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Physical activity, sedentary behaviour and well-being: experiences of people with knee and hip osteoarthritis

Archontissa M. Kanavaki[a], Alison Rushton[a], Elizabeth Hale[b], Rainer Klocke[b,c], Abhishek Abhishek[d] and Joan L. Duda[a]

[a]School of Sport, Exercise and Rehabilitation Sciences, University of Birmingham, Birmingham, UK; [b]Department of Rheumatology, Dudley Group NHS Foundation Trust, Dudley, UK; [c]Musculoskeletal and Dermatological Science, School of Biological Sciences, University of Manchester, Manchester, UK; [d]Academic Rheumatology, School of Medicine, University of Nottingham, Nottingham, UK

ABSTRACT

Living with knee and hip osteoarthritis (OA) means living with pain and difficulty in movement. Given the beneficial effects of physical activity (PA) and reduction of sedentary behaviour (SB), these behaviours need to be understood in the context of individuals' daily lives and sense of well-being. Twelve individuals (age: 43–79 years; 67% female) with knee and/or hip OA purposively selected (e.g., age, OA duration, OA severity) participated in semi-structured interviews. Data was analysed using inductive thematic analysis. PA and SB were narrated as multifaceted experiences with two overarching themes, PA negotiations (*valuing mobility, the burden of osteoarthritis, keep going, the feel-good factor*), SB negotiations (*the joy of sitting, a lot is too bad, the osteoarthritis confines*), and two overlapping themes (*the life context*, *finding a balance*). Physical and psychological aspects of PA and SB experiences were interwoven. Participants valued mobility and were proactively trying to preserve it by keeping active. A constant negotiation among the OA burden, the need to enjoy life and life circumstances was underlying PA behaviour. Prescription and encouragement of a physically active lifestyle in this population should be linked to mobility-related personal values and sense of well-being, while addressing concerns around OA-safety and normalizing PA trade-offs.

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Physical activity; sedentary behaviour; well-being; osteoarthritis; qualitative

Background

Knee and hip osteoarthritis (OA) are common musculoskeletal conditions and can impact on every life domain, compromising quality of life. Research evidence gives an account of an existence marked by pain and disability (Lundgren-Nilsson et al., 2018; Wallis et al., 2019). Physical limitations, physical deconditioning, fatigue, physical distress, psychosocial distress, sleep disturbances, financial hardship and loss of productivity are all aspects of the personal and societal burden of OA (Busija et al., 2013).

Strong evidence exists on the beneficial effects of physical activity (PA) in lower limb OA, both from its structured and repetitive form, i.e. exercise regime, which is

CONTACT Joan L. Duda j.l.duda@bham.ac.uk School of Sport, Exercise and Rehabilitation Sciences, University of Birmingham, Birmingham, UK.
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considered core treatment (Bannuru et al., 2019; Rausch Osthoff et al., 2018), and from its broad definition of any bodily movement produced by skeletal muscles. The European Alliance of Associations for Rheumatology (EULAR) further proposes that PA promotion should be integral to OA healthcare throughout the disease course and in line with PA recommendations for the general population (Rausch Osthoff et al., 2018). However, it is still not well understood what PA behaviours should be targeted (Kanavaki et al., 2022) and how these can be best promoted when it comes to lifestyle PA. A recent systematic review of physiotherapy-led exercise interventions aiming to increase PA in individuals with lower limb OA using behaviour change techniques, concluded that overall, effectiveness was limited (Willett et al., 2019). Still, the highest effect was found for techniques such as patient-led goal setting, self-monitoring, reward and social support (Willett et al., 2019) and physiotherapy treatment interventions incorporating these characteristics are emerging (Willett et al., 2021). Another systematic review of interventions to enhance PA, with ≥6-month follow-up, found no significant improvement in self-reported PA based mostly on self-management programs targeting coping skills and self-efficacy, and inconclusive evidence from few studies with accelerometry-measured PA (Williamson et al., 2015). Data was deemed insufficient to identify effective delivery methods. Overall, there is a paucity of quantitative evidence on modifiable PA determinants in OA intervention research (Stubbs et al., 2015).

