be as specific as possible. What happened exactly, who were involved?*

8. *Could you tell about a situation during the PA promoting program when you thought: 'That's really frustrating; if we keep working like this we will not improve.'*

9. *Could you take me to a moment when you were proud of yourself when supporting sustained physical activity?*

During the conversation, remember: careful listening, following and confirming non-verbally, falling silent to give opportunity to narrate more. Only ask questions about specific situations linked to a (positive or negative) emotion.

Be aware of stepping stones to a narrative question. For example, if someone says 'that really disappointed me', there is an opportunity to connect by asking a narrative question such as: 'What exactly disappointed you so much? What happened exactly and who was involved? Be aware not to judge, or being positive (compliment). You need not give feedback or a solution. After the answer, thank the participant for telling this.

When a narrative element is missing in the story, you may ask additional questions about:

- Supporters: '*Where there people or things helping you in that situation?'*
- Opponents: 'Where there people or things getting in the way or obstructing you?'
- Struggle: 'What did you struggle with? What was the main struggle?
- (Plot) twist: '*What happened? What was the turning point?*'
- Main character: '*About who is it?'*
- Time, place and person: '*Where exactly did it happen? When was this? Who were involved?*

Closing

Thanks you very much for all the stories about you being physical active. Great that you shared these stories. This provides a valuable contribution to our study. To thank you we have a small gift for you <hand over the gift voucher>

Thanks again for sharing the stories about your experiences on being and maintaining physical active.

<Let the recorder run a bit longer. Sometimes extra relevant information comes up>

Additional file 3

Template stories (in preparation of analysis)

(How are we going to set up the stories (elements and lay-out)?)

Title story
Name narrator (fictious), function/role (patient or function), age:
"*italic* the story (date + initials researcher)
Put optional themes under the story. By doing so you answer the next question: 'what does this story teach me about the research question?'

Lay-out stories- uniformity:
- Colloquial language can be removed when essence of the story stays the same
- Facts can be added
- Write in I-form (instead of 'you fall' etc.)
- The story must be understandable for an outsider

What is a story?
- Representation of events that are put into order to each other. Narrative of a story:
    - Stands on itself
    - Has a beginning, middle and end
    - Contains narrative elements
    - Evokes emotions or is narrated with emotions
    - Is personal, authentic and true

- Narrative elements:
    - Main character – Who is it about?
    - Supporters- Who/what helped?
    - Opponents- Who/what obstructed?
    - Struggle - What did you struggle with?
    - Plot change – What happened?
    - Time, location, person

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Using storytelling methodology to identify barriers and facilitators of sustained physical activity in patients with a chronic disease: a qualitative study

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TITLE PAGE

Title

Using storytelling methodology to identify barriers and facilitators of sustained physical activity in patients with a chronic disease: a qualitative study

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ABSTRACT

Objectives

To identify implicit and more profound barriers and facilitators and involving context elements to accomplish sustained physical activity (PA) in patients with a chronic disease. Understanding these barriers and facilitators may help develop future strategies to be used by healthcare professionals in primary care to support patients with a chronic disease to reach sustained physical activity.

Design and methods

The qualitative, narrative research method storytelling was applied. Perspectives of both patients with a chronic disease (n=12) and involved healthcare professionals (n=11) were collected. Stories were audiotaped and retrieved from the transcriptions. Analysis involved a cyclic process of constant comparison. Main themes were arranged in the theoretical framework of the COM-B model.

Participants

Patients were adults with a chronic disease or at high risk of developing a chronic disease who participated in a PA promoting program. Eligible healthcare professionals were those involved in these PA promoting programs in primary care, such as physiotherapists, nurse practitioners or sports consultants.

Results

From 176 stories, 62 relevant and unique stories were selected for further analysis. Eleven main themes were identified and afterwards linked to the COM-B model. Trust in one's own capabilities and in the healthcare professional were relevant themes. Also, health literacy and coping with temporary interruption were important capabilities. Important motivators were customized PA, increasing awareness, meaningful activities, exercising in a group, and success experiences. Aversion to sports was seen as a barrier. Interprofessional collaboration and prerequisites can be a facilitator of a barrier.

Conclusions

This study provides insight in deeper motivations, barriers and facilitators of sustained PA from both the patients' and healthcare professionals' perspective. Comparing these perspectives revealed different views and beliefs on some themes. Attention for temporary interruptions, aversion to sports and health literacy were identified to be important for sustained physical activity.

Strengths and limitations of this study

- By using storytelling implicit barriers and facilitators important for sustainable PA are explored among patients with a chronic disease.
- Perspectives of both patients and healthcare professionals were included and compared, providing relevant clues for the improvement of support for sustainable PA.
- Researchers were trained to improve their storytelling skills, which is important to ensure a narrative climate during the interviews, in order to collect real life stories.
- Intersubjectivity was reached among 4 researchers, increasing the quality of the study.
- Patients participating in this study took part (at least once) in a PA promoting program, limiting the transferability of results to a population less motivated.

1. INTRODUCTION

The numbers of people living with a chronic disease, such as cardiovascular disease, diabetes and cancer, are substantial and increasing worldwide.[1] Living with a chronic disease has considerable consequences for one's health, quality of life and social involvement, and is the cause of 71% of premature death rates worldwide.[2] Integrating physical activity (PA) into one's lifestyle decreases the risk of developing a chronic disease and reduces the severity of clinical characteristics.[2-9] Guidelines recommend that everyone engages in moderate intensity PA for at least 150 minutes every week, spread over several days, and strength enhancing activities at least twice a week. In addition, long periods of sitting are to be avoided.[10 11] Even though the positive effects of PA are evident, 30% of the world's population does not meet PA guidelines. For over 60-year-olds, this proportion is even larger; i.e.,45%.[12] In the Netherlands, more than 50%, of people with a chronic disease are not able to meet PA guidelines.[13]

Sustained PA is primarily the responsibility of people themselves. However, not everyone is able to initiate and maintain sustained PA, due to insufficient health literacy – and in spite of support from primary healthcare professionals.[14] Various primary healthcare professionals, such as physiotherapists and nurse-practitioners, support people with chronic diseases to improve their PA. In many cases, the therapy plan includes more PA.[15]

Not complying to PA guidelines is associated with: low level of health literacy, low level of education, obesity and chronic disease.[16-19] Patient-reported barriers for integrating PA into one's lifestyle are: sedentary habits, lack of social support, competing priorities, limited access to PA and apathy. In addition, physical limitations, lack of self-confidence, financial problems, and lack of experiencing success have been described as barriers PA.[20] Reported facilitators for PA are: accessible facilities, tailored training programs, attention for positive exercise experiences and beliefs, sufficient knowledge and social support.[21 22] Additionally, education about the importance of PA and improving environmental and financial access appear to be helpful.[20 22 23]

Most of the intervention studies on barriers and facilitators for PA show short-term effects only. Sustained effects have rarely been studied nor found.[24-26] Moreover, lack of detail in the description of promising interventions makes it difficult to replicate treatment.[27-29]

Therefore, it is important to distinguish between initial behavior change (short-term) and sustained behavior change (long-term), the latter of which is harder to achieve.[30] Evidence suggests that a personalized approach, including a person's context, is needed to reach sustained PA.[31] The personal context contains individual characteristics and physical, psychological and social functioning in one's own living environment.[32]

To gain insight into the personal context it is important not only to focus on explicit factors, but also gain knowledge about more implicit factors of importance to sustained PA.[32-35] This study aims to identify implicit and explicit barriers and facilitators to sustained PA for people with a chronic disease, including their context, by collecting perspectives of both patients and healthcare professionals. This study, therefore, employs a narrative research method. In addition, the Behaviour Change Wheel (BCW) framework is used to order and grasp a better understanding of the identified barriers and facilitators. The BCW summarizes current knowledge about behaviour change techniques. Its center is the Capability, Opportunity and Motivation (COM-B) model, which can be used as a starting point to understand behaviour (B) in its context.[32]

2. METHODS

2.1 Research design

To gain understanding of barriers and facilitators to sustained PA related to patients with a chronic disease and their context, a narrative research method – storytelling – was applied. Storytelling is an established and emerging research method in health and social science.[36 37] Storytelling can be used to obtain more nuanced, contextualized and culturally reflective data than other qualitative research methods do, e.g. semi-structured interviews. In storytelling the participant is asked to tell about his/her experience of interest using a sensitizing question. Therewith the participant is completely free to tell about any aspect of the experience of interest. The interviewer's role is to create a narrative climate and only asks questions to complete the narrative elements of a story (i.e. people involved, reactions, emotions). A single interview can contain multiple stories. A narrative question invites the participant to tell about a specific situation linked to an emotion around PA, either positive or negative.[36 38] Storytelling focusses on the perspective of the participants, who lived the experiences as an insider, and will therefore provide important insights and ideas, and a deeper understanding of barriers and facilitators. This presupposes a subjective truth in the social context of the participant and reveals implicit knowledge about the subject of the study.[38-41] By using storytelling health-related information specific to one's own situation is contextualized.[36 42] To ensure rich and informative data, stories of both patients and healthcare professionals about a specific situation linked to experiences and emotions were collected. The Consolidated criteria for Reporting Qualitative research guidelines (COREQ) were followed[43](see supplementary file 1).

2.2 Participants

Participants were selected by purposive sampling.[44] Eligible patients were adults who participated in a PA promoting program focusing on supporting people with one (or more) chronic diseases or at high risk of developing a chronic disease, such as cardiovascular disease, diabetes mellites type II, or being overweight (BMI > 25). Eligible healthcare professionals were those involved in these PA promoting programs in primary care, such as physiotherapists, nurse practitioners or sports consultants. We chose to select on these criteria because patients and healthcare professionals who participated in a PA promoting program have experienced success and/or failure in reaching sustained PA, so could share their stories about their experiences in trying to reach sustained PA. Eligible patients were contacted by their primary healthcare professional to participate. Patients who had provided consent for participation were contacted by telephone or e-mail by a member of the research group (see below) to make an appointment for an interview. The study was approved by the Regional

Ethics Board (METC-number: 19-077). All participants received an information letter and provided written informed consent before data collection.

2.3 Research group

The research group consisted of four primary researchers, experienced in conducting qualitative research (JB, AF, AH and PS) and eight trained students who assisted with the data collection. None of the members of the research group knew the participants before conducting the interviews. All had been trained in applying the storytelling method by an expert on storytelling, during three half-day sessions. The training included creating an interview guide, practicing interview skills, and analyzing data.

2.4 Data collection

The interviews were conducted individually, face-to-face, at a location chosen by the participant (participant's home, work or public place). An interview guide was used consisting of a short introduction, examples of narrative questions, and a list of narrative elements[38] (see supplementary file 2). To account for the difference in perspective, the narrative questions in the interview guide for the patients slightly differed from that for the healthcare professionals. All interviews lasted approximately one hour, were audio taped with consent, and the interviewer made brief field notes to aid later reflection. Participants received a gift voucher (worth 25 euros for patients, and 75 euros for healthcare professionals).

2.5 Theoretical framework

The COM-B model was used as a framework to organize the themes found in the analysis and to help understand behaviour in its context. The model assumes that human behaviour (B) is part of a system in which three central components affect each other: Capability, Opportunity and Motivation. Capability is a person's attribute referring to physical and psychological capability, for example body strength, knowledge or endurance to be able to execute PA. Opportunity is an attribute of a person's environmental system and can be physical or social. The combination of capability and opportunity makes a behaviour possible or facilitates it. Motivation is an aggregate of mental processes that energize and influence behaviour, and may be reflective or automatic.[32 45]

2.6 Data analysis

The analysis consisted of interpreting texts in stories form. Data analysis was conducted in three phases (table 1). In phase 1, the audio recordings were transcribed ad verbatim and anonymized to ensure privacy. Stories were retrieved from the transcripts using a consensus-based format (see supplementary file 3).[36 38 40 46] Member checks were done with the

participants. In phase 2, the primary researchers continued open and axial analysis in a cyclic process in which constant comparison between results during each step of the analysis was done. In phase 3, main themes were arranged into the COM-B model, which was used as a theoretical framework. Conclusions on how to integrate the findings into healthcare were discussed.

2.7 Patient and public involvement

In this study, participants were both healthcare professionals and patients. Storytelling is part of a larger project in which a method was developed in cocreation with patients and healthcare professionals that is more customized in its support to sustained PA. Before the start of the project, healthcare professionals were interviewed about their lack of competence in supporting people with chronic conditions. The research question was formulated based on their input.

