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Participant experiences and perceptions of physical activity-enhancing interventions for people with physical impairments and mobility limitations: A meta-synthesis of qualitative research evidence

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Abstract

Disabled people face multiple personal, environmental and social barriers that interfere with leading a physically active lifestyle. Thus, there is an urgent need for behavior change interventions to increase physical activity (PA) by specifically addressing the situations of disabled people, and barriers to participation. This original meta-synthesis of qualitative research was undertaken to explore participants' experiences and perceptions of PA-enhancing interventions for adults with physical impairments resulting in mobility limitations. Published articles were identified through a rigorous systematic search. Based on the inclusion/exclusion criteria, 10 articles were included for review. Following a critical appraisal of the articles, methods of thematic synthesis were drawn upon to generate overarching concepts through interpretation and conceptual synthesis. Seven interrelated concepts were constructed representing both components and outcomes of the interventions. These were: (i) Diversity of interventions; (ii) Importance of communication; (iii) Need for social support; (iv) Behavioral strategies; (v) Gaining knowledge; (vi) Re-framing thoughts about exercise and the self and (vii) Health and well-being. The results revealed that a combination of informational, social and behavioral interventions is perceived as crucial for PA initiation and maintenance. Furthermore, key elements of effective intervention design and implications for policies and practices to increase PA participation are proposed.

Key words: disability; physical activity; behavior change interventions; meta-synthesis; qualitative.

Introduction

The United Nations Convention on the Rights of Persons with Disabilities (2006) enshrines the rights of disabled people to participate in recreational, leisure and sport activities on an equal basis with others. Despite this protection, disabled people face multiple personal, environmental and social barriers that prevent them from leading a physically active lifestyle (see Martin Ginis et al., 2016). These barriers to physical activity (PA) align with a social relational understanding of disability (Richardson, Smith & Papathomas, 2016; Smith & Perrier, 2014). The term 'disability' and the label 'disabled people' are often contested as multiple definitions and understandings of disability arise across different disciplines[1]. Through a social relational lens, disability refers to the social restrictions on activities, aspirations and the psycho-emotional well-being of people with impairments (Thomas, 2007). Having an impairment (whether that be 'physical' or 'mental', lifelong or acquired, from injury or chronic illness), is therefore not synonymous to disability. Rather, people with impairments experience *disablism* – a form of *social oppression* – that arises from disabling and discriminatory cultural, social and environmental conditions that impede function, activities and/or social participation (Emerson et al., 2012; Smith, Bundon & Best, 2016; Smith & Perrier, 2014; Thomas, 2007; 2012). That said, a social relational approach does allow for the acknowledgement of *impairment effects* – direct or immediate impacts and effects of impairments – on the daily lives of disabled people (Thomas, 2012).

Accordingly, a social relational approach expands our understanding of the social (i.e., disablist barriers) and physical (i.e., impairment effects such as pain) experiences of disability in relation to leading a physically active lifestyle. As a result, disabled people are less likely to participate in PA such as sport or exercise. For instance, a recent British national survey (Sport England, 2015) revealed that 41% of non-disabled adults reported at least one session per week of sport or exercise, compared with just 18% of disabled adults. Similarly, population-level data from the USA indicate that whereas 26% of adults are completely inactive (no weekly bout of aerobic activity $\geq$10 min), 57% of disabled adults are inactive (Carroll et al., 2014). Indeed, across people with different types of physical impairments, those with permanent conditions, and chronic illnesses resulting in mobility limitations, are more likely to be physically inactive and at greater risk for inactivity-related diseases (e.g., heart disease, diabetes etc.) than those

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[1] The disciplinary divide between how 'disability' is defined and understood stems from debates regarding the conceptual separation of impairment/chronic illness and disability, and contrasting theoretical perspectives between medical sociology (social deviance paradigm) and disability studies (social oppression paradigm). See Thomas (2007, 2012) for detailed discussions on this debate.

without such conditions (Carroll et al., 2014). As such, there is an urgent need for strategies to increase PA participation within this population.

Considerable research has been undertaken in the fields of health psychology, exercise psychology and rehabilitation psychology to examine the effectiveness of PA-enhancing interventions for disabled people. In general, these interventions draw on psychological principles of health behavior change, and can be classified as informational, social or behavioral in nature. *Informational* interventions are strategies designed to provide people with knowledge to increase their motivation to be active and to change their behavior (Lox, Martin Ginis & Petruzello, 2014). Some examples drawn from the psychology and disability literature include delivery of a web-based program of lessons designed to strengthen motivation (Kosma, Cardinal & McCubbin, 2005), the provision of personalized information regarding one's level of risk for chronic diseases (Bassett & Martin Ginis, 2011) and mailing customized print-material about PA (Plow, Bethoux, Mai & Marcus, 2014).

Social interventions involve structuring the social environment to support people's efforts to be active (Lox et al., 2014). Examples in the psychology and disability literature include using the exercise group as an agent of change to influence members to practice and use exercise self-regulation skills (Brawley, Arbour-Nicitopoulos & Martin Ginis, 2013), providing social support to exercisers over the telephone (Arbour-Nicitopoulos, Tomasone & Martin Ginis, 2014; van der Ploeg et al., 2007), and ongoing support, advice, and encouragement from a physiotherapist (Hale, Mulligan, Treharne & Smith, 2012). Finally, *behavioral* interventions involve teaching people behavioral skills and strategies that will help them initiate and maintain a PA program (Lox et al., 2014). In samples of disabled people, tests of these interventions have typically involved activity counselors training individuals to use skills such as goal-setting, action planning, self-reward and self-monitoring (van der Ploeg et al., 2007; Latimer, Martin Ginis & Arbour, 2006).

Overall, the results of these studies have been mixed. For example, a Theory of Planned Behavior-based implementation intention intervention yielded large increases in PA behavior in people with spinal cord injury (SCI) (Latimer et al., 2006). In contrast, a web-based PA intervention for people with physical impairments based upon the Transtheoretical Model produced no significant changes in PA behavior (Kosma et al., 2005). However, the magnitude of behavior change is only one aspect of evaluation. Participant perceptions can also play a vital role in improving understanding of what makes an intervention effective and can contribute to better tailoring of interventions to the specific situations of disabled people (Emerson et al., 2012).