Qualitative evidence on the other hand comes mainly from participants in structured exercise interventions, and show that a constellation of positive PA experiences, beliefs and life attitudes, and social support was found among physically active individuals, but were absent from the ones who were physically inactive (Kanavaki et al., 2017). Among participants in an OA self-management program, PA maintenance appeared to be encouraged by developing health literacy through transformation of fears, finding hope and existential meaning, and bodily awareness (Klässbo et al., 2021). McKevitt et al. (2022) found that PA barriers were multi-level and dynamic, with underlying negative perceptions around PA, health and ageing. Still, PA in terms of moderate-to-vigorous PA recommendations appears somehow disconnected from rehabilitation (Hawke et al., 2022) and an in-depth understanding of PA behaviour in the daily life context of people with OA is missing from the literature. Limited qualitative evidence is also available regarding sedentary behaviour (SB), which refers to waking behaviours of ≤1.5 metabolic equivalent of task (METs) spent at a sitting, reclining or lying posture (Tremblay et al., 2017) and is distinct from physical inactivity, i.e. PA below the recommended 150 min/week (Thivel et al., 2018). For example, in OA patients social and environmental factors (e.g., screen-time and sitting jobs), pain and intrinsic factors (e.g. not viewing SB as relevant to health risks), were described as barriers to reducing SB (Webber et al., 2020). In a sample of women with rheumatoid arthritis, SB was a response to arthritis pain and flare ups, but also a way of living irrespective of the disease (Thomsen et al., 2015). Qualitative studies with older adults have shown that pain was an important determinant both of sitting and interrupting SB (Chastin et al., 2014), whilst negative perceptions around sitting were found both among individuals motivated to reduce SB (Greenwood-Hickman et al., 2016) and inactive ones (Grossman & Stewart, 2003).

This qualitative study of PA and SB as health behaviours draws from the biopsychosocial model of health, which highlights the subjective experience within a person's life context and the role of biological, psychological and social factors alike in health

(Karunamuni et al., 2020). It also employs self-determination (Deci & Ryan, 2008) and social-cognitive (Bandura, 2004) Theories, which are commonly used in understanding PA behaviours. These theories are also in line with the biopsychosocial perspective by linking behaviour to motivation and other psychological/cognitive constructs, while acknowledging social influences. For example, an active lifestyle can be key for the satisfaction of basic psychological needs, like the need for autonomy, competence and relatedness (Deci & Ryan, 2008), both directly (while engaging in activities) and indirectly (via the physiological and psychological benefits of PA), in turn enhancing subjective well-being (Kanning & Schlicht, 2008). In the context of OA pain and disability, an in-depth understanding of people's daily PA and sedentary experiences can be valuable in overcoming the challenges of promoting and sustaining physically active lifestyles.

Thus, the overall aim of this study was to understand how PA and SB are actualised and experienced in the daily lives of people living with knee and hip OA and how these link to people's sense of well-being.

Methods

Study design

A qualitative research design with face-to-face semi-structured interviews was employed. Study reporting is informed by the Consolidated Criteria for Reporting Qualitative Research statement (Tong et al., 2012) (Supplement 1).

Ethics

The study was approved by the Health Research Authority and the West Midlands Research Ethics Committee (IRAS ID-185665), UK.

Participant selection

Participants were recruited from Orthopedic and Rheumatology outpatient clinics (80%) and the community, self-reported physician-diagnosed hip or knee OA, were at-least 40 years in age. Sampling was purposive, from the 109 participants of an observational study on physical activity in OA described elsewhere (Kanavaki et al., 2022), and aimed to include representation of various age groups, gender, disease duration, OA severity (self-report), PA levels (self-report) and work/leisure patterns. Sample size was decided on the basis of data saturation and taking into account the available resources and research purpose (Baker & Edwards, 2012). A minimum analysis of 10 interviews with a stopping rule of two more was adopted, in line with evidence on the presence of themes after 6 interviews and data saturation after 12 (Guest et al., 2006).

Settings and procedures

The study was conducted in secondary care (two NHS Trusts) and a University site in West Midlands, UK, between February 2017 and February 2018. Participants received written information about the face-to-face interview study at the end of their visit for

the observational study, when a relationship had been established with the trained researcher (AK, female). Written consent was obtained prior to the interview. Twelve one-to-one interviews were conducted and audio-recorded, lasting between 30 and 60 min. The topic guide was informed by social-cognitive theory, i.e., inquiry about past experiences, role of others, positive/negative emotional states around PA/SB, OA-related expectations, and self-determination theory, i.e., inquiry about sources of motivation, personal meanings (Deci & Ryan, 2008; Bandura, 2000). The topic guide was reviewed by the research team and two healthcare professionals and piloted with three younger adults (two sedentary with musculoskeletal conditions), which resulted in wording replacement with lay terms, e.g., sedentary with sitting, and omission of questions that felt repetitive. The final version (Supplement 2) included open questions around OA impact, meaning and experiences of well-being and experiences, motivators, barriers to PA and SB, e.g., "How does OA affect your life- if it does?"; "When it comes to being physically active- moving or being in motion in contrast to sitting or lying- what do you do?".