Table 1. Analysis process

Phase 1: collecting and checking stories	
Step 1: transcription	Transcripts were made ad verbatim of each interview using audio recordings by the interviewer.
Step 2: stories	The interviewer collected stories from the transcripts using a consensus-based format, containing agreements on narrative elements and lay-out (supplement 3).
Step 3: member check	Participants were asked whether they recognized their stories derived from the interview, small adjustments were made in the stories.
Phase 2: analyzing by main research group	
Step 4: choosing relevant stories per perspective	After the stories were established, the main researchers continued further analysis. Stories were read and reread to familiarize with the data. A story was of relevance when it contained experiences of barriers and/or facilitators of sustained PA. A story was of relevance when it contained experiences of barriers and/or facilitators of sustained PA. Stories that where of relevance for the research question were independently chosen. Duplicates were included automatically in further analysis; inclusion of other stories were discussed, and consensus was found within duos.
Step 5: themes	Themes were linked to each story; consensus on the themes and their contents was reached in duos per perspective(open coding). Related themes were grouped together into main themes (axial coding). We asked ourselves what the essence of the stories per main theme was and created a story web using Microsoft Excel.
Step 6: comparing perspectives	Both duos presented the main themes from their own perspective. Themes, insights, similarities, and differences were discussed. If applicable, themes were renamed and consensus was reached in the main themes. Thereafter, constant comparison method was carried out in which conclusions were checked by going back to the stories. Differences between the perspectives were noted.
Phase 3: integration to framework	
Step 7: integration COM-B model	A discussion was conducted about the meaning of the separate parts of the COM-B model, in order to ensure the researchers were on the same page about the meaning of the COM-B model. After reading and rereading the themes and underlying stories, the four main researchers arranged the themes into the framework of the COM-B model (figure 2).

3. RESULTS

Twelve patients and eleven healthcare professionals participated (seven physiotherapists, three nurse practitioners and one sports consultant). Their ages ranged from 36 to 92 years. (table 2).

Table 2. Characteristics participants

Patients				***Healthcare professionals***			
Name*	***Sex***		***Chronic disease***	***Name****	***Sex***		***Profession***
Fariza	Female		Type-II diabetes, obese	**Lisa**	Female		Nurse practitioner
Paula	Female		Asthma, stroke	**Niki**	Female		Physiotherapist
Bert	Male		CVD^, stroke	**Andy**	Female		Physiotherapist
Myra	Female		Obese	**Jacky**	Female		Physiotherapist
Theo	Male		Frailty	**Hope**	Female		Physiotherapist
Pete	Male		Stroke	**Eddy**	Male		Nurse practitioner
Vera	Female		Obese, osteoarthritis	**Nathan**	Male		Sport consultant
Riki	Male		Obese	**Barbra**	Female		Physiotherapist
Wilda	Female		Frailty	**Mara**	Female		Physiotherapist
Mable	Female		Osteoarthritis, obese	**Gaby**	Female		Nurse practitioner
Rose	Female		Obese, Turner-syndrome	**Jake**	Male		Physiotherapist
Anne	Female		Osteoarthritis, obese				

**names are fictitious; ^ Cardiovascular disease*

3.1 Themes

The interviews with patients and healthcare professionals resulted in 84 and 83 unique stories, respectively. The researchers selected 26 stories from the patient's perspective, and 36 stories from the healthcare professional's perspective (step 4, table 1 + figure 1). Rereading the stories resulted in the emergence of 23 themes in the patients' stories and 36 themes in the healthcare professionals' stories (step 5, table 1). After discussion, these themes were clustered into 11 common main themes (figure 1). After that, the main themes were arranged in the COM-B model (step 7, table 1 + figure 2). Exemplar stories are embedded in the text. Some stories are exemplary for multiple themes and will be addressed to in the description of several themes.

-INSERT FIGURE 1 AND FIGURE 2 AROUND HERE-

3.2 Capability

Three themes seemed to be connected to one's capability to be physically active: trust, health literacy and temporary interruption.

3.2.1. Trust

Trust encompassed several aspects. Firstly, patients indicated that the lack of confidence in oneself can be an obstacle to be physically active. Limitations in bodily functioning or lack of

money were mentioned as reasons, as well as feeling ashamed of lack of physical fitness or one's bodily physique. These aspects sometimes made them feel anxious and inferior – and affected their self-confidence negatively. Healthcare professionals pointed out that they take a patient's lack of confidence into consideration by approaching the patient in a positive way and proceeding step-by-step, thereby increasing the patient's self-confidence (stories 1 and 2). Secondly, both perspectives indicated that trust in the treatment program is important for successful maintenance of PA. Lastly, the patients described that trust in the professional and the treatment program strongly depends on the feeling of being understood, the social relationship and the experienced expertise of the healthcare professional. The healthcare professional is consciously engaged in gaining trust because its importance is recognized (story 3).

Story 1 'Do your own shopping again'

Mara, physiotherapist narrates:

A nice example of what exercise can do to you is my patient, a single man. He has diabetes, his lungs are not good, he has chronic back pain and doesn't walk easily. In the beginning he was very reluctant to exercise. He was unhappy in his body. Our practice is not a gym. If you approach someone in a positive way and show him that there is a potential improvement you can achieve so much. dares to cross the street again, walks outside with his walker and visits us every time he does his groceries to treat us and have a chat. It's nice to see that you can do something for someone in his life. That's why you try to persuade them to go and keep moving. goes out much more often, has a totally different self-image and feels appreciated again. That's a nice side effect of being physically active.

Story 2 'Yes, I've done it again'

Mable, patient, narrates:

This summer, for the first time, I managed to swim 40 lanes again. I built it up from four lanes; each time one more lane. At one point I was back on the 40 lanes. At the end of those 40 lanes, in the water, I was like, 'Yes, I've done it again'. I also told the lifeguard, "I've got them again! Of course, he was enthusiastic. And on the way to the dressing room, I also told some people who were standing there. They also reacted: "Very nice!" They knew I was working on it. They often asked, "Where are you now?" "20 lanes. "So, you only need 20 more." "Where are you now?" '25'. I expanded it to 70 lanes and then I was set back by my knees, so I went back to 50-60 lanes. When the pool closed, I did not swim for two weeks. When I started again, I felt like I had loose bones in my knee, that does not swim well... I built that up again and this week I had 40 lanes again. That went smoothly, then I thought: "I can do it again".

Story 3 'It comes down to trust every time'

Andy, physiotherapist narrates:

I am a physiotherapist and started with a new patient last week who has a connective tissue disorder. He already had an umbilical hernia 14 times and they can't operate anymore. If he goes beyond his limits he is quickly exhausted. He was like: "well, let's talk first because I don't know if it's going to work out and I don't know what I can do". I've mainly been talking about that for an hour. And he went away with the outcome that he wanted to try. And that's what I like to hear. I first asked, "what have you done in the past"? "Then we're going to build on that, we'll start and take one step at a time. And he left with the feeling: "ok I'm confident I can build up here". So, I think that's an example of what I stand for when it comes to stimulating healthy exercise behavior. It comes down to trust every time, that's funny.

3.2.2. Health literacy

Healthcare professionals expressed their inability to help patients with insufficient health literacy. According to them, this inability can originate from the patient (cognitively) or from the framework of the healthcare system (story 4). Patients rarely addressed this topic themselves and may not be aware that healthcare professionals expect some degree of self-management.

Story 4 'We just can't do everything'

Jake, physiotherapist narrates:

A Moroccan man with four children, who is unemployed and deals with a lot of pain, participated in two PA programs within my practice. He speaks Dutch very well so we could talk about his functional impairments. Both programs lasted three months. In between the programs he didn't do anything, and his physical functioning deteriorated rapidly. We discussed to see what he wanted, and I even contacted some people that could help him. I said to him "you have to take that step yourself, I'm really not going to do that for you". And he didn't do it. And this really has to do with health literacy. I don't know if it has to do with Moroccan culture, but in this group I see more often that they do not dare to take the step. Maybe out of pride? We can't take this step for them either. If I want to go to a gym, I have to go there myself. We as physiotherapists don't get paid to take this step together with someone. We've discussed this extensively within the practice and I've already discussed it with the insurance company almost twenty times. We only get paid for the patients who are treated here. Nobody who is outside our profession understands that. We just can't do everything.

3.2.3. Temporary interruption

Patients said that a temporary interruption of PA, for instance for medical or social reasons, can be disastrous for sustained PA (stories 5, 6 and 9). They find it difficult to take it up again after an interruption. Healthcare professionals did not specifically mention this as an important theme.

Story 5 'In winter it collapses'

Rose, patient, narrates:

In summer, I manage to move around very well. I go to work cycling, it's nice, warm and sunny. In the autumn or winter, it all collapses with me. I don't really have the inspiration or the desire to do anything. Then I would like to lie in my bed all day, watch TV or read. And you also eat differently, a bit heavier. Spring and summer is really the best time for me. When it rains I don't feel like going to the gym. And in winter I don't like it either because I'm a person who falls easily. Somehow I can't motivate myself, it's just not easy for me in the winter. Until January it's usually okay, and after January it usually gets worse with motivation and energy. That's when I'm the least comfortable in my skin.

3.3 Opportunity

3.3.1. Prerequisites and interprofessional collaboration

Two main themes linked to 'opportunity' were prerequisites and interprofessional collaboration, which can contribute to or have a negative effect on sustained PA. The importance of prerequisites for sustained PA is identified in both perspectives. Patients did not always experience that healthcare professionals are aware of the importance of prerequisites for PA. Suboptimal prerequisites and collaboration between healthcare professionals negatively influences their PA. They underlined the importance of communication (making and keeping appointments) and personal contact (group size, personal attention in group) (story 6). The healthcare professionals mainly mentioned financial, material, and logistical prerequisites. Healthcare professionals are aware of the importance of these prerequisites (stories 4 and 7). They describe the importance of good collaboration between several healthcare disciplines for optimal support of the patient (stories 6 and 9).

Story 6 'Do something you like'

Fariza, patient narrates:

The nurse practitioner said: "you should do something you like". And walking is something I really like. Then I approached the sports consultant again to maybe find a walking group or something but somehow I haven't heard about it. That was also my mistake because I got very ill at that time and then I just couldn't respond to messages from the sports consultant among others. After that it hasn't really been discussed anymore by the sports consultant or something like that.

Story 7 'Funds & foundations'

Nathan, sport consultant, narrates:

I've helped a man with a mild intellectual disability. He's in a wheelchair because of an amputation of his right leg and right arm. He had been in military service, and also had PTSD. At first, he had to go to the physiotherapist. By doing so, we have tools to eventually move on to a gym. Through some funds and foundations from the military service and rehabilitation I was able to raise money so he could become a member. He owes his membership to that, so it helped him.

3.4 Motivation

We found six themes linked to motivation that can function as a barrier or facilitator to reach sustained PA.

3.4.1. Customized PA

The importance of customized PA as a motivator was mentioned from both perspectives. Customized PA should match the capabilities of people (physically and cognitively) and their wishes and preferences. Besides, the healthcare professional should also consider that some people do not like exercising and adapt to that (stories 3, 8 and 9).

3.4.2. Increasing awareness

Another motivation that the healthcare professional often focuses on is increasing awareness of the patient, by using education or confrontation.

3.4.3. Meaningful purpose

Some patients said that having a meaningful purpose motivates them to keep moving (stories 2 and 8). Healthcare professionals also said they often use this as a strategy. They link goals to a patient's meaningful activities and find that this motivates a patient to persevere (story 1).

3.4.4. Exercising in a group

According to patients and healthcare professionals, exercising in a group can be a facilitator (story 9). Some patients exercise to be among people and not primarily to achieve sustained PA. This knowledge can be used by the healthcare professional in the treatment. By contrast, several patients stated they do not want to exercise in a group.

3.4.5. Success experiences

The importance of success experiences, such as experiencing health benefits, as a facilitator is endorsed from both perspectives (stories 1, 2 and 8). Patients also talked about the negative effect of failure experiences (story 10).

Story 8 'Climbing for my granddaughter'

Wilda, patient narrates:

I try to stay as mobile as possible. I don't experience pain; I just get so stiff. When my granddaughter turned 35, I really wanted to go to her birthday. She lives alone in an old house in Amsterdam, with enormous steep stairs. To get to her apartment I had to climb 3 steep stairs and I had been sick just before her birthday and hadn't fully recovered yet. But I did it. I went up all 50 steps and went to her birthday. She is my 1st grandchild and will always have a special place in my heart.

Story 9 'Club '

Eddy, nurse practitioner, narrates:

A lady was at an aquarobics club. She liked this very much but unfortunately she got sick and had some problems in her personal environment. Because of this she didn't go a few times and then she felt the step to go again was too big. Then she came back to me because she thought she didn't exercise enough. I contacted the sports consultant and together we took the step to go back. She was very kindly received by the aquarobics club and ever since she goes back again.

