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ORIGINAL ARTICLE

Experiences, barriers, and facilitators to participating in physical activity and exercise in adults living with chronic pain: a qualitative study

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ABSTRACT

Purpose: To explore experiences, barriers, and facilitators to participating in physical activity and exercise in adults living with chronic pain.

Materials and methods: An interpretive description qualitative study using semi-structured interviews was conducted. Participants included adults living with chronic pain (pain >3 months in duration). Transcripts were analyzed using thematic analysis.

Results: Sixteen participants (five men; 11 women) with a median age of 53 years (range: 28–87) were interviewed. Three major themes related to physical activity and exercise in adults living with chronic pain were conceptualized by the researchers: the challenge of staying active (decreased activity levels, discomfort during physical activity, and uncertain and fluctuating abilities); diverse factors influence participation (pain, fatigue, perceived risks, beliefs about physical activity, competing demands, social support, motivation, other health conditions, and access to supports for physical activity or exercise); and perceived outcomes (pain management, functional improvements, social participation, mental health, and overall well-being).

Conclusions: Participating in physical activity and exercise was a challenge for adults living with chronic pain, whereby participation was influenced by multiple factors. Rehabilitation providers should aim to reduce modifiable barriers to physical activity and exercise for adults living with chronic pain, with the goal of improving health outcomes for this population.

➤ IMPLICATIONS FOR REHABILITATION

- Despite the perceived benefits, participation in physical activity and exercise is a challenge for adults living with chronic pain.
- Diverse factors can influence participation in physical activity and exercise from the perspective of adults living with chronic pain.
- Rehabilitation providers should aim to reduce modifiable barriers to physical activity and exercise for adults living with chronic pain.
- Results can be used to inform future person-oriented physical activity and exercise interventions for adults living with chronic pain.

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Physical activity; exercise; chronic pain; rehabilitation; qualitative research

Introduction

An estimated one in five adults is living with chronic pain [1–4]. Adults living with chronic pain commonly experience disability, including impairments, activity limitations, and participation restrictions [5–7]. Chronic pain is also a leading contributor to years lived with disability [8,9], high healthcare costs [10–13], and lost work productivity [14–16].

Physical activity and exercise are recommended as first-line treatment for adults living with a variety of chronic pain conditions, such as low back pain, fibromyalgia, hip and knee osteoarthritis, and neck pain [17–21]. Physical activity is defined as "any bodily movement produced by skeletal muscles that results in energy expenditure," while exercise is a subset of physical activity that is "planned, structured, and repetitive and performed with the intention to improve or maintain one or more components of physical fitness" [22]. Regular physical activity improves health and well-being in the general population [23–25], but may provide additional benefits for people living with chronic pain. For example, systematic review evidence has demonstrated that physical activity and exercise can reduce pain severity, improve physical and psychological function, and enhance quality of life in adults living with chronic pain [26].

Despite the health benefits, physical inactivity is a problem globally [27–29]. Consistent with the general population, many adults living with chronic pain do not participate in regular physical activity or exercise and may face additional challenges engaging in physical activity [30]. For example, previous research demonstrates that people living with chronic pain are less physically active in comparison to healthy controls and report difficulty participating in day-to-day physical activities [31,32]. Further, adults living with chronic pain have been shown to engage in lower intensity physical activity and are more sedentary in

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comparison to healthy controls [33]. These low levels of physical activity and exercise are concerning, given that improved physical fitness is associated with improved outcomes across multiple health domains [23–25].

Emerging evidence has shown that positive outcomes of physical activity and exercise are largely dependent on adherence over the long-term [34–36]. This has led researchers in the field of rehabilitation to call for strategies to improve adherence to physical activity and exercise [37]. Previous behavior change research has identified complex and important factors that can influence adherence to physical activity in the general population [38]. Further, research has shown that simply having knowledge on the benefits of a behavior (e.g., knowledge that regular participation in physical activity improves health) is not necessarily sufficient to lead to a change in that behavior [39]. Previous research has also demonstrated that older adults and people living with chronic health conditions, such as HIV and multiple sclerosis, can face unique barriers to participating in physical activity in comparison to the general population [40–43]. As adherence and behavior change are complex processes [44], it is critical to understand the specific barriers and facilitators to participating in physical activity and exercise among specific populations, such as adults living with chronic pain.