Participants' experiences and perceptions of PA-enhancing interventions are often collected using qualitative methods of inquiry. Qualitative inquiry allows for the exploration of specific factors that cannot be addressed through quantitative methods of evaluation. In the present context, qualitative research aims to understand *what it is like* to experience PA interventions when one is also living with a physical impairment (Sparkes & Smith, 2014). Furthermore, qualitative research can explain *how* and *why* an intervention was effective, or not, in increasing PA participation (Smith, Treharne, Mulligan & Hale, 2016). Addressing these questions provides rich, embodied descriptions of people's lived experiences of interventions that are instrumental for informing the design of more effective interventions.

One way to rigorously deepen our understanding of participant perceptions of interventions for people with physical impairments and mobility limitations is through a meta-synthesis of qualitative research on the subject (Williams, Smith & Papathomas, 2014). A meta-synthesis involves the systematic review and synthesis of qualitative research to reveal new knowledge concerning a specific research topic (Williams & Shaw, 2016). The aim of a meta-synthesis is to translate findings from qualitative research into themes, concepts or theories that *go beyond* the findings of primary studies to provide more powerful explanations of the phenomenon under review (Thomas & Harden, 2008). A systematic review and synthesis can also provide evidence to support healthcare policy and provide direction for policy makers and researchers to engage with in the future (Williams & Shaw, 2016). A meta-synthesis of qualitative research on PA-enhancing interventions would deepen the understanding of factors that people consider important to intervention success and failure. Such original and significant knowledge would be invaluable for researchers, interventionists and policy makers tasked with promoting PA within disabled populations.

Focus of the meta-synthesis

The purpose of this meta-synthesis was to: (i) systematically search and appraise the qualitative research evidence on PA behavior change interventions for people with physical impairments and mobility limitations; (ii) synthesize knowledge regarding the perceived impact of the interventions on PA behavior change; and (iii) based on the results, propose improvements to inform future interventions, policies and practices designed to increase long-term PA in these populations. Given these objectives, the following research question was formulated: What does the published qualitative research evidence contribute to our empirical knowledge of the experiences and perceptions of people with physical impairments and mobility limitations who have participated in PA behavior change interventions?

Method

The process of meta-synthesis involves five consecutive stages. The first three stages consist of developing a research question, identifying relevant articles and appraising the studies for research quality (Williams & Shaw, 2016). The last two stages involve the synthesis of the studies, and in this project, we drew upon the method of *thematic synthesis*. Thematic synthesis was chosen due to the purpose of the review and the suitability of this method to inform policy makers of practical recommendations for specific interventions (Thomas & Harden, 2008). As Thomas and Harden (2008) explain, the method of thematic synthesis was developed 'out of a need to conduct reviews that addressed questions relating to intervention need, appropriateness and acceptability – as well as those relating to effectiveness – without compromising on key principles developed in systematic reviews' (p.3).

Developing a research question and identifying relevant articles

The first stage of the meta-synthesis was to identify the purpose of the review and develop a focused research question (Williams & Shaw, 2016). Our focus on PA behavior change interventions for people with physical impairments and mobility limitations was justified by the prevalence of inactivity among these populations. The second stage involved identifying published articles and determining their relevance to the review. As the purpose of our meta-synthesis was to review current evidence to inform policy and practice, a systematic search strategy was employed (Williams & Shaw, 2016). Published articles up to April 2015 were identified using Medline, Embase, PsychINFO and AMED search databases. Based upon our understanding of the literature on PA interventions for physical impairments and mobility limitations, the following search terms were used to maximize coverage of the literature:

1) *Interventions*: 'intervention stud*' OR 'program' OR 'curriculum' OR 'physical education' OR 'promotion' OR 'initiative' OR 'behavior change' OR 'strateg*'
2) *Physical activity*: 'physical activity' OR 'exercise' OR 'physical fitness' OR 'sports' OR 'exercise therapy'
3) *Physical impairment*[2]: 'disabled person*' OR 'stroke' OR 'cerebral palsy' OR 'amputee' OR 'spinal cord injur*' OR 'multiple sclerosis' OR 'arthritis' OR 'Parkinson'

The systematic search returned 7037 citations from the 4 databases after the removal of duplicates. An additional search was conducted of relevant journals and articles using citation searching, reference lists and contact with experts. An author (J. K. M.) and research assistant

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[2] Based upon our understanding of the literature on PA interventions for disabled people we included impairments (conditions and chronic illnesses) which result in mobility limitations and subsequent restrictions on PA participation. As outlined in the introduction, through the social relational model of disability, these restrictions can be both physical (e.g., impairment effects) and social (e.g., disablism) (Thomas, 2007, 2012).

screened the articles based on the relevance of the title to the research question, and a total of 6889 articles were removed. The abstracts of the remaining 148 articles were then screened according to the following inclusion criteria: (i) original qualitative articles published in peer-reviewed journals that reported empirical research, (ii) articles that presented data assessing interventions to improve PA participation and (iii) study participants reported a physical impairment. Studies were excluded if: (i) they were not written in English, (ii) no intervention was present and (iii) the focus was on rehabilitation strategies and not PA.

Through screening articles for their relevance based on the abstract alone, 72 articles were excluded. When the abstract did not provide enough information to apply the inclusion/exclusion criteria, the full text of the article was read. Through this process, 76 articles were read in full and 66 were excluded, leaving 10 articles. A flow diagram in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) is provided as a supplementary file. The final 10 studies (Table 1) included a wide variety of PA interventions among various disabled populations (e.g., stroke, SCI, multiple sclerosis, etc.). Although articles had to employ a qualitative methodology, mixed methods studies were included when a rigorous qualitative section could be utilized for the purposes of a synthesis.

<Insert table 1 here>

Appraising studies for research quality

The third stage involved appraising research quality. This is a vital component of a meta-synthesis, undertaken to avoid drawing misleading conclusions from studies with perceived methodological deficiencies (Thomas & Harden, 2008; Williams & Shaw, 2016). To compensate for the diverse research methodologies of studies in a meta-synthesis (see Williams et al., 2014), Garside (2014) recommends that articles be appraised for quality and rigor based on an ongoing list of questions concerning *trustworthiness* (epistemological aspects), *theoretical considerations* and *practical considerations* (technical aspects). Examples of questions include the following: *Trustworthiness* – Are the design and execution appropriate to the research question? Are alternative interpretations, theories, etc. explored? How well supported by the data are any conclusions? *Theoretical considerations* – Does the report connect to a wider body of knowledge or existing theoretical framework? Does the article develop explanatory concepts for the findings? *Practical considerations* – Does the study usefully contribute to the review? Does this study provide evidence relevant to the policy setting?