3.4.6. Aversion to sports

Aversion to sports is related to patients not liking sports or talking about sports with the healthcare professional – it scares them and can be a barrier. They may not like this, but still want to be more physically active in daily life. The aversion to sports was sometimes described as the unpleasant experience of body signals during intensive exercise and as being related to negative exercise experiences in the past (story 10). Healthcare professionals did not address this topic.

Story 10 'Born without an activity-gene'

Vera, patient, narrates:

I like riding my bike, but if I don't move I like it too. Reading a book on the couch is something I can do for hours. I don't like anything about moving, to be honest. Out of everything, I like cycling the most. As a child it was terrible. Holidays with my parents in the mountains in Switzerland everyone liked to walk up mountains, except me and that ended in crying and tantrums. I was tired and, experienced painful feet of that constant upward walking. I noticed that I don't like being out of breath at all or having soured legs. I think that's terrible, really. Getting out of breath, sweating, your heart rate going up, I find it terrible, a very uncomfortable feeling, really awful. Fun in moving is very difficult for me because I always say 'I was born without a movement-gene'. In other words, I don't like moving at all.

4. DISCUSSION

The objective of this study was to identify implicit and more profound barriers and facilitators of sustained PA in patients with a chronic disease, including the patient's context. Additionally, perspectives of participating patients and healthcare professionals were compared, and afterwards linked to the three main parts of COM-B model: capability, opportunity and motivation. In line with findings of Franco and colleagues, trusting oneself – both physically and mentally – and trusting the healthcare professional, were aspects linked to the capability to show a certain behaviour.[20] Literature reports that financial, material and logistical conditions and collaboration among healthcare professionals can be both barriers or facilitators on maintaining healthy exercise behavior.[20-22] Important facilitators found in this study were customized PA, awareness of the importance of PA, social aspects of PA, meaningful activities and success experiences. These facilitators are comparable to those reported in literature.[20 23]

Although we found similar transcending barriers and facilitators, our study revealed more subtle and profound information about these barriers and facilitators from the patient perspective in daily life. Additionally, we were able to compare and learn from both the perspective of the health care professional and the client. Comparing the perspective of patients with that of healthcare professionals revealed different views and beliefs regarding the main themes of temporary interruption, aversion to sports and health literacy. Firstly, patients may find it difficult to pick up activities after an interruption, which obstructs sustained PA. Such interruptions included medical (e.g., surgery) or social interruptions (e.g., holiday). In addition, seasonal changes were brought up as possible interruptions. It seems as if patients struggle to cope with setbacks, which is an element of self-management skills (stories 5, 7 and 9).[47] Raising healthcare professionals' awareness of this struggle may provide a valuable lead for improvement of coaching and interventions.[48] Secondly, patients' stories often revealed an aversion to sports, originating from unpleasant bodily reactions or negative past experiences. Healthcare professionals did not describe this explicitly. Recognizing that some patients do not like PA and may prefer talking about 'moving/movement' instead of 'sport/exercising' could help (story 10). Also, healthcare professionals should be more aware of a patient's perception of unpleasant bodily reactions and explore how to accommodate for this in the choice of activity, advice or intensity of training. To increase the probability of achieving a sustained effect, healthcare professionals could focus on meaningful PA and integrating PA into the patient's general daily life as much as possible. A theme only mentioned by healthcare professionals is health literacy. They argued that the Dutch healthcare system does not provide for the extensive support that some patients need due to low health literacy, resulting in more consultations (story 4). Perhaps, these patients were not able to reflect or verbalize the limits

of their health literacy, or the healthcare professional is not able to adjust to the needs of the patients. It is important to realize that if a main theme does not emerge from the stories of either patients or healthcare professionals, this does not mean that the persons in question do not have an opinion on that theme. However, because the importance of the themes for maintaining PA is indicated from one perspective, it may provide important insights for PA promoting programs. In future studies, these themes should be studied more explicitly.

The patients participating in this study all participated or had participated at least once in a PA-promoting program, which goes say they were motivated to change their PA behaviour. We specifically chose to include these patients because they could tell about attempts to reach sustained PA. However, this selection of participants limits the transferability of results to a population not participating in a PA-promoting program. The healthcare professionals selected for this study represent the variety of healthcare professionals in the Dutch primary healthcare system that play a role in the support of patients with chronic diseases to reach sustained PA.[10] Although the sample sizes were relatively small, similar themes were found in the analysis (data saturation was reached). By conducting member checks, our interpretation of the stories was verified by the participants, which positively influences the validation of our data.[49]

The storytelling method allows participants to talk about their own experiences in their own context, without external constraints or preconceived ideas of the interviewer.[38] Because stories provide an emphasis to the relationship between experiences and emotions, action and consequences, we obtained profound and implicit knowledge about the subject of this study. In contrast to more general used qualitative study methods in health science, storytelling has the promise to potentially reveal something additive by comprising an individual's perceived truth linked to their daily life.[36 38 39] An important focus point in data used in storytelling research is to strive for a decision-trail that is transparent enough for reproducibility, which was done in this study by following the steps of the COREQ checklist.[36 43] By linking the explored barriers and facilitators to theory (COM-B model), results were not only structured and compared to existing literature, but were also analyzed in light of the context of the participants. Additionally, it should be mentioned that not all found barriers and facilitators could be classified to only one part of the COM-B model, but could be multi-interpretable. For example, the main theme 'customized PA' was classified as a motivator, but also could be related to opportunity. By conducting phase 3 of our analysis process with all four researchers, discussing thoroughly and rereading the underlying stories, we tried to make sure the classification represents our data as much as possible. Summarized, by using storytelling as our research method and utilizing the COM-B model as a framework, our study revealed insights in promising themes that could assist in designing better interventions for sustained PA.[31 32 36]

Although most of the researchers who contributed to this study were experienced in conducting qualitative research, the storytelling training indeed assisted to develop the skills to jointly construct narrative and meaning, as suggested in literature.[38] Attention was given to creating an optimal narrative climate, by establishing a relationship prior to the interview, being interested and explaining that there was no right or wrong response. A sensitizing question was asked at the start of the interview. Thereafter, narrative questions were asked. Of importance was that the interviewer focused on the storytelling, so as to facilitate appropriate follow-up questions about missing narrative elements (see supplementary file 2).[38 46]

In qualitative research, important considerations are the researchers' professional experience and reflexivity. All four primary researchers were female, worked as researchers and teachers at a University of Applied Sciences for physical therapy, and two had worked as physiotherapists in primary care in the past. Being aware of the importance of PA for individual health, as well as having opinions and knowledge about the healthcare system might mitigate regarding the data with an open view, limiting the interpretation of the data.[50] On the other hand, the interviewers being experienced healthcare professionals may have been an advantage in that the participants probably were more willing to share experiences.[51] Conducting a constant comparative analysis method, in which at least two researchers were involved in each selection or analyzing part, ensured that the main themes were rooted in the data[52] and that intersubjectivity was reached among the four researchers, thereby increasing the quality of the analysis.

New elements found which are important to keep in mind when supporting sustained PA are attention to a possible future temporary interruption and less focus on sports participation. Furthermore, the results of our study underline the importance of taking the patient's context into account in providing personalized support of sustained PA. While this may cost time during the treatment program, it might be more efficient to reach sustained PA.

5. CONCLUSION

This study identified additional and more detailed information on barriers and facilitators concerning sustained PA in primary care. Building upon one's individual context and comparing the perspectives of both patients and healthcare professionals helped us draft clues for improvement of the support of sustained PA for patients with chronic diseases. Trust in one's own capabilities and in the healthcare professional, as well as health literacy were main themes emerging from the data. Motivators for sustained PA were customized PA, increasing awareness, social aspects of PA, meaningful goals and activities, success experiences and coping with temporary interruption. Interprofessional collaboration and prerequisites such as financial or materialistic needs can be beneficial or obstructive. We found that paying attention to possible future temporary interruption and less focus on sports participation could be important elements in developing personalized guidance programs for sustained PA in primary health care. Using a narrative method such as storytelling seems appropriate for studies in which context is important.

END STATEMENTS

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Contributors All authors contributed to conceiving and designing the study. JB, AF, AH and PS contributed to the data collection and conducted the data analysis. Initial drafts of the manuscript were written by JB, which were reviewed and edited by the other authors. All authors approved the manuscript.

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Competing interests None declared

Patient and public involvement Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. See the Methods section for further details.

Patient consent for publication Not required.

Ethics approval The study was approved by the Regional Ethics Board(METC-number: 19-077). All participants provided written informed consent before data collection. **Provenance and peer review** Not commissioned; externally peer reviewed.

Data availability statement The datasets generated and analyzed during the current study are not publicly available due to the risk of compromising the individual privacy of participants and are available from the corresponding author on reasonable request.

Supplemental material

Supplement 1. COREQ check

Supplement 2. Interview guide

Supplement 3. Template stories

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Legends figures

Legend figure 1.

Figure 1. Results analysis process

The analysis steps displayed in the left column are linked to the steps in table 1.

AH refers to author Arlette Hesselink
PS refers to author Petra Siemonsma
JB refers to author Johanna de Boer
AF refers to author Anita Feleus

Legend figure 2.

Figure 2. Main themes organized according to COM-B model
The main themes are linked to the C (capability), O (opportunity) or M (motivation)

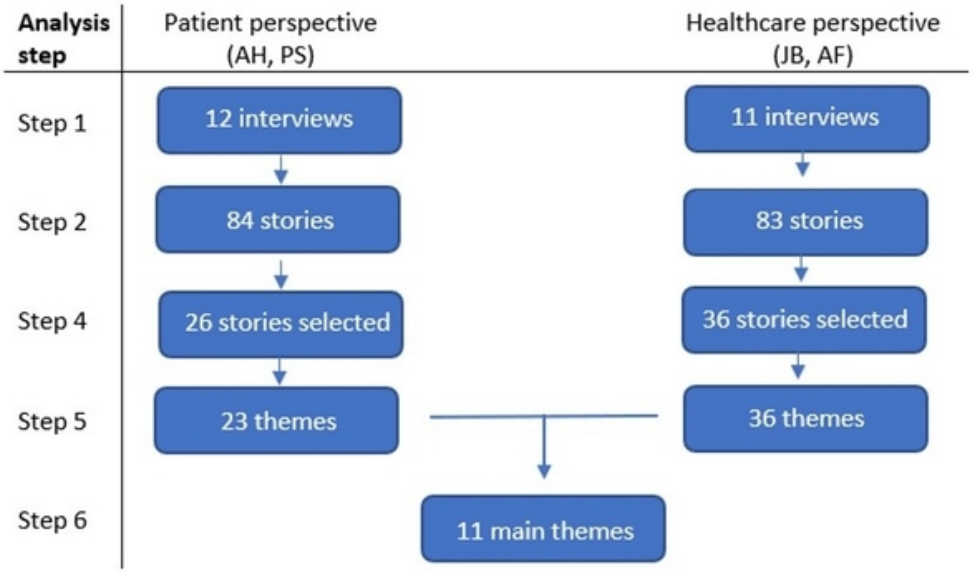

Figure 1. Results analysis process

51x30mm (300 x 300 DPI)