Although systematic review evidence has demonstrated that physical activity can have positive health outcomes for adults living with chronic pain [26], limited research has explored the experiences of this population when participating in physical activity and exercise. In particular, there is currently a paucity of published qualitative research on perspectives toward physical activity and exercise among adults living with chronic pain. Although qualitative work is beginning to emerge in the field of chronic pain research, it is only just beginning to provide a better understanding of the lived experiences of adults living with chronic pain when participating in physical activity [45,46]. An improved understanding of experiences and perspectives toward physical activity and exercise in adults living with chronic pain will help to inform future physical activity interventions that consider common barriers and facilitators to engagement and are tailored to meet the needs of this population.

The aim of this qualitative study was to explore experiences, barriers, and facilitators to physical activity and exercise from the perspective of adults living with chronic pain.

Materials and methods

Study design

An interpretive description qualitative methodology was used in this research to understand experiences, barriers, and facilitators to physical activity and exercise from the perspective of adults living with chronic pain [47–49]. This research was situated within a constructivist paradigm [50]. An interpretive description methodological orientation was selected for this research as it emphasizes the generation of findings that can be applied practically in clinical settings [47–49]. Interpretive description guides researchers to produce pragmatic, versus theoretical, findings in response to real world practice problems (e.g., low levels of participation in physical activity and exercise among many adults living with chronic pain) [47–49]. Unlike traditional qualitative research methods such as phenomenology or grounded theory, interpretive description encourages researchers to consider various factors that might influence the clinical problem when designing their research study [47–49]. This practice-oriented approach allows research findings to have clear implications in clinical practice [47–49]. As such, an inductive approach was used in this research, whereby no frameworks or theories (e.g., theories related to physical activity and behavior change) were used at the outset of the study. Ethical approval was obtained from Queen's University in Kingston, Ontario, Canada.

Research team

The research team included two physical therapists with pain management experience (K.V. and T.D.), a family physician with a roster of patients of which a large proportion are living with chronic pain (R.P.), and a physical therapist and researcher with a program of research focused on pain (J.M.).

Recruitment

A purposive sampling technique was implemented to recruit participants and achieve maximum variation (e.g., age, gender, chronic pain diagnosis) [51,52]. Potential participants were approached face-to-face by clinicians at primary care sites and at the hospital-based clinic. Once interviews were scheduled, no participants dropped out of this research. Participants were eligible to participate in this study if they self-identified as: an adult (>18 years of age); experiencing chronic pain (pain >3 months in duration); and able to communicate in English. All participants provided verbal or written informed consent to participate in this research. Informed consent was obtained verbally for participants who completed telephone interviews, while written informed consent was obtained for participants who completed an in-person interview.

Semi-structured interviews

A combination of in-person and telephone semi-structured interviews was conducted, based on participant preference [53]. The choice of completing an interview over the telephone was offered to all participants in order to decrease barriers to participating in an in-person semi-structured interview (e.g., those who lived a great distance to the research location, lacked accessible transportation, or those who had other responsibilities, such as childcare, that would have made attending an in-person interview challenging). With the exception of one in-person interview (where a participant was accompanied by their spouse at their request), no other persons were present for the interview beyond the interviewer and the participant. All interviews were conducted by the first author (K.V., male) who had previous experience and training conducting qualitative semi-structured interviews. Field notes were taken during each interview. Before each interview, participants were made aware that the interviewer was a physical therapist employed at a hospital-based chronic pain clinic.