Accordingly, the quality of the included 10 articles was appraised by all authors based on these 3 elements. Firstly, when assessing trustworthiness, each article was considered to be designed and executed appropriately to answer the research questions and all conclusions were supported with data. Secondly, theoretical considerations were easier to appraise when authors made explicit reference to their conceptual/theoretical framework in their design and analysis (see Table 1). Furthermore, some studies paid particular attention to detail regarding reflexivity (e.g., Sharma, Bulley & van Wijck, 2012) and identified appropriate criteria for judging their particular method of inquiry (e.g., Smith, Tomasone, Latimer-Cheung & Martin Ginis, 2015). Whilst this level of methodological detail was not evident across all studies, this was not considered to influence the usability of the results for the synthesis. Thirdly, in relation to practical considerations, it was deemed by all authors that each article usefully contributed to the review. To check the contributions of each article to the final synthesis, see Table 2.

Developing descriptive themes

The last two stages of a meta-synthesis relate to the method for synthesizing the studies. Drawing upon the method of *thematic synthesis*, the fourth stage involves extracting data, coding the text and developing descriptive themes. In line with thematic synthesis, all text labelled 'results' or 'findings', including that within the abstract or discussion, was extracted for coding (Thomas & Harden, 2008). The raw data extracted for synthesis included participant quotations and author interpretations of these data. Where articles included additional quotes in appendices to support their themes (e.g., Bossen, Buskermolen, Veenhof, Bakker & Dekker, 2013) or figures in text (e.g., Hurley, Walsh, Bhavnani, Britten & Stevenson, 2010), these data were also extracted. In line with our research question, only quotations or interpretations that were from participants of the intervention were utilized for synthesis. In studies (e.g. Mulligan, Treharne, Hale & Smith, 2013; Smith et al., 2015) which included the views and perceptions of other participants (physiotherapists, intervention staff, peers, etc.), these data were excluded. Furthermore, in another instance (Tomasone et al., 2016) where the study included the views of non-users who did not take part in the intervention (i.e. were therefore not subject to a behavior change technique), these participant quotes were also excluded.

The next step involved coding the text line by line according to both its meaning and content (Braun & Clarke, 2013). As Thomas and Harden (2008) propose, coding the data line by line is an important task in a meta-synthesis as it allows for the *translation* of key concepts from one study to another. The participants' experiences and perceptions of behavior change interventions were coded inductively without restriction to a prior framework. This decision was undertaken as coding to a prior framework could prevent new concepts being revealed in the data (Thomas & Harden, 2008). Both the first and second authors coded the text to identify aspects of data that related to the research question. The rationale for coding the data in this manner was not to seek inter-rater reliability and ensure 'reliable' coding (Braun & Clarke, 2013). Rather, both the first author (experienced in qualitative research) and second author (inexperienced in qualitative research) coded the data to act as *critical friends*. The purpose of a critical friend is to scrutinize the audit trail in terms of data collection and analysis by encouraging reflection and exploration of alternative interpretations and explanations (Sparkes & Smith, 2014).

Once the data had been coded, the codes were identified as 1) expectations of the intervention or reasons for participating, 2) factors perceived to be good about the intervention, 3) facilitators of continued exercise (during intervention or in the community), 4) barriers to exercise (completion of intervention or continuing exercise) and 5) participant suggestions for improvements to the intervention (see examples in Table 3 provided as a supplementary file). The next step was to look for similarities and differences in the codes to group them into descriptive themes across studies (Thomas & Harden, 2008). Continuing to act as critical friends to each other, all three authors engaged in the process of developing descriptive themes.

Interpretation and conceptual synthesis

In this last stage, overarching concepts were generated from the descriptive themes through third-order interpretation and conceptual synthesis (Gonsalves, McGannon, Schinke & Pegoraro, 2017; Williams et al., 2014). A key feature of thematic synthesis is the clear differentiation between generating 'data-driven' descriptive themes in stage 4 and constructing 'theory-driven' analytical themes, or overarching concepts in stage 5 (Williams & Shaw, 2016). This process involves 'interrogating a descriptive synthesis by placing it within an external theoretical framework (review question and sub-questions)' (Thomas & Harden, 2008, p.9). The identification of third-order interpretations was an iterative process whereby the descriptive themes were examined again in light of the research question and purpose of the review to construct overarching concepts (Gonsalves et al., 2017; Thomas & Harden, 2008; Williams et al., 2014). This method involved the continuous comparison of codes and descriptive themes to ensure that the concepts were grounded in data from the original studies (Williams & Shaw, 2016). A table illustrating the overarching concepts, themes and list of accompanying codes from the review articles is provided in Table 3 (supplementary file).

Results

There were seven interrelated concepts identified through the thematic synthesis. These were: 1) Diversity of interventions; 2) Importance of communication; 3) Need for social support; 4) Behavioral strategies; 5) Gaining knowledge; 6) Re-framing thoughts about exercise and the self and 7) Health and well-being. The concepts represented both components and outcomes of the interventions. As Table 2 illustrates, diversity of interventions and the importance of communication were key components of the interventions. The need for social support was a significant component of the interventions with continued social support a desired outcome. Behavioral strategies were both a component of the interventions, as some included behavioral and physical feedback, and an outcome of some interventions, as participants were able to develop self-regulatory skills. Similarly, gaining knowledge was both a component of the intervention, as many included some form of education, and an outcome, as participants were able to gain knowledge about both PA and how to manage their impairment. Re-framing thoughts about exercise and the self, and health and well-being, were conceptualized as outcomes of the interventions.

<Insert Table 2 here>

Diversity of interventions

The diversity of interventions substantially impacted upon participants' engagement with PA. Some participants were initially motivated to become involved with the intervention because they perceived the program was flexible to adapt to individual needs and provide suitable PA options: 'To perform strength training parallel with aerobic exercise, it makes it possible to push myself much harder in the aerobics without being hindered by my old back or a joint not being one hundred percent' (Demmelmaier, Lindkvist, Nordgren & Opava, 2015, p.434). In addition, participants valued being able to exercise at their own pace and in moderation. Yet, some participants believed the interventions were not flexible enough as they became frustrated when exercises were too hard, or found exercises too easy and not physically challenging. Furthermore, some participants perceived they had different needs from other people in their group which were not being taken into consideration.