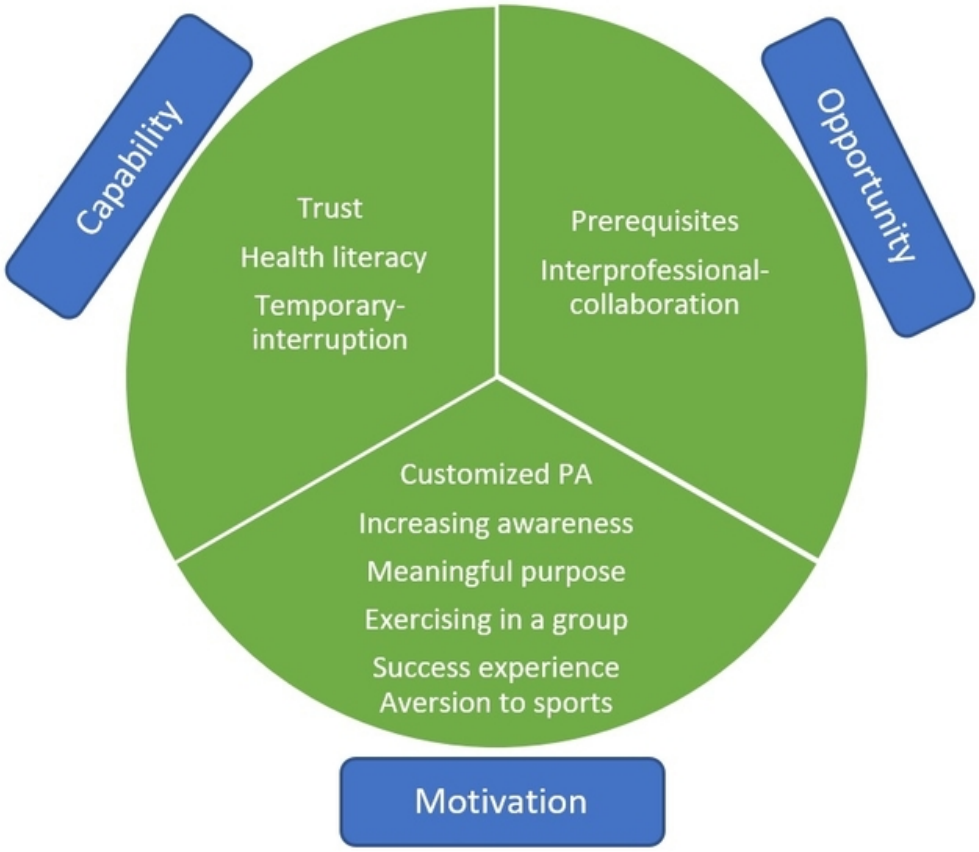

Figure 2. Main themes organized according to COM-B model

54x47mm (300 x 300 DPI)

Additional file 1

Consolidated criteria for reporting qualitative studies (COREQ): 32-item checklist

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. Int J Qual Health C. 2007; 19(6): 349–357. http://dx.doi.org/10.1093/intqhc/mzm042

Topic	Item no.	Guide question/description	Reported on page no.
Domain 1: Research team reflexivity			
Personal characteristics			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	Paragraph 2.3
Credentials	2	What were the researcher's credentials?	Paragraph 2.3 + chapter 4
Occupation	3	What was their occupation at the time of the study	Chapter 4
Gender	4	Was the researcher male or female?	Chapter 4
Experience and training	5	What experience or training did the researcher have?	Paragraph 2.3 + chapter 4
Relationship with participants			
Relationship established	6	Was a relationship established prior to study commencement?	Chapter 4
Participant knowledge of the interviewer	7	What did the participants know about the researcher? E.g. personal goals, reasons for doing the research	N/A
Interviewer characteristics	8	What characteristics were reported about the interviewer? E.g. bias, assumptions, reasons and interests in the research topic	Chapter 4
Domain 2: Study design			
Theoretical framework			
Methodological orientation and Theory	9	What methodological orientation was used to underpin the study? E.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	Paragraph 2.1 + 2.5
Participant selection			
Sampling	10	How were participants selected? E.g. purposive, convenience, consecutive, snowball	Paragraph 2.2
Method of approach	11	How were participants approached? E.g. face-to-face, telephone, mail, email	Paragraph 2.2
Sample size	12	How many participants were in the study?	Chapter 3 (table 2)
Non-participation	13	How many people refused to participate or dropped out? Reasons?	N/A
Setting			
Setting of data collection	14	Where was the data collected? E.g. home, clinic, workplace	Paragraph 2.4
Presence of nonparticipants	15	Was anyone else present besides the participants and researchers?	Paragraph 2.4
Description of sample	16	What are the important characteristics of the sample? E.g. demographic data	Chapter 3 (table 2)
Data collection			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	Paragraph 2.4 + supplement 2
Repeat interviews	18	Were repeat interviews carried out? If yes, how many?	N/A
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	Paragraph 2.4
Field notes	20	Were field notes made during and/or after the interview or focus group?	Paragraph 2.4

Duration	21	What was the duration of the interviews or focus group?	Paragraph 2.4
Data saturation	22	Was data saturation discussed?	Chapter 4
Transcripts returned	23	Were transcripts returned to participants for comment and/or correction	Paragraph 2.6
Domain 3: analysis and findings			
Data analysis			
Number of data coders	24	How many data coders coded the data?	Paragraph 2.6
Description of the coding tree	25	Did authors provide a description of the coding tree?	Chapter 3 (Figure 2: represents the themes)
Derivation of themes	26	Were themes identified in advance or derived from the data?	Paragraph 2.6 (table 1)
Software	27	What software, if applicable, was used to manage the data?	Paragraph 2.6 (table 1)
Participant checking	28	Did participants provide feedback on the findings?	Paragraph 2.6 (table 1)
Reporting			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? E.g. participant number	Chapter 3
Data and findings consistent	30	Was there consistency between the data presented and the findings?	Chapter 3
Clarity of major themes	31	Were major themes clearly presented in the findings?	Chapter 3
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	Chapter 3

Additional file 2

Interview guide: patients

Introduction

Getting acquainted, organizing materials.

- Ensure to create a narrative climate. Consider:
  - Safe environment
  - Being patient, emphatic and curious
  - Create space for listening and narrating (even when you experience time pressure)
- Connect with the participant by (for example):
  - Complimenting about their home, interior design or surroundings
  - Talking about your commute
- Important: sincere intention to listen to the participant's experiences

Transition to the conversation by explaining the order of the conversation. Give the participant the opportunity to ask questions about any vagueness.

Introduction to the conversation

Do you give permission to record this conversation, so I can focus on listening?

<confirm, sign Informed consent form and start tape recorder>

Thank you that I can record this conversation. This makes it possible to re-listen and transcribe it. After the transcription has been made, the audio recording will be deleted. In the report, I will use a fictitious name, although your real age will be used. So, your story cannot be traced to you. Please, could you state your age?

In this study, we will collect stories on how different people experience physical activity. We want to know more about what motivates people to initiate, maintain, and perhaps obstructs them to be physical active. The results will be used to improve the support of physical activity in primary care. The primary healthcare professionals could be a physical therapist, family doctor or nurse practitioner. I have scheduled an hour for this conversation; does that suit you as well? Everything you tell about your experiences, good or bad, is helpful. I am very curious about your experiences about being physical active.

Do you have any questions?

Conversation

Introduction question (sensitizing).

To start, I am very curious to know what you think about being physical active. Please can you tell me something about that?

<make sure the participant does not merely think about exercising/sports, but about physical activity in a broader context>
<remember being silent to provide enough space for the participant, confirm non-verbally while listening to encourage him or her to go on>

Narrative questions: (these are exemplary questions, you need not to ask all the questions. More important is to ask follow-up questions about missing narrative elements)

1. *Could you tell me about a specific situation when you were physical active and thought: 'Right now I really am having fun!'*

2. *Could you tell me about a specific moment you look back on with pride because you succeeded in having enough physical activity? What made you succeed then?*
3. *Could you describe a specific situation in which you thought: 'I don't enjoy being physical active anymore, I quit right now'.*
4. *Could you describe a specific situation in which a person or circumstance really discouraged you to maintain being physical active?*
5. *Do you have an example of a situation when you thought: 'Maintaining being physical active is really difficult, but I still did it! What helped you in that situation?'*
6. *Could you give an example of a situation in the past year when you noticed that a healthcare professional helped or motivated you a lot? What happened, how did that go?*
7. *You participated in a PA promoting program. Could you take me to a specific moment when you felt really motivated to maintain being physical active, also after the program had ended?*
8. *If you could decide what the optimal support program for PA would look like? How would it look like then?*

During the conversation, remember: careful listening, following and confirming non-verbally, falling silent to give opportunity to narrate more. Only ask questions about specific situations linked to a (positive or negative) emotion.

Be aware of stepping stones to a narrative question. For example, if someone says 'that really disappointed me', there is an opportunity to connect by asking a narrative question such as: 'What exactly disappointed you so much? What happened exactly and who was involved? Be aware not to judge, or being positive (compliment). You need not give feedback or a solution. After the answer, thank the participant for telling this.

When a narrative element is missing in the story, you may ask additional questions about:

- Supporters: '*Where there people or things helping you in that situation?'*
- Opponents: 'Where there people or things getting in the way or obstructing you?'
- Struggle: 'What did you struggle with? What was the main struggle?
- (Plot) twist: '*What happened? What was the turning point?*'
- Main character: '*About who is it?'*
- Time, place and person: '*Where exactly did it happen? When was this? Who were involved?*

Closing

Thanks you very much for all the stories about you being physical active. Great that you shared these stories. This provides a valuable contribution to our study. To thank you we have a small gift for you <hand over the gift voucher>

Thanks again for sharing the stories about your experiences on being and maintaining physical active.

<Let the recorder run a bit longer. Sometimes extra relevant information comes up>

Interview guide: Healthcare professionals

Introduction

Getting acquainted, organizing materials.

- Ensure to create a narrative climate. Consider:
  - Safe environment
  - Being patient, emphatic and curious
  - Create space for listening and narrating (even when you experience time pressure)
- Connect with the participant by (for example):
  - Complimenting about their home, interior design or surroundings
  - Talking about your commute
- Important: sincere intention to listen to the participant's experiences

Transition to the conversation by explaining the order of the conversation. Give the participant the opportunity to ask questions about any vagueness.

Introduction to the conversation

Do you give permission to record this conversation, so I can focus on listening?

<confirm, sign Informed consent form and start tape recorder>

Thank you that I can record this conversation. This makes it possible to re-listen and transcribe it. After the transcription has been made, the audio recording will be deleted. In the report, I will use a fictitious name, although your real age will be used. So, your story cannot be traced to you. Please, could you state your age? And what is your function/occupation in the work situation? In this study we will collect stories about healthcare professionals' experiences supporting patients to sustain physical activity. Besides, we collect stories about how healthcare professionals motivate their patients to be and maintain physical active and what barriers they experience. We would like to know what drives people to start being physical active, what it takes to maintain it and what obstructs them. By collecting stories of healthcare professionals we could, in the end, develop an effective method to increase sustained physical activity.

I have scheduled an hour for this conversation, does that suit you as well? Everything you have experienced and narrate, good or bad, is helpful. We are curious about your experiences of physical activity of your patients and your strategies to keep them physical active.

Do you have any questions?

Conversation

Introduction question (sensitizing).

To start, I am very curious what you think about supporting sustained PA, in for example <name intervention they were involved in>. What did you experience? Please could you tell something about that? What moment impacted the most?

<Remember: we want to know about what the healthcare professionals do themselves, not what patients do>

<Remember being silent to provide enough space, confirm non-verbally while listening to encourage the participant to continue narrating>

Narrative questions: (these are exemplary questions, you need not ask all the questions. More important is to ask follow-up questions about missing narrative elements)

1. *Could you tell me about a specific situation of a client in which you thought:' in that moment I really helped a patient, I was really happy about that, I wish every time it would go like that?'*

2. *Could you tell me about a specific event you regard as: 'this is why I enjoy to work with this patient group so much?'*

   <try to invite a specific example of one patient. When the narrator states to really have added something, ask: could you give an example?>

3. *Could you describe a specific moment when you thought: 'It is really difficult to motivate this client'? What made it difficult for you? What did you do? Who were involved?*

4. *Could you describe a specific situation in which you were concerned about permanent effects of the PA promoting program and your support within this program? What made you being concerned?*

5. *Do you have an example of a situation when the support of a patient to sustained PA was frustrating or even unwanted?*

6. *Could you tell your dream image/nightmare in supporting sustained PA? Please be as specific as possible.*

7. *Could you tell about a situation that represents what you stand for concerning sustained PA? Please be as specific as possible. What happened exactly, who were involved?*

8. *Could you tell about a situation during the PA promoting program when you thought: 'That's really frustrating; if we keep working like this we will not improve.'*

9. *Could you take me to a moment when you were proud of yourself when supporting sustained physical activity?*

During the conversation, remember: careful listening, following and confirming non-verbally, falling silent to give opportunity to narrate more. Only ask questions about specific situations linked to a (positive or negative) emotion.

Be aware of stepping stones to a narrative question. For example, if someone says 'that really disappointed me', there is an opportunity to connect by asking a narrative question such as: 'What exactly disappointed you so much? What happened exactly and who was involved? Be aware not to judge, or being positive (compliment). You need not give feedback or a solution. After the answer, thank the participant for telling this.

When a narrative element is missing in the story, you may ask additional questions about:

- Supporters: '*Where there people or things helping you in that situation?'*
- Opponents: 'Where there people or things getting in the way or obstructing you?'
- Struggle: 'What did you struggle with? What was the main struggle?
- (Plot) twist: '*What happened? What was the turning point?*'
- Main character: '*About who is it?'*
- Time, place and person: '*Where exactly did it happen? When was this? Who were involved?*

Closing

Thanks you very much for all the stories about you being physical active. Great that you shared these stories. This provides a valuable contribution to our study. To thank you we have a small gift for you <hand over the gift voucher>

Thanks again for sharing the stories about your experiences on being and maintaining physical active.