Data analysis

Inductive thematic analysis was employed (Braun & Clarke, 2006), consonant with the exploratory nature of the study. The epistemological stance is underpinned by critical realism, which in a health-promoting context should attempt to "uncover generating mechanisms" stemming from agent-agent (individuals) and agent-structure (social-physical environments) relations (Connelly, 2001). As a first step these relations are described "epidemiologically" through individuals' accounts on how, when, where they happen (Connelly, 2001).

Interviews, transcription of the recordings and coding were conducted by the first author. Identifiable information was anonymized. Interview transcripts were read through and memos were kept along the field notes. Transcripts were analysed in an iterative process. Open coding of all text from ten transcripts was completed in NVivo 12(QSR International©). Two transcripts were kept aside and analysed later for referential adequacy and to confirm data saturation. Similar codes from the ten transcripts were grouped together in the process of searching for themes and three authors (AMK, AR, JLD) met to discuss preliminary thematic patterns. During the discussion the potential of other themes emerged. The first author repeated the analysis, with pen and paper for a fresh look into the data. All units of text relevant to study aims were coded and themes were identified. Next, themes were reviewed quote-by-quote to ensure that the thematic headings reflected the issues discussed. Themes were then combined into greater and overarching themes. A team debriefing followed and findings were deemed meaningful and grounded to the data. The last stage was writing up of the findings. Accelerometry-measured PA and SB drawn from visit-1 of the observational study are reported for informational purposes. Pseudonyms are used when reporting original quotes.

Trustworthiness

The sample selected was appropriate for the study, i.e., participants had lived experience of the topic under study. Analysis was grounded in the data and an audit trail, evidenced by the quotes provided, links back to the data (more quotes available

upon request). Several processes further ensured trustworthiness of the findings: prolonged engagement, peer debriefing, external audit, thick description, negative case analysis, referential adequacy, reflexivity (Cohen & Crabtree, 2006) (Supplement 3).

Findings

Twelve individuals with hip or/and knee OA were invited and took part in the study, eight recruited from secondary care, four recruited from the community. Ages ranged from 43 to 79 years (mean 56.9 years), eight were women (67%) (Table 1 for detailed participant characteristics). Two overarching themes emerged: "PA negotiations" including the themes *Valuing mobility, The burden of osteoarthritis, Keep going, The feel-good factor*; "SB negotiations" including the themes *The joy of sitting, A lot is too bad, The osteoarthritis confines*. Two additional themes were overlapping between PA and SB Negotiations: *The life context* and *Finding a balance* (Figure 1).

Physical activity negotiations overarching theme

Participants brought up different and sometimes contrasting factors which appeared to operate, interact and be under constant negotiation in shaping PA behaviour and experience. The themes offer an insight on the main aspects of these negotiations.

Valuing mobility

Being physically active and able to do daily activities was highly valued by all participants. Life satisfaction was related to activities of daily living and physical ability was at its core. The more disabling OA symptoms they experienced, the more central mobility appeared to be in their sense of well-being.

> *Like if I go walking now, if I have got to go out of a stile or anything, I'm not like a normal person.[][1] As long as I can get- do the daily things and walk to work, do my housework, and- I'm, I'm happy.* (Irene, 49)

Table 1. Participants characteristics.

Pseudonym (age in years)	Work status	OA duration	TJR offered	Had physio	Joint	MVPA (min)	LPA (min)	ST (hours)
Anna (43)	PT work	Recent		√	Hip	27	84	14.8
Brian (52)	FT work	Chronic		√	Knee	43	79	13.3
Chris (49)	FT work	Recent			Hip	102	147	10.6
David (63)	FT work	Chronic	√		Knee	40	71	12.7
Emma (55)	FT work	Recent		√	Hip	21	74	12.1
Florence (49)	FT work	Chronic		√	Knee	39	77	12.6
Gail (55)	PT work	Chronic	√		Knee	50	182	12.2
Helen (45)	FT work	Recent			Hip	47	92	12.6
Irene (49)	FT work	Chronic	√		Knee	71	55	12.3
Jane (74)	Retired	Recent		√	Hip	35	63	12.6
Kate (70)	Retired	Chronic			Hip	23	85	12.0
Liam (79)	Retired	Chronic	√		Knee	32	115	12.4

FT = full-time; PT = part-time; "Recent"= seeking medical help or receiving a diagnosis within the last three years; TJR = total joint replacement offered as treatment option; physio = physiotherapy; joint = joint of primary concern; PA = physical activity; LPA = light PA; MVPA = moderate-to-vigorous PA; ST = sitting time.