Autonomy was an important sub-theme that was developed through the diversity and flexibility of PA options provided in the interventions. Autonomy is experienced when people have feelings of perceived control regarding their choices and decision-making (Deci & Ryan, 1985). For example, a perceived lack of control and inability to self-manage exercise plans prevented some participants from engaging in the intervention. However, people were motivated to be active when they were able to identify personally desired and meaningful physical activities as part of the interventions. Furthermore, participants engaged in the intervention when they felt responsible for their own health and progress, and had a sense of control over decisions regarding PA options:

> I did that [aqua jogging] for a while but found that it was getting harder and harder to walk around the side of the pool without using my stick and my left leg was dragging by the time I got out of the pool . . . So I had to put on my thinking cap and do something

> else. Now I’ve joined a gym… which is a machine-driven Pilates-type exercise, which I go to four or five times a week. (Mulligan et al., 2013, p.54)

The diverse environment in which PA took place also influenced participants’ engagement with the intervention. For example, both the equipment and the culture of the environment could facilitate continued exercise or act as a barrier to participation. Participants valued an open, honest and supportive environment where differences and limitations were accepted rather than frowned upon. Another benefit of the environment created by the intervention was the absence of fit ‘able’ bodies and the diversity of impaired bodies: ‘And there is a great variation in people. The fit people do not come here, so it is OK to be gimpy’ (Demmelmaier et al., 2015, p.434). Some people were also motivated to continue with the intervention as they felt committed to the research project and obliged to continue. In contrast, inaccessible equipment or facilities, a lack of transport or finances, and difficulty relating to others in the group acted as barriers to continued exercise.

Importance of communication

The meta-synthesis revealed several components concerning the importance of communication within the interventions. There was great variety regarding the preferred methods of communication. Some participants were motivated to take part in the intervention because they received a personally relevant invitation. Phone and email were the preferred channels of communication for some participants while others found text communication more valuable. Similarly, a number of participants preferred the convenience of an internet web-based service over face-to-face interaction, while other participants found telephone-based services limited their social engagement and opportunity to learn from others. The resources used within the intervention to disseminate information on PA were also varied. For instance, pamphlets were considered to provide understandable information yet were not thought to be motivating. On the other hand, an aural story or film was considered to be a far better resource to disseminate PA information; ‘The best way though would be to record it on, like a film… More people would get to see it that way and you could show it in so many places… Ideally real disabled people would be in it’ (Smith et al., 2015, p.308).

The written information utilized within interventions was also important in terms of discourse and narrative. For example, having evidence-based information provided trust, reliability and confidence in the intervention. Conversely, experiencing difficulties with the wording, meaning and understanding of questionnaires on PA decreased motivation. Using narrative (i.e. stories) as a behavior change tool provided many benefits to participants. People were able to see themselves and others in characters of the story and could relate to the thoughts, fears, anxieties and curiosities of PA: ‘What makes the stories real, well, there are quite a few things, but the people, how they interact, and talk about physical activity, their experiences of it, and other things you need to emotionally deal with’ (Smith et al., 2015, p.307). Peers and health professionals were identified as suitable messengers to share and promote relevant PA information, and participants indicated this information should be offered from the onset of rehabilitation and made available in a range of organizations (e.g. hospitals, libraries, resources centers, community exercise facilities, etc.).

Need for social support

The results of the synthesized studies revealed that different types of social support for PA (Lox et al., 2014) were a significant component of the interventions. Perceived social support was crucial to engagement with the intervention and was provided by health professionals, peers, family and friends. In particular, informational support (Cohen et al., 2000) from health professionals (e.g., physiotherapists, personal trainers, etc.), such as providing advice and guidance, and being able to problem-solve together, was highly valued by participants. Furthermore, health professionals were perceived as having the specific knowledge and skills to advise people on being active: ‘Having a person who can actually give recommendations on fitness activities with the knowledge of SCI is very helpful and not easy to come by in the gyms or anywhere else where people have any clue or can give any advice’ (Tomasone et al., 2016, p.6).

Other perceived benefits to the intervention from the involvement of health professionals included emotional support (Cohen et al., 2000) as participants were able to discuss concerns with exercise. Furthermore, the interpersonal qualities of health professionals such as their caring attitude, being non-judgmental and empathetic, facilitated continued engagement with the intervention. Health professionals were also able to offer tangible support (Cohen et al., 2000) as in some instances they provided physical assistance and demonstrated specific exercises. In addition to health professionals, peers were also crucial to engagement with the intervention in providing emotional and informational support. For example, having the opportunity to meet people in a similar situation facilitated initial participation in the intervention. Moreover, peer support facilitated a sense of belonging and a sense of community as people were able to share their experiences with others.

A perceived lack of ongoing support and inability to manage without health professionals’ support were barriers to ongoing PA. Interventions which provided greater support at the beginning were not always successful in maintaining continued engagement: ‘I found at the beginning it was quite exciting but over a period of three months there was sort of no contact… Started off with a hiss and a roar and sort of…died off' (Smith et al., 2012, p.1179). Equally, a lack of social support throughout the intervention was perceived negatively as participants desired more personal interaction. Moreover, participants commented on the need for greater access to support services (e.g. social services, psychological counseling) as well as access to health professionals and peers, for long-term PA engagement.

Behavioral strategies

The results of the meta-synthesis revealed numerous behavioral strategies that facilitated continued engagement with the interventions and on-going PA. These behavioral strategies included behavioral feedback, physical feedback and self-regulation. Developing behavioral skills such as action planning and goal setting were important for maintaining and increasing PA. Furthermore, having to report action plans to intervention staff motivated people to engage with the intervention. Physical feedback through performance tests and follow-up assessments were important for tracking progress and keeping participants motivated. That said, strategies designed to monitor participants' progress were not always perceived as positive. For example, some participants disliked the thought of people checking their exercise diary, so they disengaged with the intervention, or felt like a failure when they were unable to attend an exercise session: 'When I have reported several zeros, when I haven't been to the gym…it feels like a failure, it is negative' (Demmelmaier et al., 2015, p.435). In addition, some participants reported disappointment when they were unable to achieve their set goals or when physical tests revealed no improvement.