<Let the recorder run a bit longer. Sometimes extra relevant information comes up>

Additional file 3

Template stories (in preparation of analysis)

(How are we going to set up the stories (elements and lay-out)?)

Title story
Name narrator (fictious), function/role (patient or function), age:
"*italic* the story (date + initials researcher)
Put optional themes under the story. By doing so you answer the next question: 'what does this story teach me about the research question?'

Lay-out stories- uniformity:
- Colloquial language can be removed when essence of the story stays the same
- Facts can be added
- Write in I-form (instead of 'you fall' etc.)
- The story must be understandable for an outsider

What is a story?
- Representation of events that are put into order to each other. Narrative of a story:
    - Stands on itself
    - Has a beginning, middle and end
    - Contains narrative elements
    - Evokes emotions or is narrated with emotions
    - Is personal, authentic and true

- Narrative elements:
    - Main character – Who is it about?
    - Supporters- Who/what helped?
    - Opponents- Who/what obstructed?
    - Struggle - What did you struggle with?
    - Plot change – What happened?
    - Time, location, person

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TITLE PAGE

Title

Using storytelling methodology to identify barriers and facilitators of sustained physical activity in patients with a chronic disease: a qualitative study

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ABSTRACT

Objectives

To identify implicit and more profound barriers and facilitators and involving context elements to accomplish sustained physical activity (PA) in patients with a chronic disease. Understanding these barriers and facilitators may help develop future strategies to be used by healthcare professionals in primary care to support patients with a chronic disease to reach sustained physical activity.

Design and methods

The qualitative, narrative research method storytelling was applied. Perspectives of both patients with a chronic disease (n=12) and involved healthcare professionals (n=11) were collected. Stories were audiotaped and retrieved from the transcriptions. Analysis involved a cyclic process of constant comparison. Main themes were arranged in the theoretical framework of the COM-B model.

Participants

Patients were adults with a chronic disease or at high risk of developing a chronic disease who participated in a PA promoting program. Eligible healthcare professionals were those involved in these PA promoting programs in primary care, such as physiotherapists, nurse practitioners or sports consultants.

Results

From 176 stories, 62 relevant and unique stories were selected for further analysis. Eleven main themes were identified and afterwards linked to the COM-B model. Trust in one's own capabilities and in the healthcare professional were relevant themes. Also, health literacy and coping with temporary interruption were important capabilities. Important motivators were customized PA, increasing awareness, meaningful activities, exercising in a group, and success experiences. Aversion to sports was seen as a barrier. Interprofessional collaboration and prerequisites can be a facilitator of a barrier.

Conclusions

This study provides insight in deeper motivations, barriers and facilitators of sustained PA from both the patients' and healthcare professionals' perspective. Comparing these perspectives revealed different views and beliefs on some themes. Attention for temporary interruptions, aversion to sports and health literacy were identified to be important for sustained physical activity.

Strengths and limitations of this study

- By using storytelling implicit barriers and facilitators important for sustainable PA are explored among patients with a chronic disease.
- Perspectives of both patients and healthcare professionals were included and compared, providing relevant clues for the improvement of support for sustainable PA.
- Researchers were trained to improve their storytelling skills, which is important to ensure a narrative climate during the interviews, in order to collect real life stories.
- Intersubjectivity was reached among 4 researchers, increasing the quality of the study.
- Patients participating in this study took part (at least once) in a PA promoting program, limiting the transferability of results to a population less motivated.

1. INTRODUCTION

The numbers of people living with a chronic disease, such as cardiovascular disease, diabetes and cancer, are substantial and increasing worldwide.[1] Living with a chronic disease has considerable consequences for one's health, quality of life and social involvement, and is the cause of 71% of premature death rates worldwide.[2] Integrating physical activity (PA) into one's lifestyle decreases the risk of developing a chronic disease and reduces the severity of clinical characteristics.[2-9] Guidelines recommend that everyone engages in moderate intensity PA for at least 150 minutes every week, spread over several days, and strength enhancing activities at least twice a week. In addition, long periods of sitting are to be avoided.[10, 11] Even though the positive effects of PA are evident, 30% of the world's population does not meet PA guidelines. For over 60-year-olds, this proportion is even larger; i.e.,45%.[12] In the Netherlands, more than 50%, of people with a chronic disease are not able to meet PA guidelines.[13]

Sustained PA is primarily the responsibility of people themselves. However, not everyone is able to initiate and maintain sustained PA, due to insufficient health literacy – and in spite of support from primary healthcare professionals.[14] Various primary healthcare professionals, such as physiotherapists and nurse-practitioners, support people with chronic diseases to improve their PA. In many cases, the therapy plan includes more PA.[15]

Not complying to PA guidelines is associated with: low level of health literacy, low level of education, obesity and chronic disease.[16-19] Patient-reported barriers for integrating PA into one's lifestyle are: sedentary habits, lack of social support, competing priorities, limited access to PA and apathy. In addition, physical limitations, lack of self-confidence, financial problems, and lack of experiencing success have been described as barriers PA.[20] Reported facilitators for PA are: accessible facilities, tailored training programs, attention for positive exercise experiences and beliefs, sufficient knowledge and social support.[21, 22] Additionally, education about the importance of PA and improving environmental and financial access appear to be helpful.[20, 22, 23]

Most of the intervention studies on barriers and facilitators for PA show short-term effects only. Sustained effects have rarely been studied nor found.[24-26] Moreover, lack of detail in the description of promising interventions makes it difficult to replicate treatment.[27-29]

Therefore, it is important to distinguish between initial behavior change (short-term) and sustained behavior change (long-term), the latter of which is harder to achieve.[30] Evidence suggests that a personalized approach, including a person's context, is needed to reach

sustained PA.[31] The personal context contains individual characteristics and physical, psychological and social functioning in one's own living environment.[32]

To gain insight into the personal context it is important not only to focus on explicit factors, but also gain knowledge about more implicit factors of importance to sustained PA.[32-35] This study aims to identify implicit and explicit barriers and facilitators to sustained PA for people with a chronic disease, including their context, by collecting perspectives of both patients and healthcare professionals. This study, therefore, employs a narrative research method. In addition, the Behaviour Change Wheel (BCW) framework is used to order and grasp a better understanding of the identified barriers and facilitators. The BCW summarizes current knowledge about behaviour change techniques. Its center is the Capability, Opportunity and Motivation (COM-B) model, which can be used as a starting point to understand behaviour (B) in its context.[32]

2. METHODS

2.1 Research design

To gain understanding of barriers and facilitators to sustained PA related to patients with a chronic disease and their context, a narrative research method – storytelling – was applied. Storytelling is an established and emerging research method in health and social science.[36, 37] Storytelling can be used to obtain more nuanced, contextualized and culturally reflective data than other qualitative research methods do, e.g. semi-structured interviews. In storytelling the participant is asked to tell about his/her experience of interest using a sensitizing question. Therewith the participant is completely free to tell about any aspect of the experience of interest. The interviewer's role is to create a narrative climate and only asks questions to complete the narrative elements of a story (i.e. people involved, reactions, emotions). A single interview can contain multiple stories. A narrative question invites the participant to tell about a specific situation linked to an emotion around PA, either positive or negative.[36, 38] Storytelling focusses on the perspective of the participants, who lived the experiences as an insider, and will therefore provide important insights and ideas, and a deeper understanding of barriers and facilitators. This presupposes a subjective truth in the social context of the participant and reveals implicit knowledge about the subject of the study.[38-41] By using storytelling health-related information specific to one's own situation is contextualized.[36, 42] To ensure rich and informative data, stories of both patients and healthcare professionals about a specific situation linked to experiences and emotions were collected. The Consolidated criteria for Reporting Qualitative research guidelines (COREQ) were followed[43](see supplementary file 1).

2.2 Participants

Participants were selected by purposive sampling.[44] Eligible patients were adults who participated in a PA promoting program focusing on supporting people with one (or more) chronic diseases or at high risk of developing a chronic disease, such as cardiovascular disease, diabetes mellites type II, or being overweight (BMI > 25). Eligible healthcare professionals were those involved in these PA promoting programs in primary care, such as physiotherapists, nurse practitioners or sports consultants. We chose to select on these criteria because patients and healthcare professionals who participated in a PA promoting program have experienced success and/or failure in reaching sustained PA, so could share their stories about their experiences in trying to reach sustained PA. Eligible patients were contacted by their primary healthcare professional to participate. Patients who had provided consent for participation were contacted by telephone or e-mail by a member of the research group (see

below) to make an appointment for an interview. The study was approved by the Regional Ethics Board (METC-number: 19-077). All participants received an information letter and provided written informed consent before data collection.

2.3 Research group

The research group consisted of four primary researchers, experienced in conducting qualitative research (JB, AF, AH and PS) and eight trained students who assisted with the data collection. None of the members of the research group knew the participants before conducting the interviews. All had been trained in applying the storytelling method by an expert on storytelling, during three half-day sessions. The training included creating an interview guide, practicing interview skills, and analyzing data.

2.4 Data collection

The interviews were conducted individually, face-to-face, at a location chosen by the participant (participant's home, work or public place). An interview guide was used consisting of a short introduction, examples of narrative questions, and a list of narrative elements[38] (see supplementary file 2). To account for the difference in perspective, the narrative questions in the interview guide for the patients slightly differed from that for the healthcare professionals. All interviews lasted approximately one hour, were audio taped with consent, and the interviewer made brief field notes to aid later reflection. Participants received a gift voucher (worth 25 euros for patients, and 75 euros for healthcare professionals).

2.5 Theoretical framework

The COM-B model was used as a framework to organize the themes found in the analysis and to help understand behaviour in its context. The model assumes that human behaviour (B) is part of a system in which three central components affect each other: Capability, Opportunity and Motivation. Capability is a person's attribute referring to physical and psychological capability, for example body strength, knowledge or endurance to be able to execute PA. Opportunity is an attribute of a person's environmental system and can be physical or social. The combination of capability and opportunity makes a behaviour possible or facilitates it. Motivation is an aggregate of mental processes that energize and influence behaviour, and may be reflective or automatic.[32, 45]

2.6 Data analysis

The analysis consisted of interpreting texts in stories form. Data analysis was conducted in three phases (table 1). In phase 1, the audio recordings were transcribed ad verbatim and anonymized to ensure privacy. Stories were retrieved from the transcripts using a consensus-

based format (see supplementary file 3).[36, 38, 40, 46] Member checks were done with the participants. In phase 2, the primary researchers continued open and axial analysis in a cyclic process in which constant comparison between results during each step of the analysis was done. In phase 3, main themes were arranged into the COM-B model, which was used as a theoretical framework. Conclusions on how to integrate the findings into healthcare were discussed.

2.7 Patient and public involvement

In this study, participants were both healthcare professionals and patients. Storytelling is part of a larger project in which a method was developed in cocreation with patients and healthcare professionals that is more customized in its support to sustained PA. Before the start of the project, healthcare professionals were interviewed about their lack of competence in supporting people with chronic conditions. The research question was formulated based on their input.

Table 1. Analysis process

Phase 1: collecting and checking stories	
Step 1: transcription	Transcripts were made ad verbatim of each interview using audio recordings by the interviewer.
Step 2: stories	The interviewer collected stories from the transcripts using a consensus-based format, containing agreements on narrative elements and lay-out (supplement 3).
Step 3: member check	Participants were asked whether they recognized their stories derived from the interview, small adjustments were made in the stories.
Phase 2: analyzing by main research group	
Step 4: choosing relevant stories per perspective	After the stories were established, the main researchers continued further analysis. Stories were read and reread to familiarize with the data. A story was of relevance when it contained experiences of barriers and/or facilitators of sustained PA. A story was of relevance when it contained experiences of barriers and/or facilitators of sustained PA. Stories that where of relevance for the research question were independently chosen. Duplicates were included automatically in further analysis; inclusion of other stories were discussed, and consensus was found within duos.
Step 5: themes	Themes were linked to each story; consensus on the themes and their contents was reached in duos per perspective(open coding). Related themes were grouped together into main themes (axial coding). We asked ourselves what the essence of the stories per main theme was and created a story web using Microsoft Excel.
Step 6: comparing perspectives	Both duos presented the main themes from their own perspective. Themes, insights, similarities, and differences were discussed. If applicable, themes were renamed and consensus was reached in the main themes. Thereafter, constant comparison method was carried out in which conclusions were checked by going back to the stories. Differences between the perspectives were noted.
Phase 3: integration to framework	
Step 7: integration COM-B model	A discussion was conducted about the meaning of the separate parts of the COM-B model, in order to ensure the researchers were on the same page about the meaning of the COM-B model. After reading and rereading the themes and underlying stories, the four main researchers arranged the themes into the framework of the COM-B model (figure 2).