Data collection

A pre-piloted, semi-structured interview guide was developed, based on study objectives, to explore experiences, barriers, and facilitators to physical activity and exercise among adults living with chronic pain. The structure and content of the interview guide did not change significantly between interviews, although minor changes in wording were made to improve clarity of some questions. See Box 1 for sample questions from the interview guide. Demographic information was collected prior to each interview. Interviews were audio recorded, transcribed verbatim, and checked for accuracy by the interviewer. No repeat interviews were conducted. All data were collected, managed, and stored securely according to research ethics guidelines.

Box 1. Sample questions from the semi-structured interview guide.

1. Tell me about your experience with physical activity and exercise as someone who has chronic pain.
2. Can you tell me your thoughts on using physical activity or exercise as a strategy to manage your chronic pain and stay engaged in your daily activities?
3. What do you think are the risks/benefits of engaging in physical activity or exercise?
4. What are some of the things that get in the way for you when trying to participate in physical activity or exercise?
5. What are some of the things that make it easier for you to participate in physical activity or exercise?

Data analysis

Interview transcripts were analyzed using thematic analysis, as described by Braun and Clarke, and included: (1) familiarization with the data; (2) generating initial codes; (3) searching for themes; (4) reviewing themes; (5) defining and naming themes; and (6) producing a report [54]. As the first step of data analysis, all members of the research team (K.V., T.D., R.P., and J.M.) reviewed the first three transcripts and met in-person to discuss the initial coding tree. The remaining transcripts were independently coded by at least two researchers to ensure comprehensiveness of the coding scheme (e.g., K.V. and T.D.). For consistency and continuity, the first author (K.V.) coded each interview, in addition to another member of the research team (e.g., T.D., R.P., or J.M.). Consistent with an interpretive description methodology, the research team reviewed codes to create broader themes related to study objectives. Following this, the entire research team reviewed themes and finalized major themes and sub-themes. Consistent with interpretive description, creating broader themes involved researchers comprehending the data, synthesizing meanings, theorizing relationships, and recontextualizing the data into findings [47]. Data analysis was considered complete once thematic saturation was reached (i.e., when no new key themes were identified from the data) [55–57]. Thematic saturation differs from theoretical saturation, used in grounded theory research, which has been described as the point at which categories are fully accounted for, variability between categories fully explained, and relationships between categories tested and validated [58]. Instead, thematic saturation describes a state when there are no more emergent patterns in the data [56]. Once the research team determined that thematic saturation was reached, participant recruitment was stopped.

Trustworthiness

Peer debriefing, reflexivity, and multiple in-person team meetings were used to establish analytic rigor [59]. MAXQDA (v.2015) software was used to assist with data management [60]. Reporting of this qualitative study is presented based on the COsolidated criteria for REporting Qualitative research (COREQ) Checklist [61].

Results

A total of 16 participants took part in a one-to-one semi-structured interview (approximately 60 min in length) between October 2017 and January 2018. Five participants engaged in a telephone interview, while the remaining 11 participants engaged in an in-person interview. The majority of participants identified as women (11/16) with a median age of 53 years (range: 28, 87). The median number of days per week that participants self-reported engaging in moderate-to-vigorous physical activity was 2.5 days per week (range: 0, 7). On days when participants reported engaging in moderate-to-vigorous physical activity, the median duration of time spent engaging in physical activity was 30 min (range: 0, 75). See Table 1 for participant demographic information.

Three major themes related to experiences participating in physical activity and exercise among adults living with chronic pain are described: the challenge of staying active, diverse factors influence participation, and perceived outcomes. See Table 2 for major themes and sub-themes.

The challenge of staying active

Participants reported challenges staying physically active when living with chronic pain. Participants described decreased activity levels, discomfort during physical activity, and uncertain and fluctuating abilities to participate in physical activity and exercise.