Through engagement with an informative and educational intervention program, many participants reportedly developed self-regulatory skills which facilitated regular PA. In this context, self-regulation refers to the ability of an individual to exert control over their thoughts, feelings and emotions in order to regulate their PA behavior (Lox et al., 2014). Self-regulation skills were evident by participants routinely scheduling time for exercise, planning ahead and setting meaningful goals. For example, interventions that were implemented over a long period of time (e.g.12 months) facilitated exercise to become habitual. Furthermore, interventions which encouraged participants to reflect upon their own goals and adjust their action plan accordingly, further motivated people to be physically active: 'I had to make a different plan because I, I was like okay, this isn't working because if I wait to do this at this time of day when I don't walk really well, this doesn't work for me' (Plow et al., 2014, p.890).

Gaining knowledge

The meta-synthesis revealed that participants in behavior change interventions gained knowledge on PA and self-management of their impairment. The potential to learn about the benefits of exercise in managing symptoms of impairments and how to engage in PA initially motivated people to take part in the intervention. During the intervention, many participants benefitted from general knowledge about how to be physically active with impairment, and specific information such as how to adapt exercises which helped them remain active. This new knowledge was gained through various resources including group taught sessions, pamphlets and stories, and gave people the confidence to keep exercising despite setbacks.

Equally, gaining knowledge on how to self-manage impairments and related symptoms was an important benefit of the intervention and facilitator of continued exercise. Advice from health professionals on the potential benefit of exercise to control pain and manage impairments additionally motivated people: ‘If you don’t exercise you’re never going to be able to manage the pain...Gentle exercise actually relieves the pain, and it means that you should be able to cut down [analgesia] and that the answer is not necessarily knee replacement...’ (Hurley et al., 2010, p.7).

Re-framing thoughts about exercise and the self

The interventions brought about many changes to participants’ thoughts about the role of exercise in their lives. For instance, before partaking in the intervention, some participants described it as the perfect opportunity to start exercise and re-frame their thoughts on what constituted PA for disabled people. During the intervention, exercise was re-appraised as being fun, rewarding, worth paying for and becoming a priority in people’s lives. Participants’ attitudes to exercise became more positive as they came to understand the importance of remaining physically active. Furthermore, participating in the intervention decreased fear and anxiety about exercise and instead allowed participants to view exercise as preventative medicine.

Participants were also able to re-evaluate their physical capability and change their thoughts about their ability to exercise: ‘I wasn’t thinking about exercise, and I wasn’t thinking about anything, other than sit at home, eat and watch television. When I started, at least they gave me that ability, they gave me that push’ (Sharma et al., 2012, pp.338-339). Being physically active also brought about positive changes in self-image and enabled some participants to develop and embody a new physically active identity. However, despite the potential of behavior change interventions to transform thoughts about exercise, ability and the self, some participants had persistent negative beliefs which acted as a barrier to PA. These included the belief that symptoms were too severe to benefit from exercise, that deterioration was inevitable and a perceived lack of time for exercise.

Health and well-being

Health and well-being were a substantial concept of the meta-synthesis. The potential for improvement in health and well-being motivated engagement in the intervention, and improvements in health and well-being facilitated an ongoing physically active lifestyle. Participants were initially motivated to engage with the intervention to reduce mobility limitations, lose weight and limit medication. Partaking in the intervention resulted in many benefits to health as participants reported increased strength, function, ability and reductions in fatigue, pain, medication and weight. These health benefits were accompanied by perceived improvements in subjective well-being. Subjective well-being refers to an individual's perceived happiness and life satisfaction (Ryan & Deci, 2001). Accordingly, participants reported feeling enjoyment and perceived an increase in their confidence to be active, as well as exercise self-efficacy, self-determination and independence. All of these factors additionally motivated people to continue being physically active at home.

Conversely, a decline in health was a perceived negative consequence of exercise and a barrier to ongoing PA. For example, some participants were unable to continue exercising due to illness, injury or exhaustion. For others, the unpredictability of their impairment inhibited their ability to engage with the intervention, or they experienced pain following exercise. In addition to health problems, perceived declines in subjective well-being were reported as reasons for discontinuation with the intervention: 'I had a bad year and I was not at ease with myself. I was not in the right mood to exercise. It was all too much' (Bossen et al., 2013, p.7).

Discussion

The purpose of this meta-synthesis was to systematically review and interpret qualitative research evidence regarding the experiences and perceptions of people with physical impairments and mobility limitations who have participated in PA-enhancing interventions. Our analyses yielded seven themes. The *diversity of interventions* and *importance of communication* were identified as significant components of interventions, while *re-framing thoughts about exercise and the self* and *health and well-being* were identified as important intervention outcomes. The *need for social support*, *behavioral strategies* and *gaining knowledge* were identified as both key intervention components and outcomes. Taken together, these results provide important new information regarding participants' perceptions of what makes PA-enhancing interventions effective for disabled people. Our results also provide direction for developing interventions, policies and practices to increase PA participation in these populations.

What makes interventions effective?

The results of the thematic synthesis indicate that disabled people perceive aspects of informational, social and behavioral interventions to be important for promoting PA initiation and maintenance. Our findings align with quantitative syntheses showing the importance of these types of interventions for producing significant increases in PA behavior change (e.g., Kahn et al., 2002; Greaves et al., 2011). Yet, whereas recent efforts have been devoted to identifying *which* intervention type is most effective (e.g., Heath et al., 2012; Williams & French, 2011), our results suggest that people with physical impairments perceive a *combination* of intervention types to be most effective. Our results also provide insight on *why* each type of intervention is important.

Regarding informational aspects of interventions, the opportunity to learn more about one's condition was perceived as an important motivator for getting involved, whereas ongoing information delivery from interventionists was considered critical for staying involved because it makes participants feel valued and cared for. Participants indicated that information should be evidence-based in order to instill feelings of trust, reliability and confidence in the intervention. Moreover, peer-based and narrative forms of information delivery were perceived as better than pamphlets because they promote understanding, identification and motivation.