3. RESULTS

Twelve patients and eleven healthcare professionals participated (seven physiotherapists, three nurse practitioners and one sports consultant). Table 2 contains a summary of participants' demographic characteristics.

Table 2. Characteristics participants

Patients				*Healthcare professionals*			
Name*	***Sex***	***Age(y)***	***Chronic disease***	***Name****	***Sex***	***Age (y)***	***Profession***
Fariza	Female	30-39	Type-II diabetes, obese	**Lisa**	Female	30-39	Nurse practitioner
Paula	Female	70-79	Asthma, stroke	**Niki**	Female	20-29	Physiotherapist
Bert	Male	70-79	CVD^, stroke	**Andy**	Female	30-39	Physiotherapist
Myra	Female	40-49	Obese	**Jacky**	Female	20-29	Physiotherapist
Theo	Male	80-89	Frailty	**Hope**	Female	30-39	Physiotherapist
Pete	Male	70-79	Stroke	**Eddy**	Male	50-59	Nurse practitioner
Vera	Female	40-49	Obese, osteoarthritis	**Nathan**	Male	30-39	Sport consultant
Riki	Male	70-79	Obese	**Barbra**	Female	30-39	Physiotherapist
Wilda	Female	90-99	Frailty	**Mara**	Female	40-49	Physiotherapist
Mable	Female	50-59	Osteoarthritis, obese	**Gaby**	Female	60-69	Nurse practitioner
Rose	Female	40-49	Obese, Turner-syndrome	**Jake**	Male	50-59	Physiotherapist
Anne	Female	60-69	Osteoarthritis, obese				

**names are fictitious; ^ Cardiovascular disease*

3.1 Themes

The interviews with patients and healthcare professionals resulted in 84 and 83 unique stories, respectively. The researchers selected 26 stories from the patient's perspective, and 36 stories from the healthcare professional's perspective (step 4, table 1 + figure 1). Rereading the stories resulted in the emergence of 23 themes in the patients' stories and 36 themes in the healthcare professionals' stories (step 5, table 1). After discussion, these themes were clustered into 11 common main themes (figure 1). After that, the main themes were arranged in the COM-B model (step 7, table 1 + figure 2). Exemplar stories are embedded in the text. Some stories are exemplary for multiple themes and will be addressed to in the description of several themes.

-INSERT FIGURE 1 AND FIGURE 2 AROUND HERE-

3.2 Capability

Three themes seemed to be connected to one's capability to be physically active: trust, health literacy and temporary interruption.

3.2.1. Trust

Trust encompassed several aspects. Firstly, patients indicated that the lack of confidence in oneself can be an obstacle to be physically active. Limitations in bodily functioning or lack of

money were mentioned as reasons, as well as feeling ashamed of lack of physical fitness or one's bodily physique. These aspects sometimes made them feel anxious and inferior – and affected their self-confidence negatively. Healthcare professionals pointed out that they take a patient's lack of confidence into consideration by approaching the patient in a positive way and proceeding step-by-step, thereby increasing the patient's self-confidence (stories 1 and 2). Secondly, both perspectives indicated that trust in the treatment program is important for successful maintenance of PA. Lastly, the patients described that trust in the professional and the treatment program strongly depends on the feeling of being understood, the social relationship and the experienced expertise of the healthcare professional. The healthcare professional is consciously engaged in gaining trust because its importance is recognized (story 3).

Story 1 'Do your own shopping again'

Mara, physiotherapist narrates:

A nice example of what exercise can do to you is a story of one of my patients, a single man (70-79y). He has diabetes, his lungs are not good, he has chronic back pain and doesn't walk easily. In the beginning he was very reluctant to exercise. He was unhappy in his body. Our practice is not a gym. If you approach someone in a positive way and show him that there is a potential improvement you can achieve so much. He dares to cross the street again, walks outside with his walker and visits us every time he does his groceries to treat us and have a chat. It's nice to see that you can do something for someone in his life. That's why you try to persuade them to go and keep moving. He goes out much more often, has a totally different self-image and feels appreciated again. That's a nice side effect of being physically active.

Story 2 'Yes, I've done it again'

Mable, patient, narrates:

This summer, for the first time, I managed to swim 40 lanes again. I built it up from four lanes; each time one more lane. At one point I was back on the 40 lanes. At the end of those 40 lanes, in the water, I was like, 'Yes, I've done it again'. I also told the lifeguard, "I've got them again! Of course, he was enthusiastic. And on the way to the dressing room, I also told some people who were standing there. They also reacted: "Very nice!" They knew I was working on it. They often asked, "Where are you now?" "20 lanes. "So, you only need 20 more." "Where are you now?" '25'. I expanded it to 70 lanes and then I was set back by my knees, so I went back to 50-60 lanes. When the pool closed, I did not swim for two weeks. When I started again, I felt like I had loose bones in my knee, that does not swim well... I built that up again and this week I had 40 lanes again. That went smoothly, then I thought: "I can do it again".

Story 3 'It comes down to trust every time'

Andy, physiotherapist narrates:

I am a physiotherapist and started with a new patient last week who has a connective tissue disorder. He already had an umbilical hernia 14 times and they can't operate anymore. If he goes beyond his limits he is quickly exhausted. He was like: "well, let's talk first because I don't know if it's going to work out and I don't know what I can do". I've mainly been talking about that for an hour. And he went away with the outcome that he wanted to try. And that's what I like to hear. I first asked, "what have you done in the past"? "Then we're going to build on that, we'll start and take one step at a time. And he left with the feeling: "ok I'm confident I can build up here". So, I think that's an example of what I stand for when it comes to stimulating healthy exercise behavior. It comes down to trust every time, that's funny.

3.2.2. Health literacy

Healthcare professionals expressed their inability to help patients with insufficient health literacy. According to them, this inability can originate from the patient (cognitively) or from the framework of the healthcare system (story 4). Patients rarely addressed this topic themselves and may not be aware that healthcare professionals expect some degree of self-management.

Story 4 'We just can't do everything'

Jake, physiotherapist narrates:

A Moroccan man with four children, who is unemployed and deals with a lot of pain, participated in two PA programs within my practice. He speaks Dutch very well so we could talk about his functional impairments. Both programs lasted three months. In between the programs he didn't do anything, and his physical functioning deteriorated rapidly. We discussed to see what he wanted, and I even contacted some people that could help him. I said to him "you have to take that step yourself, I'm really not going to do that for you". And he didn't do it. And this really has to do with health literacy. I don't know if it has to do with Moroccan culture, but in this group I see more often that they do not dare to take the step. Maybe out of pride? We can't take this step for them either. If I want to go to a gym, I have to go there myself. We as physiotherapists don't get paid to take this step together with someone. We've discussed this extensively within the practice and I've already discussed it with the insurance company almost twenty times. We only get paid for the patients who are treated here. Nobody who is outside our profession understands that. We just can't do everything.

3.2.3. Temporary interruption

Patients said that a temporary interruption of PA, for instance for medical or social reasons, can be disastrous for sustained PA (stories 5, 6 and 9). They find it difficult to take it up again after an interruption. Healthcare professionals did not specifically mention this as an important theme.

Story 5 'In winter it collapses'

Rose, patient, narrates:

In summer, I manage to move around very well. I go to work cycling, it's nice, warm and sunny. In the autumn or winter, it all collapses with me. I don't really have the inspiration or the desire to do anything. Then I would like to lie in my bed all day, watch TV or read. And you also eat differently, a bit heavier. Spring and summer is really the best time for me. When it rains I don't feel like going to the gym. And in winter I don't like it either because I'm a person who falls easily. Somehow I can't motivate myself, it's just not easy for me in the winter. Until January it's usually okay, and after January it usually gets worse with motivation and energy. That's when I'm the least comfortable in my skin.

3.3 Opportunity

3.3.1. Prerequisites and interprofessional collaboration

Two main themes linked to 'opportunity' were prerequisites and interprofessional collaboration, which can contribute to or have a negative effect on sustained PA. The importance of prerequisites for sustained PA is identified in both perspectives. Patients did not always experience that healthcare professionals are aware of the importance of prerequisites for PA. Suboptimal prerequisites and collaboration between healthcare professionals negatively influences their PA. They underlined the importance of communication (making and keeping appointments) and personal contact (group size, personal attention in group) (story 6). The healthcare professionals mainly mentioned financial, material, and logistical prerequisites. Healthcare professionals are aware of the importance of these prerequisites (stories 4 and 7). They describe the importance of good collaboration between several healthcare disciplines for optimal support of the patient (stories 6 and 9).

Story 6 'Do something you like'

Fariza, patient narrates:

The nurse practitioner said: "you should do something you like". And walking is something I really like. Then I approached the sports consultant again to maybe find a walking group or something but somehow I haven't heard about it. That was also my mistake because I got very ill at that time and then I just couldn't respond to messages from the sports consultant among others. After that it hasn't really been discussed anymore by the sports consultant or something like that.

Story 7 'Funds & foundations'

Nathan, sport consultant, narrates:

I've helped a man with a mild intellectual disability. He's in a wheelchair because of an amputation of his right leg and right arm. He had been in military service, and also had PTSD. At first, he had to go to the physiotherapist. By doing so, we have tools to eventually move on to a gym. Through some funds and foundations from the military service and rehabilitation I was able to raise money so he could become a member. He owes his membership to that, so it helped him.

3.4 Motivation

We found six themes linked to motivation that can function as a barrier or facilitator to reach sustained PA.

3.4.1. Customized PA

The importance of customized PA as a motivator was mentioned from both perspectives. Customized PA should match the capabilities of people (physically and cognitively) and their wishes and preferences. Besides, the healthcare professional should also consider that some people do not like exercising and adapt to that (stories 3, 8 and 9).

3.4.2. Increasing awareness

Another motivation that the healthcare professional often focuses on is increasing awareness of the patient, by using education or confrontation.

3.4.3. Meaningful purpose

Some patients said that having a meaningful purpose motivates them to keep moving (stories 2 and 8). Healthcare professionals also said they often use this as a strategy. They link goals to a patient's meaningful activities and find that this motivates a patient to persevere (story 1).

3.4.4. Exercising in a group

According to patients and healthcare professionals, exercising in a group can be a facilitator (story 9). Some patients exercise to be among people and not primarily to achieve sustained PA. This knowledge can be used by the healthcare professional in the treatment. By contrast, several patients stated they do not want to exercise in a group.

3.4.5. Success experiences

The importance of success experiences, such as experiencing health benefits, as a facilitator is endorsed from both perspectives (stories 1, 2 and 8). Patients also talked about the negative effect of failure experiences (story 10).

Story 8 'Climbing for my granddaughter'

Wilda, patient narrates:

I try to stay as mobile as possible. I don't experience pain; I just get so stiff. When my granddaughter turned 35, I really wanted to go to her birthday. She lives alone in an old house in Amsterdam, with enormous steep stairs. To get to her apartment I had to climb 3 steep stairs and I had been sick just before her birthday and hadn't fully recovered yet. But I did it. I went up all 50 steps and went to her birthday. She is my 1st grandchild and will always have a special place in my heart.

Story 9 'Club'

Eddy, nurse practitioner, narrates:

A lady was at an aquarobics club. She liked this very much but unfortunately she got sick and had some problems in her personal environment. Because of this she didn't go a few times and then she felt the step to go again was too big. Then she came back to me because she thought she didn't exercise enough. I contacted the sports consultant and together we took the step to go back. She was very kindly received by the aquarobics club and ever since she goes back again.

3.4.6. Aversion to sports

Aversion to sports is related to patients not liking sports or talking about sports with the healthcare professional – it scares them and can be a barrier. They may not like this, but still want to be more physically active in daily life. The aversion to sports was sometimes described as the unpleasant experience of body signals during intensive exercise and as being related to negative exercise experiences in the past (story 10). Healthcare professionals did not address this topic.

Story 10 'Born without an activity-gene'

Vera, patient, narrates:

I like riding my bike, but if I don't move I like it too. Reading a book on the couch is something I can do for hours. I don't like anything about moving, to be honest. Out of everything, I like cycling the most. As a child it was terrible. Holidays with my parents in the mountains in Switzerland everyone liked to walk up mountains, except me and that ended in crying and tantrums. I was tired and, experienced painful feet of that constant upward walking. I noticed that I don't like being out of breath at all or having soured legs. I think that's terrible, really. Getting out of breath, sweating, your heart rate going up, I find it terrible, a very uncomfortable feeling, really awful. Fun in moving is very difficult for me because I always say 'I was born without a movement-gene'. In other words, I don't like moving at all.