Decreased activity levels

The majority of participants described their level of physical activity had decreased since the onset of chronic pain:

> It's been a struggle, I used to be more active prior to the chronic pain and over the years it's gotten progressively worse [...] in the last couple of years with the leg and the feet problem it's been a real struggle, like I still walk, I'm not doing what I used to though, like I used to swim and bike [...] so it's been a challenge. (INT-15; 51-year-old woman who self-reported living with chronic pain for 18 years and engaging in 120 minutes of moderate-to-vigorous physical activity per week)

Discomfort during physical activity

Participants reported experiencing discomfort during physical activity and exercise, often described as increased pain severity:

> At first [when being physically active] it starts out not bad, after a few minutes it gets harder, I feel heavier, harder to move. My legs will start to hurt but they're not in shape right now like they used to be so I have to work through that pain. (INT-10; 51-year-old woman who self-reported living with chronic pain for 11 years and engaging in 0 minutes of moderate-to-vigorous physical activity per week)

Uncertain and fluctuating abilities

Several participants described fluctuating abilities to participate in physical activity and exercise, particularly due to pain. For example, one participant shared his fluctuating ability to be active due to pain flare-ups:

> When you're at the beginning of a [pain] flare-up there's not a lot you can do, this last flare-up [...] that started in September was more severe where I was only tolerating standing and sitting for an hour, two at the most [...] Since then I've been building up [my physical activity] tolerances again [...] I'm trying to get back to a new baseline. (INT-16; 37-year-old man who self-reported living with chronic pain for 3 years and engaging in 150 minutes of moderate-to-vigorous physical activity per week)

The uncertainty of pain flare-ups and its impact on physical activity was also described by participants, particularly when pain levels fluctuate from day to day:

> If I wake up in severe pain I have to start automatically putting a [new] plan in place of how I'm going to operate during the day. (INT-13; 55-year-old man who self-reported living with chronic pain for 43 years and engaging in 0 minutes of moderate-to-vigorous physical activity per week)

Table 1. Participant demographic information ($n = 16$).

Characteristic	Description
Median age in years (range)	53 (28, 87)
Gender	
Men	5
Women	11
Median duration living with chronic pain in years (range)	11 (1, 70)
Number using a mobility aid	4/16
Self-reported chronic pain conditions	
Arthritis	4
Degenerative disc disease	4
Fibromyalgia	2
Peripheral neuropathy	2
Sciatica	2
Cervicogenic headache	1
Chronic headache	1
Cervical radiculopathy	1
Occupital neuralgia	1
Spinal stenosis	1
Post-meningitis infection	1
Mechanical back pain	1
Rotator cuff tear	1
Osgood Schlatters	1
Endometriosis	1
Myofascial pain	1
Chronic back pain	1
Carpal tunnel syndrome	1
Migraine	1
Temporal mandibular joint dysfunction	1
No formal chronic pain diagnosis	1
Median number of self-reported unique pain sites (range)	5 (1, 31)
Number of participants self-reporting living with more than one chronic pain condition	6/16
Median number of comorbidities (range)	1.5 (0, 9)
Self-reported comorbidities	
Depression	4
Anxiety	3
Gastroesophageal reflux disease	2
Osteoporosis	2
Hypertension	2
Cerebrovascular event	1
Raynaud's syndrome	1
Systematic masteocytosis	1
Fatty liver disease	1
Angina	1
Hypothyroidism	2
Hypercholesteremia	1
Factor 5 condition	1
Diabetes	1
Ulcer disease	1
Basal cell carcinoma	1
Fleukes	1
Blepharitis	1
Hearing loss	1
Coronary artery disease	1
Bipolar disorder	1
Post-traumatic stress disorder	1
Psoriasis	1
Sleep apnea	1
Irritable bowel syndrome	1
Number taking an opioid for chronic pain management	4/16
Highest level of education achieved	
Secondary school	2
College	6
University	8
Occupational status	
Unemployed	3
Student	1
Part-time employment	3
Full-time employment	2
Sick leave	1
Retired	6
Annual household income	
<$20 000	2
$20 000–39 999	2
$40 000–59 999	1
$60 000–79 999	5
>$80 000	5
Number of days per week engaging in moderate-to-vigorous physical activity (range)	2.5 (0, 7)
On days when engaging in moderate-to-vigorous physical activity, number of minutes spent engaging (range)	30 (0, 75)

Table 2. Major themes and sub-themes related to participation in physical activity and exercise among adults living with chronic pain.