Consistent with research highlighting the importance of social support for PA initiation and maintenance among disabled persons (for a review, see Martin Ginis et al., 2016), participants emphasized the significance of health professionals, peers, family and friends in providing different types of social support. Support, care, advice and guidance from health professionals were perceived as particularly valuable. Some participants noted long-standing questions or concerns about being active and the intervention provided opportunity to access experts who could provide the necessary emotional, tangible and informational support. Interestingly, long-term support was seen as crucial. Although some intervention models are predicated on trying to 'wean' people off of interventionists' support (Brawley et al., 2013), participants strongly voiced their need for ongoing support in order to stay physically active.

Behavioral interventions were considered important for developing the self-regulation skills and strategies needed to maintain an active lifestyle, and for developing a sense of accountability. However, the implementation of behavioral and physical feedback could be perceived as controlling or demoralizing if use of the strategies undermined autonomy or emphasized a lack of progress. Indeed, the need for autonomy transpired as a sub-theme in our analysis. Programs that provided diverse activity options were flexible and adaptive to participants' unique needs, and created a sense of belonging, made participants feel in control, independent and motivated to work harder and stick to their program. Motivation and adherence were also greater when participants realized improvements in health and well-being, and had positive experiences that allowed them to reframe negative thoughts and feelings about exercise.

Implications for interventions, policies and practice

In light of these findings, there are several implications for the design of future interventions, policies and practices to facilitate PA among disabled people. Firstly, the results of this meta-synthesis highlight the importance of *diversity* within PA interventions and environments. As Dutta (2016) explains, diversity within health practices acknowledges that ‘one size does not fit all’ and any intervention to enhance PA participation needs to be adaptable to the cultural setting and characteristics of disabled populations (p.7). With this in mind, interventions should be designed to respect individual choice and control, giving participants’ autonomy over their PA participation. Indeed, facilitating choice and control over PA are central to theories and methods of behavior change, and can build self-efficacy and vitality for life which is important for sustained PA motivation (Smith, Treharne, et al., 2016).

In addition, a supportive environment that is culturally accepting of difference and diversity is crucial if disabled people are to maintain a physically active life beyond any intervention. However, despite this need, disabled people face multiple environmental and social barriers that prevent them taking part in sport and exercise (Martin Ginis et al., 2016). In line with the social relational model of disability, these barriers highlight how people experience *disablism,* a form of social oppression that arises from relationships with structures and people (Smith & Perrier, 2014; Smith, Bundon, et al., 2016; Thomas, 2007). For Thomas (2012), *structural disablism* is exhibited through a lack of accessible facilities, whereas *psycho-emotional disablism* occurs through hurtful words and actions that restrict the activity and well-being of people with impairments. As Richardson et al. (2016) revealed, experiences of psycho-emotional disablism are further heightened in exercise environments such as the gym, where strong, muscular and aesthetically pleasing ‘normal’ bodies are culturally valued. To alleviate psycho-social disablism, healthcare and community settings should work together to combat the negative societal attitudes towards disabled people and address the potentially intimidating cultural image of PA contexts (Martin Ginis et al., 2016; Richardson et al., 2016).

Secondly, in terms of the *importance of communication,* participants should be able to communicate with members of the intervention through a variety of methods to suit individual preference and capabilities (e.g. phone, email, etc.). Furthermore, a range of resources should be drawn upon to disseminate PA information through more engaging means. For instance, narrative resources such as aural stories or films can motivate participants to change their behavior as they can relate to the thoughts, concerns and actions of characters within the stories (Smith et al., 2015). Certainly, the *exercise is medicine* narrative – which focuses upon stories of health improvement and illness prevention – has been identified as an idealistic message to promote PA to disabled people (see Papathomas, Williams & Smith, 2015).

Thirdly, in line with the social relational model of disability and the importance of relationships in restricting activity, the *need for social support* was perceived as crucial for ongoing participation. One of the major challenges in sustaining PA participation in the 'afterlife' of an intervention is overcoming the removal of social support (Rimmer, Lai & Young, 2016). To help foster ongoing social support with peers and family, health professionals can encourage disabled people to build and utilize support networks (Martin Ginis et al., 2016). Whilst acknowledging the complexity of building effective support networks, disability groups and activity centers can provide invaluable emotional, tangible and information social support to facilitate a physically active lifestyle (Williams et al., 2014).

Furthermore, health professionals need to act as key messengers, and provide the highly valued care, guidance and knowledge on how to be active (Williams, Smith & Papathomas, 2016). However, in healthcare and recreational community settings, many health professionals such as physiotherapists and personal trainers lack training and education on PA and disability (Martin Ginis et al., 2016; Williams et al., 2016). This barrier can be addressed by ensuring health professionals have the skills, knowledge and resources to promote and prescribe PA to disabled people. That said, health professionals face additional perceived barriers to PA promotion including a lack of time to engage in such activities, limited sport and exercise resources within rehabilitation and limited funding from the healthcare system to support PA initiatives in the community (Williams et al., 2016). Accordingly, the 'barriers' to 'barriers' need to be tackled if health professionals are able to promote and prescribe PA. Thus, effective knowledge translation strategies are needed across healthcare systems, recreational sectors and key organizations for health professionals to support policy and practice regarding PA (Martin Ginis et al., 2016; Richardson et al., 2016; Williams et al., 2016).

Finally, *behavioral strategies* and *gaining knowledge* are both important aspects of effective intervention design to develop self-regulation skills and the ability to self-manage impairment. Interventions for disabled people have been shown to achieve higher rates of PA retention when they include behavioral strategies (Morris, Macgillivray & McFarlane, 2014). Furthermore, effective methods to measure and monitor PA across the lifespan are critical (Rimmer et al., 2016). As Rimmer et al. (2016) advocate, technology can be combined with behavior change strategies to help facilitate adherence, and to help determine the association between health outcomes and PA participation. For example, communication technologies can be a medium for providing continued social support, whereas wearable tracking devices can provide information on the type and dose of PA needed to provide health benefits.

Yet critically, the results of this meta-synthesis have highlighted the danger of disengaging participants through monitoring exercise behavior and tracking progress. Indeed, the use of technology, such as mobile and wearable digital devices, and the ways in which related social media tools/apps can monitor and measure the human body is of increasing concern. Firstly, many disabled people face financial barriers to PA participation (Martin Ginis et al., 2016) and without resources, or tangible support, technological devices may be beyond their economic capital. Secondly, the ways in which social media tools depict social groups can often reproduce and exacerbate negative stereotypes (e.g. disablism) by privileging physically fit, slim and youthful bodies (Lupton, 2016).