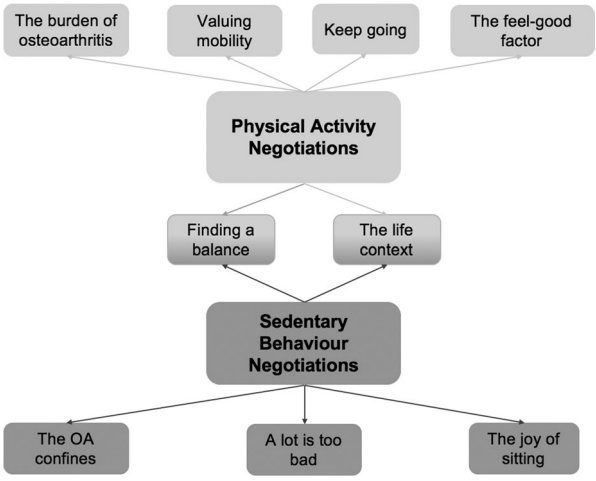

Figure 1. Visual representation of themes and overarching themes.

For many, a glimpse of disability during a flare-up awakened a realisation of the value of mobility and the need to preserve it through PA:

> *Actually losing that mobility makes you realise you take things for granted. [] And I'm thinking to myself, I just don't know how to cope if that was a permanent thing. I do think it's important to try to keep mobile, try to keep exercising for as long as I can really.* (David, 63)

Four participants highlighted the importance of maintaining independent living (Emma, Gail, Jane, Liam). For three participants being physically active was about making the most of their lives (Chris, Kate, Liam). Potentially disabling OA effects were not as prominent in their narratives:

> *I just enjoy life![]I want to keep as active and as bright, positive as I can for as long as I can…*(Kate, 70)

Participants also expressed their worries for future OA impact. This is discussed more in the next theme.

The burden of osteoarthritis

Living with OA meant living with mobility limitations and pain of various degrees. In turn, experiencing constraints, disability and pain had a negative impact on participants' well-being and was a source of distress. This theme contained the highest volume of quotes, comprising three subthemes:

Limited movement

All participants were experiencing some sort of inability in doing PAs although the degree of impact varied greatly. The majority talked about a list of daily activities they could no longer do, from putting clothes on and work activities, to leisure and sports. All had given up PAs they enjoyed because of experienced or anticipated long-term impact of OA on mobility.

It affects it [life] quite a bit really. Not so much now, after I've done the hydrotherapy, you know, 'cause I've got a better range of movement. When it was really bad [] I couldn't lift my legs to put socks on, shoes and like trousers and that. (Florence, 49)

In Liam, Kate and Chris's narratives, experiencing limitations rarely came up, although they did mention some constraints. Irene and Emma experienced serious limitations on a permanent basis. Besides the stiffness and decreased range of movement, pain was the underlying cause of limitations, ranging from no pain or a constant "dull ache" to "horrendous" recurring episodes.

Sometimes it's not too bad. I can't do stairs particularly very well, they are pain, [] Then once it gives way, I have weeks when I can barely walk of the pain. (Irene, 49)

… I just put up with a dull ache all the time. (Brian, 52)

Some participants described a limit to how active they could be before aggravating their symptoms.

I do, I do try occasionally, I think, oh it's a nice day today, I'll have a walk, and then I find a couple of days after I'm thinking, UFF! I know I've walked! My knees are hurting… (Gail, 55)

Subtler shades of being "limited" were also brought up. Most participants talked about instances when they felt unsafe on their feet. For some, such instances had turned into accidents. The discomfort, pain and risk of exacerbation appeared to give rise to a movement-related awareness. Some talked about how they were always conscious of their problem and cautious when active.