4. DISCUSSION

The objective of this study was to identify implicit and more profound barriers and facilitators of sustained PA in patients with a chronic disease, including the patient's context. Additionally, perspectives of participating patients and healthcare professionals were compared, and afterwards linked to the three main parts of COM-B model: capability, opportunity and motivation. In line with findings of Franco and colleagues, trusting oneself – both physically and mentally – and trusting the healthcare professional, were aspects linked to the capability to show a certain behaviour.[20] Literature reports that financial, material and logistical conditions and collaboration among healthcare professionals can be both barriers or facilitators on maintaining healthy exercise behavior.[20-22] Important facilitators found in this study were customized PA, awareness of the importance of PA, social aspects of PA, meaningful activities and success experiences. These facilitators are comparable to those reported in literature.[20, 23]

Although we found similar transcending barriers and facilitators, our study revealed more subtle and profound information about these barriers and facilitators from the patient perspective in daily life. Additionally, we were able to compare and learn from both the perspective of the health care professional and the client. Comparing the perspective of patients with that of healthcare professionals revealed different views and beliefs regarding the main themes of temporary interruption, aversion to sports and health literacy. Firstly, patients may find it difficult to pick up activities after an interruption, which obstructs sustained PA. Such interruptions included medical (e.g., surgery) or social interruptions (e.g., holiday). In addition, seasonal changes were brought up as possible interruptions. It seems as if patients struggle to cope with setbacks, which is an element of self-management skills (stories 5, 7 and 9).[47] Raising healthcare professionals' awareness of this struggle may provide a valuable lead for improvement of coaching and interventions.[48] Secondly, patients' stories often revealed an aversion to sports, originating from unpleasant bodily reactions or negative past experiences. Healthcare professionals did not describe this explicitly. Recognizing that some patients do not like PA and may prefer talking about 'moving/movement' instead of 'sport/exercising' could help (story 10). Also, healthcare professionals should be more aware of a patient's perception of unpleasant bodily reactions and explore how to accommodate for this in the choice of activity, advice or intensity of training. To increase the probability of achieving a sustained effect, healthcare professionals could focus on meaningful PA and integrating PA into the patient's general daily life as much as possible. A theme only mentioned by healthcare professionals is health literacy. They argued that the Dutch healthcare system does not provide for the extensive support that some patients need due to low health literacy, resulting in more

consultations (story 4). Perhaps, these patients were not able to reflect or verbalize the limits of their health literacy, or the healthcare professional is not able to adjust to the needs of the patients. It is important to realize that if a main theme does not emerge from the stories of either patients or healthcare professionals, this does not mean that the persons in question do not have an opinion on that theme. However, because the importance of the themes for maintaining PA is indicated from one perspective, it may provide important insights for PA promoting programs. In future studies, these themes should be studied more explicitly.

The patients participating in this study all participated or had participated at least once in a PA-promoting program, which goes say they were motivated to change their PA behaviour. We specifically chose to include these patients because they could tell about attempts to reach sustained PA. However, this selection of participants limits the transferability of results to a population not participating in a PA-promoting program. The healthcare professionals selected for this study represent the variety of healthcare professionals in the Dutch primary healthcare system that play a role in the support of patients with chronic diseases to reach sustained PA.[10] Although the sample sizes were relatively small, similar themes were found in the analysis (data saturation was reached). By conducting member checks, our interpretation of the stories was verified by the participants, which positively influences the validation of our data[49]

The storytelling method allows participants to talk about their own experiences in their own context, without external constraints or preconceived ideas of the interviewer.[38] Because stories provide an emphasis to the relationship between experiences and emotions, action and consequences, we obtained profound and implicit knowledge about the subject of this study. In contrast to more general used qualitative study methods in health science, storytelling has the promise to potentially reveal something additive by comprising an individual's perceived truth linked to their daily life.[36, 38, 39] An important focus point in data used in storytelling research is to strive for a decision-trail that is transparent enough for reproducibility, which was done in this study by following the steps of the COREQ checklist.[36, 43] By linking the explored barriers and facilitators to theory (COM-B model), results were not only structured and compared to existing literature, but were also analyzed in light of the context of the participants. Additionally, it should be mentioned that not all found barriers and facilitators could be classified to only one part of the COM-B model, but could be multi-interpretable. For example, the main theme 'customized PA' was classified as a motivator, but also could be related to opportunity. By conducting phase 3 of our analysis process with all four researchers, discussing thoroughly and rereading the underlying stories, we tried to make sure the classification represents our data as much as possible. Summarized, by using storytelling as our research method and utilizing the COM-B model as a framework, our study revealed

insights in promising themes that could assist in designing better interventions for sustained PA.[31, 32, 36]

Although most of the researchers who contributed to this study were experienced in conducting qualitative research, the storytelling training indeed assisted to develop the skills to jointly construct narrative and meaning, as suggested in literature.[38] Attention was given to creating an optimal narrative climate, by establishing a relationship prior to the interview, being interested and explaining that there was no right or wrong response. A sensitizing question was asked at the start of the interview. Thereafter, narrative questions were asked. Of importance was that the interviewer focused on the storytelling, so as to facilitate appropriate follow-up questions about missing narrative elements (see supplementary file 2).[38, 46]

In qualitative research, important considerations are the researchers' professional experience and reflexivity. All four primary researchers were female, worked as researchers and teachers at a University of Applied Sciences for physical therapy, and two had worked as physiotherapists in primary care in the past. Being aware of the importance of PA for individual health, as well as having opinions and knowledge about the healthcare system might mitigate regarding the data with an open view, limiting the interpretation of the data.[50] On the other hand, the interviewers being experienced healthcare professionals may have been an advantage in that the participants probably were more willing to share experiences.[51] Conducting a constant comparative analysis method, in which at least two researchers were involved in each selection or analyzing part, ensured that the main themes were rooted in the data[52] and that intersubjectivity was reached among the four researchers, thereby increasing the quality of the analysis.

New elements found which are important to keep in mind when supporting sustained PA are attention to a possible future temporary interruption and less focus on sports participation. Furthermore, the results of our study underline the importance of taking the patient's context into account in providing personalized support of sustained PA. While this may cost time during the treatment program, it might be more efficient to reach sustained PA.

5. CONCLUSION

This study identified additional and more detailed information on barriers and facilitators concerning sustained PA in primary care. Building upon one's individual context and comparing the perspectives of both patients and healthcare professionals helped us draft clues for improvement of the support of sustained PA for patients with chronic diseases. Trust in one's own capabilities and in the healthcare professional, as well as health literacy were main themes emerging from the data. Motivators for sustained PA were customized PA, increasing awareness, social aspects of PA, meaningful goals and activities, success experiences and coping with temporary interruption. Interprofessional collaboration and prerequisites such as financial or materialistic needs can be beneficial or obstructive. We found that paying attention to possible future temporary interruption and less focus on sports participation could be important elements in developing personalized guidance programs for sustained PA in primary health care. Using a narrative method such as storytelling seems appropriate for studies in which context is important.

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Supplemental material

Supplement 1. COREQ check

Supplement 2. Interview guide

Supplement 3. Template stories

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Legends figures

Legend figure 1.

Figure 1. Results analysis process

The analysis steps displayed in the left column are linked to the steps in table 1.

AH refers to author Arlette Hesselink
PS refers to author Petra Siemonsma
JB refers to author Johanna de Boer
AF refers to author Anita Feleus

Legend figure 2.

Figure 2. Main themes organized according to COM-B model
The main themes are linked to the C (capability), O (opportunity) or M (motivation)

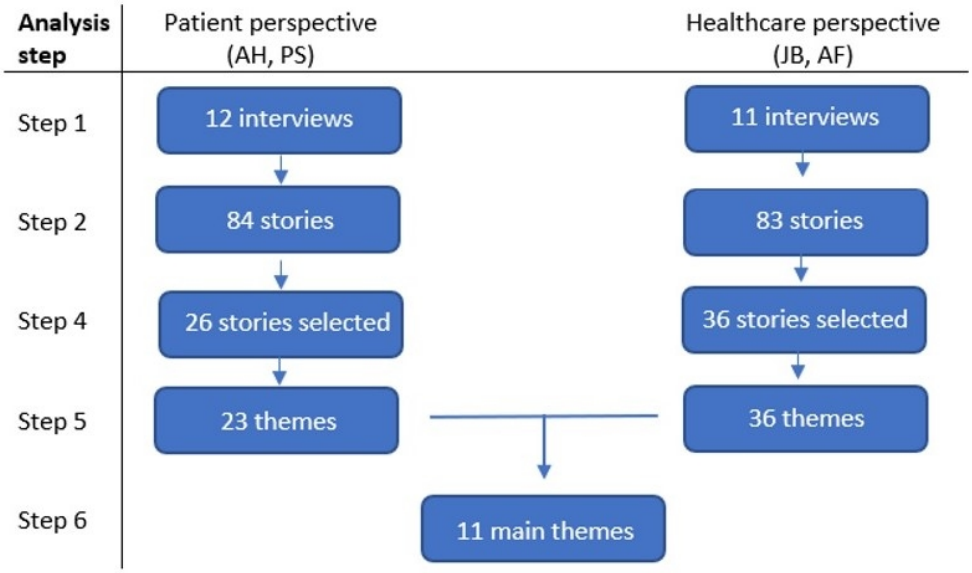

Figure 1. Results analysis process

51x30mm (400 x 400 DPI)

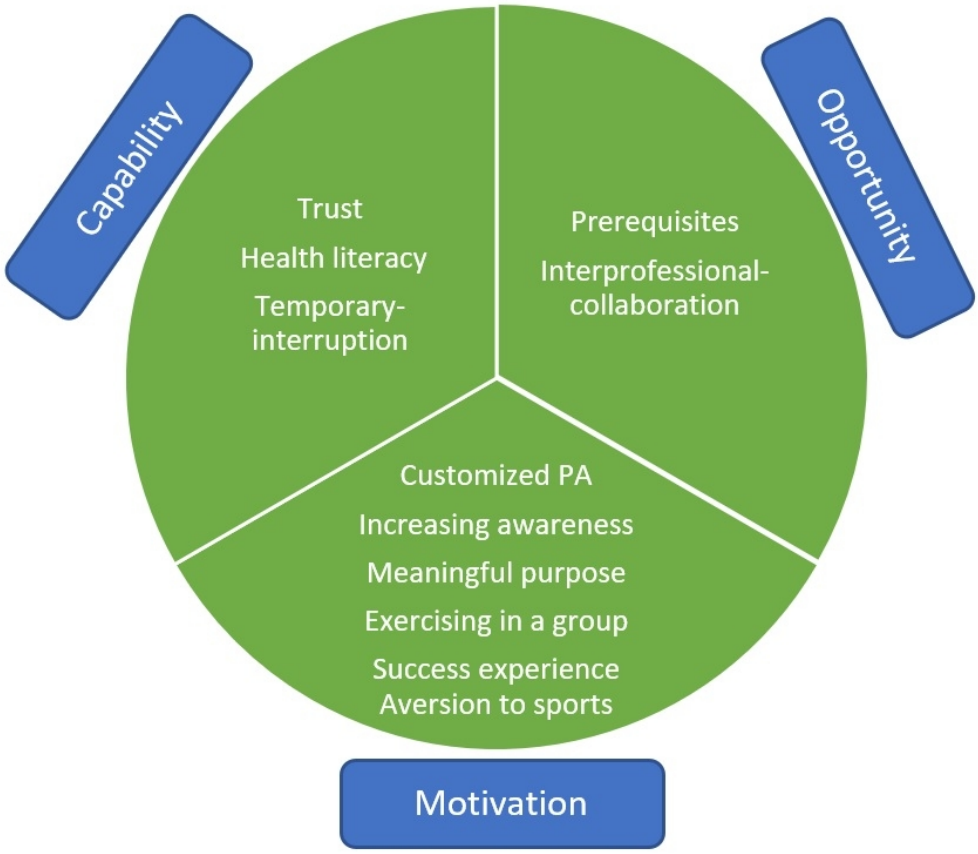

Figure 2. Main themes organized according to COM-B model

54x47mm (400 x 400 DPI)

Additional file 1

Consolidated criteria for reporting qualitative studies (COREQ): 32-item checklist

Developed from: Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. Int J Qual Health C. 2007; 19(6): 349–357. http://dx.doi.org/10.1093/intqhc/mzm042