Thirdly, the use of technological devices to engage in ‘body projects’ can serve to assist people in defining their identities and take control over disempowering bodily experiences such as chronic illness or injury (Lupton, 2016). However, the use of technology to ‘correct’ apparent ‘deficits’ in the body aligns with a medical, rather than social relational, understanding of disability (see Thomas, 2007, 2012, for discussion). Lastly, the practice of ‘self-tracking’ may lead to addictive behavior concerning exercise and health, and feelings of anxiety, failure and self-hatred (Lupton, 2016). Therefore, careful consideration should be taken regarding the potential disengaging and dangerous associations with the use of technological devices.

Reflections

This meta-synthesis contributes to original knowledge through the application of a rigorous method to systematically search, appraise and synthesize the qualitative research evidence on PA-enhancing interventions for people with physical impairments and mobility limitations. From a methodological perspective, we have demonstrated the utility of thematic synthesis in providing evidence to support researchers, interventionists and policy makers tasked with promoting PA to disabled people. Importantly, we have revealed that a combination of informational, social and behavioral interventions may be most effective in increasing PA behavior for this population. Furthermore from a practical standpoint, we have identified the aspects of each type of intervention which are perceived to be significant for facilitating a physically active lifestyle, and key elements of intervention design. We have also highlighted the implications of this research for policy and practice by critically examining the barriers and challenges to sustaining PA in the afterlife of an intervention.

There are, however, a few methodological limitations which may have importance for future research and practice. First, some studies were excluded from the final synthesis in the initial stages because they did not explicitly examine PA behavior change. Second, some mixed methods studies were excluded due to the lack of a rigorous analysis of the qualitative data. To avoid these issues in the future, researchers need to be clearer in the reporting of behavior change post-intervention, and draw upon established methodologies and methods of analysis to present the results of qualitative data. Third, extracted data that were not relevant to the research question were excluded from the thematic synthesis. This included data that concerned participants' beliefs and understanding regarding their mobility impairment and data relating to the barriers, benefits and facilitators of exercise pre-intervention. The rationale for this decision was based upon the plethora of research that already covers these issues for people with disabilities (see Martin Ginis et al., 2016).

Fourth, in the studies reviewed, the theory or framework used to guide the intervention was not taken into consideration in the synthesized results. Some methods to synthesize qualitative research – such as meta-study – examine the application of theory in shaping the research question, method and construction of findings (Williams & Shaw, 2016). Although this is not a distinguished aspect of the method of thematic analysis, this limitation may be relevant for people interpreting this meta-synthesis in line with behavior change theories. For example, participants in this synthesis were not explicitly identified in terms of their 'stage' or 'phase' of behavior change. Readiness for change is a key aspect of some behavior change theories and a potentially important consideration when designing PA interventions. Therefore, there could be other factors that disabled people consider important to intervention success and failure that were not identified in this review.

Lastly, it is important to remain critical in the promotion of PA to disabled people. For example, with a focus on the medicinal benefits of exercise, the exercise is medicine narrative may not motivate those who want to exercise simply for pleasure. The results of this synthesis highlighted the importance of enjoyment to perceived improvements in well-being. Despite fun and enjoyable activities being linked to increased PA participation (Martin Ginis et al., 2016), pleasure is often the forgotten dimension of PA promotion (Phoenix & Orr, 2014). PA messages should therefore 'look beyond the usual suspects' (e.g. reducing risks of secondary health conditions) and bring the pleasurable aspects of PA to the foreground of intervention and policy design (Phoenix & Orr, 2014, p.101). Another concern is that the exercise is medicine narrative risks endorsing a neoliberal health role which calls upon individuals to be responsible for their own health, consequently ignoring societal barriers and overlooking disablism (Williams et al., 2014). This point is of significant importance considering the role societal factors – such as social support – play in the maintenance of a physically active lifestyle. Finally, the possible adverse consequences of partaking in sport and exercise, such as physical and psychological harm, should be considered (see Williams et al., 2014).

Conclusion

Our meta-synthesis has made an important contribution to the scientific literature on PA interventions for disabled people by identifying that a combination of informational, social and behavioral interventions are perceived to be crucial for the initiation and maintenance of PA. Furthermore, we have identified why each type of intervention is important and revealed diversity of interventions, importance of communication, need for social support, behavioral strategies and gaining knowledge as key elements of intervention design. Moreover, we have provided a critical insight into the implications for interventions, policy and practice across both health care and community contexts to facilitate PA in the afterlife of the intervention. Future research needs to focus on developing and testing combined-type interventions that are tailored to the specific situations of disabled people, and that address the barriers and challenges to sustained PA participation.

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Table 1: Summary of review articles.