Themes	Sub-themes
The challenge of staying active	Decreased activity levels
	Discomfort during physical activity
	Uncertain and fluctuating abilities
Diverse factors influence participation	Pain
	Fatigue
	Perceived risks
	Beliefs about physical activity
	Competing demands
	Social support
	Motivation
	Other health conditions
	Access to supports for physical activity and exercise
Perceived outcomes	Pain management
	Functional improvements
	Social participation
	Mental health
	Overall well-being

Diverse factors influence participation

Multiple barriers and facilitators to physical activity were described by participants. Factors that influenced participation in physical activity and exercise included: pain, fatigue, perceived risks, beliefs about physical activity, competing demands, social support, motivation, other health conditions, and access to supports for physical activity and exercise.

Pain

The experience of pain itself was described by participants as a barrier to participation in physical activity and exercise:

> I would say that pain is a huge barrier to having even the motivation to exercise. In your mind you know you should exercise and that it's good for you but the pain and knowing that there could be more pain after exercising is like a turn off for me. (INT-14; 28-year-old woman who self-reported living with chronic pain for 8 years and engaging in 60 minutes of moderate-to-vigorous physical activity per week)

Fatigue

Fatigue was common among many participants. Low energy was described as a factor which decreased participants ability to engage in physical activity and exercise:

> Well I sleep all night and I get up and I feel good and then, all of a sudden, an hour later I just get tired and it just, it just, how would I say fatigued, you just got no energy, you just don't want to do nothing, you just sit there, you know, you just don't have energy, that's a barrier, that's a big barrier. (INT-2; 58-year-old woman who self-reported living with chronic pain for 36 years and engaging in 30 minutes of moderate-to-vigorous physical activity per week)

Table 3. Perceived barriers and facilitators to participating in physical activity and exercise as described by each participant living with chronic pain.

Participant	Pain	Fatigue	Perceived risks	Beliefs about physical activity	Competing demands	Social support	Motivation	Other health conditions	Access to supports for physical activity and exercise
INT-1	x	x	x	x	x	x	x		x
INT-2	x	x	x			x	x	x	
INT-3	x	x	x			x	x		x
INT-4	x	x	x		x	x	x		x
INT-5		x	x	x		x		x	x
INT-6		x	x	x		x	x	x	x
INT-7	x			x			x	x	x
INT-8	x			x		x	x	x	
INT-9	x		x	x		x		x	x
INT-10	x	x	x		x	x	x	x	x
INT-11			x	x		x	x		x
INT-12	x	x	x		x		x		x
INT-13	x		x	x		x	x		x
INT-14	x		x	x	x		x		x
INT-15	x	x					x	x	
INT-16	x		x		x	x	x		x

Perceived risks

Several participants described perceived risks of participating in physical activity and exercise. For example, risk of increased pain and injury were common factors which influenced participants likelihood of engaging in physical activity and exercise:

> I was always under the concern, if I make a mis-step, is this nerve in my neck going to paralyze me? Because when it struck me the first time, it drove me to my knees and I was always concerned as to whether I would be totally immobilized by it. (INT-6; 74-year-old man who self-reported living with chronic pain for 50 years and engaging in over 150 minutes of moderate-to-vigorous physical activity per week)

Beliefs about physical activity

Beliefs about physical activity and exercise, particularly whether it was viewed positively or negatively, were described as a factor that influenced participation. Most participants believed that physical activity and exercise was an important part of managing chronic pain:

> I know there's value in staying moving [...] if I don't move then I'm gonna lose it. I get more stiff and I get more sore and I lose more if I don't move. (INT-5; 69-year-old woman who self-reported living with chronic pain for 40 years and engaging in 0 minutes of moderate-to-vigorous physical activity per week)

Competing demands

Competing demands were brought up by participants as a factor influencing their ability to participate in physical activity and exercise. In particular, participants with children at home described that other daily activities take priority over physical activity:

> Well I've been raising three children on my own for the last eight years [...] getting them to school and picking them up and you know if they've got any extracurricular activities after school and what not. (INT-4; 39-year-old woman who self-reported living with chronic pain for 4 years and engaging in 0 minutes of moderate-to-vigorous physical activity per week)

Social support

Social support from peers and healthcare providers was described as a factor that helped participants to engage in physical activity. For example, peer support through group-based physical activity programming was viewed positively:

> [...] guided activity or group activity [is good] because it doesn't make you feel stigmatized from your injuries or from your pain. (INT-11; 31-year-old man who self-reported living with chronic pain for 11 years and engaging in over 150 minutes of moderate-to-vigorous physical activity per week)

Motivation

A lack of motivation to be physically active, due to a combination of factors, was described by many participants:

> Yes, I have to keep going, I don't know where I'd be if I didn't keep going [...] I would like to do chair yoga but I just don't have the motivation. You know some exercises or some things call to motivation and I just, once I've started I can't make sense of doing it. (INT-7; 79-year-old woman who self-reported living with chronic pain for 70 years and engaging in 0 minutes of moderate to vigorous physical activity per week)

Other health conditions

Other health conditions, particularly co-morbid mental health challenges, were described as significant barriers to physical activity and exercise for several participants:

> I think mental wellbeing goes hand in hand with physical wellbeing and if ... you're not feeling mentally well then you're less likely to participate in physical activities [such as exercise]. (INT-8; 62 year old woman who self-reported living with chronic pain for 10 years and engaging in over 150 minutes of moderate-to-vigorous physical activity per week)

Access to supports for physical activity and exercise

Access to supports for physical activity and exercise, such as fitness facilities, was highlighted by several participants. In particular, the financial strain of purchasing a gym membership was described as a barrier to being physically active:

> It's coming up with a gym membership [that is a barrier], it's not cheap [...] my money is paying rent and groceries and making sure the lights are still on. (INT-4; 39-year-old woman who self-reported living with chronic pain for 4 years and engaging in 0 minutes of moderate-to-vigorous physical activity per week)

As a whole, participants described that a combination of factors influenced their likelihood to be physically active. See Table 3 for an overview of the combination of factors that were described as barriers or facilitators to participating in physical activity and exercise as described by each participant.

Table 4. Perceived outcomes of participating in physical activity and exercise as described by each participant living with chronic pain.

Participant	Pain management	Functional improvements	Social participation	Mental health	Overall well-being
INT-1		x	x	x	x
INT-2	x	x		x	x
INT-3	x		x	x	x
INT-4				x	x
INT-5	x	x		x	
INT-6		x			
INT-7	x	x			
INT-8	x		x	x	x
INT-9		x	x	x	x
INT-10				x	x
INT-11	x		x		
INT-12	x			x	x
INT-13		x		x	x
INT-14			x	x	x
INT-15				x	
INT-16	x			x	x

Perceived outcomes

Participants described several perceived outcomes of participating in physical activity and exercise when living with chronic pain, including: pain management, functional improvements, social participation, mental health, and overall well-being. See Table 4 for an overview of perceived outcomes of participating in physical activity and exercise as described by each participant.