…I am always, always conscious of it. Even like I said if you go out and you 're dancing and things like that, you know it is always, always there at the back of your mind. [].because I know my knee could go any minute and lock up… (Irene, 49)

OA drags you down

Depression, despair, frustration, anger, worry, anxiety- a range of adverse feelings surrounded participants' PA experiences. OA appeared to have had an impact on their psychological state as much as it had on their body. Besides pain being an adverse and stressful experience itself, the very fact of not being able to move and do the things they wanted was hard to cope with, as was unanimously expressed by participants:

…the fact that you can't get up and do what you want to do, the fact that you can't just take the dog out and, I think that drags you down. Mentally it drags you down. [] it drains you. (David, 63)

The OA interference with family or work roles was also described as stressful. For younger participants having less physical abilities than peers seemed to be a cognitive and emotional challenge.

…all his [son's] friends' dads are probably about ten years younger than me and not all of them but some of them seem a lot fitter, stronger, sportier than I am. I don't want him to be embarrassed. (Brian, 52)

Projections of themselves in an unpredictable, painful and impaired future was another facet of mental distress. Most participants talked about their fears of the

disabling effects of OA progression (Anna, Chris, Helen, Jane) or of an unsuccessful surgery (David, Gail, Irene, Liam).

> *I was sort of thought of hip replacements and my mobility is going to suffer and, you know, you see people walking around with sticks and I'm thinking- oh, I'm still young… [] And it's, UFF!, I got that to look forward to? Yes, scared.* (Helen, 45)

Uncertainty around PA safety

Participants who did not discuss experiencing physiotherapy benefits or might have had confusing or no discussions with their healthcare professionals(HCPs) about PA/exercise, seemed to think that exercise wouldn't help or could aggravate OA. They did not engage in structured exercise:

> *I mean the doctor gave me a load of exercises, but I mean I think it was for people who sort of had a knee injury, but not like arthritis. There are things I couldn't do, like sliding down the wall and bending- I couldn't do half of it.* (Gail, 55)

Brief information provided during interviews triggered their interest to find out more and potentially routinely adopt exercises (David, Gail, Helen, Irene). However, unless perceived as safe for the joint, exercise seemed not to be considered:

> *If I was to go on this ARUK website and it was said on that, in black and white, that these exercises are good, that would motivate me. [] It must be ok. Not so much stick your hand in the fire, I wouldn't.* (Helen, 45)

PA avoidance for fear of pain or OA aggravation was also mentioned and the line between the two appeared to be blurred.

> *…[having unstable knee] you either then get into the habit of not doing anything, or whether you're worried that by doing something it's gonna make the knee worse, or you're going to get pain and you're trying to avoid the pain so you don't do anything.* (Brian, 52)

One exception was Chris, who wanted to go back to high impact sports if his symptoms subsided.

Keep going

This theme reflects the positive side of PA experience, a combination of positive mentality, proactive engagement with PAs and experienced benefits. It consists of two subthemes:

Keep moving, there is always something you can do

Most participants emphatically talked about the importance to "keep moving", literally and metaphorically- the reference was commonly accompanied by a statement regarding psychological well-being and coping with their condition. The alternative was a vicious cycle of physically becoming immobile and mentally getting depressed.

> *I try- generally don't give up, because there are ways to be mobile. If you give up, that's it. That's the downfall.* (Anna, 43)

While participants accepted there are limitations and believed that certain PAs would be inappropriate for their condition, they acknowledged they could still be active.

…if it gets that bad, I'll get into a wheelchair and I'll play wheelchair basketball. I will always do something. There's something that I can do, definitely. (Chris, 49)

Participants talked emphatically about activities, within their abilities, they engaged with, including modified versions, new alternatives or a non-joint-strenuous selection. This also meant sustaining independent living.

I try and find ways of doing it. I was cleaning once and my son said, what are you doing on the floor mom? And I- just sort of finding my way to the stairs to get up… if I'm really stuck I can't get on the floor, I get on the stairs and then allow myself down [giggle] and then I sort of get around the house sort on me back side. (Gail, 55)

Being active helps with OA

Most participants had experienced improvement in joint symptoms and physical function by being active, i.e., walking regularly, keeping busy with activities, doing physiotherapist-prescribed exercises. At the same time, several discussed that they had no (better) treatment options or formal PA advice by their HCPs. Those keeping an active lifestyle, had no formal PA advice. They were relying on their own positive experience, even contrary to pain and common beliefs about wear and tear:

…common sense tells me a lot of cartilage has gone from there, …even walking has got to sort of aggravate that. But I can only speak from my own experience, which since I've been doing more walking, I haven't had so many problems with my knees. (David, 63)

No, no, I just decided that myself. That if I try to be energetic and make my knees work, it would help and it seems to do. (Liam, 79)

Those who had had physiotherapy expressed satisfaction with the results and tended to view exercise as treatment. This translated into trying to do the exercises regularly or when needed.