Article	Aim	Sample	Characteristics of the Intervention	Methodology
Bossen et al. (2013) Netherlands	Explore patient, interventions and study characteristics that facilitate or impede usage of web-based PA intervention for people with knee and /or hip osteoarthritis.	Interview sample: 15 knee and/or hip osteoarthritis	*Informational Intervention*: Educational messages. *Social Intervention*: Positive reinforcement given for healthy active behavior. *Behavioral Intervention*: goal setting, reward, and graded tasks, performance charts for self-monitoring.	*Design*: Mixed method. *Data collection*: Semi-structured interviews. *Analysis*: Deductive and inductive content analysis. *Conceptual framework*: Eysenbach's law of attrition.
Demmelmaier et al. (2014) Sweden	Determine perception of a health-enhancing PA program for people with rheumatoid arthritis.	Interview sample: 10M and 25F with rheumatoid arthritis. Mean age = 62 years.	*Social Intervention*: Feedback on performance and group social support. *Behavioral Intervention*: Individual goal setting and action planning.	*Design*: Mixed method. *Data collection*: Semi-structured interviews. *Analysis*: Content analysis.
Hurley et al. (2010) UK	To determine how and why participants' beliefs regarding causes, management and prognosis of chronic knee pain changed from pre to post intervention.	Baseline Interviews: 10M and 19F with chronic knee pain. Mean age = 67 years Post-rehabilitation interviews: 8M and 15F with chronic knee pain. Mean age = 68 years	*Informational Intervention*: Increasing understanding of condition, the benefits of PA and other information and advice. *Social Intervention*: Exercise program administered individually or in a group and completed with physiotherapist supervision. *Behavioral Intervention*: self-management, coping strategies, planning skills and problem solving.	*Design*: Qualitative. *Data collection*: Semi-structured interviews. *Analysis*: Thematic analysis.
Mulligan et al. (2013) New Zealand	Determine participant challenges and ways to further develop the 'Blue Prescription' program for individuals with multiple sclerosis.	4M and 23F with multiple sclerosis. Age range 34 – 71 years.	*Informational Intervention*: Physiotherapist instructed PA advice and equipment modifications. *Social Intervention*: Physiotherapist helped participants get started and participants kept in regular contact with the physiotherapist. *Behavioral Intervention*: Motivational interviewing - goal setting, problem solving.	*Design*: Qualitative. *Data collection*: Semi-structured interviews. *Analysis*: General inductive approach.
Plow et al. (2014) USA	Evaluate the effectiveness of customized pamphlets at promoting PA for individuals with multiple sclerosis.	30F with relapsing-remitting multiple sclerosis. Age range 18 – 65 years.	*Informational Intervention*: PA pamphlets (includes the benefits of PA and strategies for overcoming barriers) and tip sheets.	*Design*: Mixed method. *Data collection*: Semi-structured interviews.

			Behavioral Intervention: Barrier-matched self-management pamphlets.	*Analysis*: Issue-focused analysis approach.
Schoster et al. (2005) USA	Determine participant satisfaction as well as motivators and barriers to attending a PA program for individuals with arthritis or joint pain.	2M and 49F with arthritis or joint pain resulting in moderate to severe limitations in joint motion, strength or both. Mean age = 67. Age range 32 – 90.	*Informational Intervention*: Education provided by exercise instructors. *Social Intervention*: Community-based exercise program.	*Design*: Qualitative. *Data collection*: Semi-structured interviews. *Analysis*: Thematic analysis. *Conceptual framework*: Information-motivation-behavioral skills (IMB) model.
Sharma et al. (2012) UK	Examine participants' experiences with exercise as a result of an exercise referral scheme for individuals with chronic stroke.	5M and 4F who are stroke survivors. Mean age = 51 years. Age range 37-61 years.	*Social Intervention*: Community-based and physiotherapy led exercise referral scheme.	*Design*: Constructivist qualitative approach, phenomenological methodology. *Data collection*: Semi-structured interviews. *Analysis*: Thematic analysis.
Smith et al. (2012) New Zealand	Examine participants' experiences in 'Blue Prescription', a physiotherapy intervention for people with multiple sclerosis	4M and 23F with multiple sclerosis. Mean age = 51 years. Age range 34 – 71	Informational Intervention: Physiotherapist advice on PA. Social Intervention: Participants maintained communication with the physiotherapist. Behavioral Intervention: Problem solving, goal setting and self-management.	*Design*: Qualitative *Data collection*: Semi-structured interviews. *Analysis*: General inductive approach.
Smith et al. (2015) Canada	Identify the effectiveness of narratives as a way to share PA knowledge with adults with a spinal cord injury (SCI) and health care professionals (HCPs)	15 adults with SCI: 9M and 6F	*Informational Intervention*: Evidence-based aural narratives.	*Design*: Qualitative underpinned by interpretivism. *Data collection*: Semi-structured interviews. *Analysis*: Thematic analysis. *Conceptual framework*: Narrative.
Tomasone et al. (2016) Canada	Examine the individual-level factors that influence participation and retention in a PA behavioral counselling service aimed at individuals with physical disabilities.	Non-users = 13 (excluded from study) Adopters = 26 (69.2% female) with physical impairments (e.g. SCI, arthritis, fibromyalgia)	*Informational Intervention*: Instruction on how to perform the behavior, information about benefits. *Social Intervention*: Counsellor provided social support (practical). *Behavioral Intervention*: Goal setting, problem solving, action planning, rewards and review goals.	*Design:* Qualitative *Data collection:* Semi-structured interviews. *Analysis:* Thematic analysis. *Conceptual framework:* Theoretical Domains Framework, Health Action Process Approach.

Table 2: Concepts, themes and the articles in which they were identified.

Intervention	**Concepts**	**Theme**	**Article**
Components	Diversity of interventions	Flexibility	1, 2, 3, 5, 6, 8, 10
		Autonomy	1, 2, 4, 5, 7, 8, 10
		Environment	1, 2, 3, 5, 6, 8, 10
	Importance of communication	Medium & resource	1, 2, 4, 5, 8, 9, 10
		Discourse & narrative	1, 2, 3, 4, 5, 8, 9
		Messengers	1, 2, 9
		Time & place	8, 9, 10
Components and outcomes	Need for social support	Health professionals	2, 3, 4, 5, 6, 8, 10
		Peers	2, 3, 4, 5, 6, 7, 8, 9, 10
		Family & friends	1, 2, 5, 8, 10
		Lack	1, 2, 3, 4, 5, 6, 8, 9, 10
	Behavioral strategies	Behavioral feedback	2, 4, 5, 6, 8, 10
		Physical feedback	2, 3, 4, 8
		Self-regulation	2, 3, 4, 5, 8, 10
	Gaining knowledge	Physical activity	2, 3, 4, 5, 6, 9, 10
		Self-management	2, 3, 4, 5, 6, 8
Outcomes	Re-framing thoughts about exercise and the self	Exercise	2, 3, 4, 5, 6, 8, 10
		Ability	2, 5, 6, 8, 10
		Self	2, 3, 4, 6, 7
		Persistent negative beliefs	1, 2, 3, 5, 6
	Health and Well-being	Improvement	2, 3, 4, 5, 6, 7, 8, 10
		Decline	1, 2, 5, 6, 8, 10

Notes: 1 = Bossen et al. (2013); 2 = Demmelmaier et al. (2015); 3 = Hurley et al. (2010); 4 = Mulligan et al. (2013); 5 = Plow et al. (2014); 6 = Schoster et al. (2005); 7 = Sharma et al. (2012); 8 = Smith et al. (2012); 9 = Smith et al. (2015); 10 = Tomasone et al. (2016).