Pain management

Improved pain management was highlighted as an important outcome of participating in physical activity:

> Just going to hot yoga [...] I can actually measure the benefit. You know, I'll go in there with pain at a level 6 or 7 and I'll leave and I'll be down to a 2 or 3, it isn't magic, it doesn't get rid of it but I can definitely say that I never left there feeling worse. (INT-11; 31-year-old man who self-reported living with chronic pain for 11 years and engaging in over 150 minutes of moderate-to-vigorous physical activity per week)

Functional improvements

Functional improvements were commonly reported outcome of participating in physical activity and exercise:

> [Physical activity and exercise] keeps me functional [...] it makes me want to think about other things that can enhance my life. (INT-5; 69-year-old woman who self-reported living with chronic pain for 40 years and engaging in 0 minutes of moderate-to-vigorous physical activity per week)

Social participation

The social benefits of participating in physical activity and exercise, particularly when group-based, were also emphasized by participants. One participant described the social benefits she experienced as a result of participating in a group-based pool therapy program:

> Well I feel, if I can get out of the house [and exercise] and go to where I talk to people I know that it's much better than being in the house by myself. (INT-9; 87-year-old woman who self-reported living with chronic pain for 2 years and engaging in 0 minutes of moderate-to-vigorous physical activity per week)

Mental health

Improved mental health as a result of participating in physical activity and exercise was also stated by many participants:

> [Exercise] definitely helps with mental health [...] I mean you do get a bit of extra energy after you do something [...] and mental because it releases good chemicals and just makes you feel better as a person. (INT-14; 28-year-old woman who self-reported living with chronic pain for 8 years and engaging in 60 minutes of moderate-to-vigorous physical activity per week)

Overall well-being

The cumulative impact of improved pain management, functional improvements, social participation, and mental health lead several participants to describe an improved sense of overall well-being when participating in physical activity and exercise:

> [When I'm physically active] I feel more positive, I feel more assured of myself, I don't, I know once I get started, the last thing I want to do is be in the house, I always want to be out and going so as far as it all goes, it brings on more or less a whole new person. (INT-13; 55-year-old man who self-reported living with chronic pain for 43 years and engaging in 0 minutes of moderate-to-vigorous physical activity per week)

Moreover, these results highlight the challenge of staying physically active and the combination of factors that influence participation in physical activity and exercise for adults living with chronic pain. Furthermore, perceived outcomes of physical activity and exercise included pain management, functional improvements, social participation, mental health, and overall well-being.

Discussion

The purpose of this study was to explore experiences, barriers, and facilitators to participating in physical activity and exercise from the perspective of adults living with chronic pain. Key themes identified through this research included: the challenge of staying active, diverse factors influence participation, and perceived outcomes. This research adds to the literature by providing in-depth perspectives on physical activity and exercise from the perspective of adults living with chronic pain. Results can also be used inform future person-oriented physical activity and exercise interventions for adults living with chronic pain.

Participants in this research emphasized the challenge of staying active when living with chronic pain. These findings are consistent with previous research which has shown that people living with chronic pain value physical activity, but can experience challenges, such as increased pain and discomfort, when engaging in physical activity and exercise [46]. Our results build on this research by demonstrating that the day-to-day uncertainty about pain severity and fluctuating abilities is also an important aspect of participating in physical activity and exercise when living with chronic pain. Furthermore, results of this study demonstrate that people living with chronic pain report low levels of physical activity and the desire to "start small" with new physical activities. These results reinforce the value of graded approaches to physical activity and exercise [62–64]. Based on these results, adults living with chronic pain may also benefit from ongoing support, by

healthcare providers or others with expertise in physical activity and exercise, to manage the challenges they face when engaging in physical activity and exercise over the long term [65].