Topic	Item no.	Guide question/description	Reported on page no.
Domain 1: Research team reflexivity			
Personal characteristics			
Interviewer/facilitator	1	Which author/s conducted the interview or focus group?	Paragraph 2.3
Credentials	2	What were the researcher's credentials?	Paragraph 2.3 + chapter 4
Occupation	3	What was their occupation at the time of the study	Chapter 4
Gender	4	Was the researcher male or female?	Chapter 4
Experience and training	5	What experience or training did the researcher have?	Paragraph 2.3 + chapter 4
Relationship with participants			
Relationship established	6	Was a relationship established prior to study commencement?	Chapter 4
Participant knowledge of the interviewer	7	What did the participants know about the researcher? E.g. personal goals, reasons for doing the research	N/A
Interviewer characteristics	8	What characteristics were reported about the interviewer? E.g. bias, assumptions, reasons and interests in the research topic	Chapter 4
Domain 2: Study design			
Theoretical framework			
Methodological orientation and Theory	9	What methodological orientation was used to underpin the study? E.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis	Paragraph 2.1 + 2.5
Participant selection			
Sampling	10	How were participants selected? E.g. purposive, convenience, consecutive, snowball	Paragraph 2.2
Method of approach	11	How were participants approached? E.g. face-to-face, telephone, mail, email	Paragraph 2.2
Sample size	12	How many participants were in the study?	Chapter 3 (table 2)
Non-participation	13	How many people refused to participate or dropped out? Reasons?	N/A
Setting			
Setting of data collection	14	Where was the data collected? E.g. home, clinic, workplace	Paragraph 2.4
Presence of nonparticipants	15	Was anyone else present besides the participants and researchers?	Paragraph 2.4
Description of sample	16	What are the important characteristics of the sample? E.g. demographic data	Chapter 3 (table 2)
Data collection			
Interview guide	17	Were questions, prompts, guides provided by the authors? Was it pilot tested?	Paragraph 2.4 + supplement 2
Repeat interviews	18	Were repeat interviews carried out? If yes, how many?	N/A
Audio/visual recording	19	Did the research use audio or visual recording to collect the data?	Paragraph 2.4
Field notes	20	Were field notes made during and/or after the interview or focus group?	Paragraph 2.4

Duration	21	What was the duration of the interviews or focus group?	Paragraph 2.4
Data saturation	22	Was data saturation discussed?	Chapter 4
Transcripts returned	23	Were transcripts returned to participants for comment and/or correction	Paragraph 2.6
Domain 3: analysis and findings			
Data analysis			
Number of data coders	24	How many data coders coded the data?	Paragraph 2.6
Description of the coding tree	25	Did authors provide a description of the coding tree?	Chapter 3 (Figure 2: represents the themes)
Derivation of themes	26	Were themes identified in advance or derived from the data?	Paragraph 2.6 (table 1)
Software	27	What software, if applicable, was used to manage the data?	Paragraph 2.6 (table 1)
Participant checking	28	Did participants provide feedback on the findings?	Paragraph 2.6 (table 1)
Reporting			
Quotations presented	29	Were participant quotations presented to illustrate the themes/findings? Was each quotation identified? E.g. participant number	Chapter 3
Data and findings consistent	30	Was there consistency between the data presented and the findings?	Chapter 3
Clarity of major themes	31	Were major themes clearly presented in the findings?	Chapter 3
Clarity of minor themes	32	Is there a description of diverse cases or discussion of minor themes?	Chapter 3

Additional file 2

Interview guide: patients

Introduction

Getting acquainted, organizing materials.

- Ensure to create a narrative climate. Consider:
  - Safe environment
  - Being patient, emphatic and curious
  - Create space for listening and narrating (even when you experience time pressure)
- Connect with the participant by (for example):
  - Complimenting about their home, interior design or surroundings
  - Talking about your commute
- Important: sincere intention to listen to the participant's experiences

Transition to the conversation by explaining the order of the conversation. Give the participant the opportunity to ask questions about any vagueness.

Introduction to the conversation

Do you give permission to record this conversation, so I can focus on listening?

<confirm, sign Informed consent form and start tape recorder>

Thank you that I can record this conversation. This makes it possible to re-listen and transcribe it. After the transcription has been made, the audio recording will be deleted. In the report, I will use a fictitious name, although your real age will be used. So, your story cannot be traced to you. Please, could you state your age?

In this study, we will collect stories on how different people experience physical activity. We want to know more about what motivates people to initiate, maintain, and perhaps obstructs them to be physical active. The results will be used to improve the support of physical activity in primary care. The primary healthcare professionals could be a physical therapist, family doctor or nurse practitioner. I have scheduled an hour for this conversation; does that suit you as well? Everything you tell about your experiences, good or bad, is helpful. I am very curious about your experiences about being physical active.

Do you have any questions?

Conversation

Introduction question (sensitizing).

To start, I am very curious to know what you think about being physical active. Please can you tell me something about that?

<make sure the participant does not merely think about exercising/sports, but about physical activity in a broader context>
<remember being silent to provide enough space for the participant, confirm non-verbally while listening to encourage him or her to go on>

Narrative questions: (these are exemplary questions, you need not to ask all the questions. More important is to ask follow-up questions about missing narrative elements)

1. *Could you tell me about a specific situation when you were physical active and thought: 'Right now I really am having fun!'*

2. *Could you tell me about a specific moment you look back on with pride because you succeeded in having enough physical activity? What made you succeed then?*
3. *Could you describe a specific situation in which you thought: 'I don't enjoy being physical active anymore, I quit right now'.*
4. *Could you describe a specific situation in which a person or circumstance really discouraged you to maintain being physical active?*
5. *Do you have an example of a situation when you thought: 'Maintaining being physical active is really difficult, but I still did it! What helped you in that situation?'*
6. *Could you give an example of a situation in the past year when you noticed that a healthcare professional helped or motivated you a lot? What happened, how did that go?*
7. *You participated in a PA promoting program. Could you take me to a specific moment when you felt really motivated to maintain being physical active, also after the program had ended?*
8. *If you could decide what the optimal support program for PA would look like? How would it look like then?*

During the conversation, remember: careful listening, following and confirming non-verbally, falling silent to give opportunity to narrate more. Only ask questions about specific situations linked to a (positive or negative) emotion.

Be aware of stepping stones to a narrative question. For example, if someone says 'that really disappointed me', there is an opportunity to connect by asking a narrative question such as: 'What exactly disappointed you so much? What happened exactly and who was involved? Be aware not to judge, or being positive (compliment). You need not give feedback or a solution. After the answer, thank the participant for telling this.

When a narrative element is missing in the story, you may ask additional questions about:

- Supporters: '*Where there people or things helping you in that situation?'*
- Opponents: 'Where there people or things getting in the way or obstructing you?'
- Struggle: 'What did you struggle with? What was the main struggle?
- (Plot) twist: '*What happened? What was the turning point?*'
- Main character: '*About who is it?'*
- Time, place and person: '*Where exactly did it happen? When was this? Who were involved?*

Closing

Thanks you very much for all the stories about you being physical active. Great that you shared these stories. This provides a valuable contribution to our study. To thank you we have a small gift for you <hand over the gift voucher>

Thanks again for sharing the stories about your experiences on being and maintaining physical active.

<Let the recorder run a bit longer. Sometimes extra relevant information comes up>

Interview guide: Healthcare professionals

Introduction

Getting acquainted, organizing materials.

- Ensure to create a narrative climate. Consider:
  - Safe environment
  - Being patient, emphatic and curious
  - Create space for listening and narrating (even when you experience time pressure)
- Connect with the participant by (for example):
  - Complimenting about their home, interior design or surroundings
  - Talking about your commute
- Important: sincere intention to listen to the participant's experiences

Transition to the conversation by explaining the order of the conversation. Give the participant the opportunity to ask questions about any vagueness.

Introduction to the conversation

Do you give permission to record this conversation, so I can focus on listening?

<confirm, sign Informed consent form and start tape recorder>

Thank you that I can record this conversation. This makes it possible to re-listen and transcribe it. After the transcription has been made, the audio recording will be deleted. In the report, I will use a fictitious name, although your real age will be used. So, your story cannot be traced to you. Please, could you state your age? And what is your function/occupation in the work situation? In this study we will collect stories about healthcare professionals' experiences supporting patients to sustain physical activity. Besides, we collect stories about how healthcare professionals motivate their patients to be and maintain physical active and what barriers they experience. We would like to know what drives people to start being physical active, what it takes to maintain it and what obstructs them. By collecting stories of healthcare professionals we could, in the end, develop an effective method to increase sustained physical activity.

I have scheduled an hour for this conversation, does that suit you as well? Everything you have experienced and narrate, good or bad, is helpful. We are curious about your experiences of physical activity of your patients and your strategies to keep them physical active.

Do you have any questions?

Conversation

Introduction question (sensitizing).

To start, I am very curious what you think about supporting sustained PA, in for example <name intervention they were involved in>. What did you experience? Please could you tell something about that? What moment impacted the most?

<Remember: we want to know about what the healthcare professionals do themselves, not what patients do>

<Remember being silent to provide enough space, confirm non-verbally while listening to encourage the participant to continue narrating>

Narrative questions: (these are exemplary questions, you need not ask all the questions. More important is to ask follow-up questions about missing narrative elements)

1. *Could you tell me about a specific situation of a client in which you thought:' in that moment I really helped a patient, I was really happy about that, I wish every time it would go like that?'*

2. *Could you tell me about a specific event you regard as: 'this is why I enjoy to work with this patient group so much?'*

   <try to invite a specific example of one patient. When the narrator states to really have added something, ask: could you give an example?>

3. *Could you describe a specific moment when you thought: 'It is really difficult to motivate this client'? What made it difficult for you? What did you do? Who were involved?*

4. *Could you describe a specific situation in which you were concerned about permanent effects of the PA promoting program and your support within this program? What made you being concerned?*

5. *Do you have an example of a situation when the support of a patient to sustained PA was frustrating or even unwanted?*

6. *Could you tell your dream image/nightmare in supporting sustained PA? Please be as specific as possible.*

7. *Could you tell about a situation that represents what you stand for concerning sustained PA? Please be as specific as possible. What happened exactly, who were involved?*

8. *Could you tell about a situation during the PA promoting program when you thought: 'That's really frustrating; if we keep working like this we will not improve.'*

9. *Could you take me to a moment when you were proud of yourself when supporting sustained physical activity?*

During the conversation, remember: careful listening, following and confirming non-verbally, falling silent to give opportunity to narrate more. Only ask questions about specific situations linked to a (positive or negative) emotion.

Be aware of stepping stones to a narrative question. For example, if someone says 'that really disappointed me', there is an opportunity to connect by asking a narrative question such as: 'What exactly disappointed you so much? What happened exactly and who was involved? Be aware not to judge, or being positive (compliment). You need not give feedback or a solution. After the answer, thank the participant for telling this.

When a narrative element is missing in the story, you may ask additional questions about:

- Supporters: '*Where there people or things helping you in that situation?'*
- Opponents: 'Where there people or things getting in the way or obstructing you?'
- Struggle: 'What did you struggle with? What was the main struggle?
- (Plot) twist: '*What happened? What was the turning point?*'
- Main character: '*About who is it?'*
- Time, place and person: '*Where exactly did it happen? When was this? Who were involved?*

Closing

Thanks you very much for all the stories about you being physical active. Great that you shared these stories. This provides a valuable contribution to our study. To thank you we have a small gift for you <hand over the gift voucher>

Thanks again for sharing the stories about your experiences on being and maintaining physical active.

<Let the recorder run a bit longer. Sometimes extra relevant information comes up>

Additional file 3

Template stories (in preparation of analysis)

(How are we going to set up the stories (elements and lay-out)?)

Title story
Name narrator (fictious), function/role (patient or function), age:
"*italic* the story (date + initials researcher)
Put optional themes under the story. By doing so you answer the next question: 'what does this story teach me about the research question?'

Lay-out stories- uniformity:
- Colloquial language can be removed when essence of the story stays the same
- Facts can be added
- Write in I-form (instead of 'you fall' etc.)
- The story must be understandable for an outsider

What is a story?
- Representation of events that are put into order to each other. Narrative of a story:
    - Stands on itself
    - Has a beginning, middle and end
    - Contains narrative elements
    - Evokes emotions or is narrated with emotions
    - Is personal, authentic and true

- Narrative elements:
    - Main character – Who is it about?
    - Supporters- Who/what helped?
    - Opponents- Who/what obstructed?
    - Struggle - What did you struggle with?
    - Plot change – What happened?
    - Time, location, person