Our research results demonstrated that diverse factors influence participation in physical activity and exercise for people living with chronic pain. Several themes identified in this research are consistent with evidence on barriers to participating in physical activity and exercise among the general population (e.g., competing demands, social support, motivation, and access to supports for physical activity and exercise) [66–70]. Similarly, results of this research align with research on older adult's perspectives toward participation in physical activity, whereby social influences, physical limitations, competing priority, access difficulties, and motivation and beliefs are important factors which influence engagement [71]. However, our study also identified several challenges to participation in physical activity and exercise that are unique to people living with chronic pain (e.g., increasing pain, fatigue, uncertainty due to pain fluctuations, perceived risks associated with physical activity). Several of these factors align with previous survey research on barriers to physical activity in people living with chronic pain, including lack of time, limited access to supports for physical activity and exercise, and fear of movement and pain aggravation [72]. Our results build on this previous research by providing a richer exploration through qualitative interviews. The results of this study also highlight some additional factors influencing physical activity participation for people living with chronic pain. For example, uncertainty around daily fluctuations in pain was identified as an important factor that made staying physically active a challenge. People living with chronic pain also reported difficulty accessing resources for physical activity and exercise, such as financially accessible physical activity programming in the community. This builds on previous research describing how low-income populations living with chronic pain are less likely to engage in exercise as a result of financial constraints [73]. These results demonstrate that healthcare providers ought to consider how they might intervene on modifiable barriers to physical activity and exercise for adults living with chronic pain, at the level of the individual (e.g., perceived risks), healthcare system (e.g., access to supports for physical activity and exercise), and society more broadly (e.g., beliefs on the role of physical activity for chronic pain management).

Perceived outcomes of physical activity and exercise in adults living with chronic pain included pain management, functional improvements, social participation, mental health, and overall well-being. Perceived outcomes, such as social participation, are similar to previous qualitative research among women with fibromyalgia which found that group-based exercise contributed to positive social interactions, including decreased isolation and depression [74]. Furthermore, the results described align with quantitative research which has demonstrated that physical activity and exercise can decrease pain severity, improve physical and psychological functioning, and improve quality of life for adults living with chronic pain [26].

Clinically, it is important for rehabilitation providers to take a tailored approach, whereby an individual's unique barriers and facilitators are explored and used to inform recommendations for physical activity and exercise in adults living with chronic pain. In a clinical context, these results also demonstrate that strategies to facilitate participation and adherence in physical activity and exercise for this population need to extend beyond building conviction to help enhance confidence and ought to address and help overcome modifiable barriers and challenges to participation. This is important to consider, as previous research has demonstrated that knowledge on physical activity recommendations is not always sufficient to lead to behavior change [39]. These results also highlight that researchers ought to monitor and measure outcomes of physical activity and exercise interventions that are important to this population beyond traditional measures of pain severity, such as function, social participation, mental health, and overall well-being.

Despite the strengths of this research, it is not without limitations. First, this research recruited a diverse sample of adults living with various chronic pain conditions and may not have captured the nuances of experiences when participating in physical activity and exercise in the context of specific chronic pain conditions (e.g., chronic neck pain versus pelvic pain). Second, although this research describes key themes related to experiences, barriers, and facilitators to physical activity and exercise, it is not clear whether themes and sub-themes described would quantitatively predict participation in physical activity and exercise. Future research ought to quantitatively explore whether the factors described in this research predict participation in physical activity and exercise programs among adults living with chronic pain. It would also be valuable for future research to explore the relationship between the themes described in this research. Finally, a combination of in-person and telephone interviews was conducted in this research. While this decision was made to ensure we were not excluding potential participants due to geographical or functional barriers to interview participation, it is possible that participants who completed telephone interviews did not establish the same level of rapport with the interviewer, and share the same depth of information, as those who participated in an in-person interview.

In conclusion, results of this research highlight the challenges of staying physically active when living with chronic pain and that multiple factors are perceived to influence participation in physical activity and exercise in this population. Furthermore, perceived outcomes of physical activity and exercise included improved pain management, function, social participation, mental health, and overall well-being. Following these results, it is recommended that physical activity and exercise interventions are appropriately individualized to adults living with chronic pain based on their specific experiences, barriers, and facilitators to participation in physical activity and exercise. Ultimately, the results of this research have clinical and research implications for informing future person-oriented physical activity and exercise interventions for adults living with chronic pain, with the ultimate goal of improving engagement in physical activity and exercise among this population.

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