I'm not a person that runs up to the doctors and say, I have this pain or that pain. I go to my sports injury man and I say, this is what's hurting, how can we put it right? And I'll work and I'll do my exercises to make sure I get it right…(Kate, 70)

In Brian's case, physiotherapy facilitated breaking years of inactivity following a series of injuries.

Witnessing others deteriorating when inactive or doing well when active, also confirmed participants' pro-PA beliefs:

…she also had a new hip fitted about a year after I did, but she didn't enjoy the pain and so didn't do the exercises. [] And now because of her chosen inactivity [] she can't walk more than 200 yards without stopping or having a rest. (Liam, 79)

The indirect beneficial effect of PA on OA, through weight management, was also mentioned.

I mean, walking obviously helps keep my weight down, which is another factor. I know definitely that when my weight creeps up, my knee gets worse. (Irene, 49)

The feel-good factor

Almost all participants had experienced feeling good, physically and mentally, when active: "Feeling more energy" (David), "everything sparkling off" (Kate), "the extra spring in your step" (Brian), getting fitter and being in a better mood, feeling happier. In essence, mind and body seemed to be inseparable in their experience. PA engagement also seemed to offer a sense of satisfaction and content and the knowledge that PA is beneficial for health further added to that.

> *I felt that I got more energy and generally it does make you feel more well-being. Because you feel that you got a little bit more energy, you know you've lost a little bit of weight and you know the exercise is doing you good, so…that in itself makes you feel more positive.* (David, 63)

Most of the participants also talked about how they enjoyed particular activities, which were part of their PA repertoire.

> *I can walk 14 miles in a day backwards and forwards [in the garden]. You know. [] So as soon as the sun is out, I am outside regardless of the weather, it's rain, snow, you know, I'm outside. I just love being outside. So I just keep busy.* (Kate, 70)

Sedentary behaviour negotiations overarching theme

SBs and related patterns such as interrupting prolonged sitting time are also underlain by a complex process. Although discussed in less detail by the participants, they appear as part of a continuum with PA experiences. The three themes under this overarching theme were:

The joy of sitting

All participants talked about sedentary activities they enjoyed doing. SB included favourite activities, like crafts or reading, and was considered quality time for oneself.

> *Yes, I also like to enjoy breakfast and sit for a while and listen to the radio. If I've got the time, that's very pleasant, yeah.* (Jane, 74)

SB was also an opportunity to spend quality time with important others and socialise.

> *And yeah, in front of the TV and there's always something nice to watch. And again, just spending time together is nice, because we don't really see each other that much during the week.* (Helen, 45)

For most, SB was also a time of physical and mental relaxation amidst a busy or stressful life, usually at the end of the day.

A lot is too bad

Although participants enjoyed sedentary activities, almost all mentioned negative perceptions about prolonged sitting and most did not see themselves as sedentary.

> *I try not to…[sighs] be a couch potato. I try not to… I'm not one of these that sit much, you know, in front of box sets, TVs.* (Helen, 45)

Many gave examples of attempts they made to reduce sitting time. Some particularly expressed their dislike for sitting (Chris, Kate, Liam). Importantly, a sedentary lifestyle seemed to have an existential load, viewed as a waste of potential and evidence of a miserable state of being. This was vividly worded in phrases like "sit down and vegetate" (Gail), "sit at home and brew" (Jane), "sitting in the house and feel sorry for yourself" (Anna), referring to what one should avoid doing or as the opposite of well-being.

The osteoarthritis confines

Another negative aspect of sitting most participants referred to was symptom aggravation. OA set a boundary to how much sitting participants could do before OA symptoms kicked in:

> *…if I sit for too long, when I stand up I've really stiffened up.* (Florence, 49)

Many participants described how they were frequently breaking up their sitting time to avoid pain and discomfort. For some, this had become habitual:

> *I don't remind myself [to interrupt my sitting time], but it seems to happen naturally actually.* (Jane, 74)

On the other hand, sometimes participants felt it was necessary to sit down to get relief from pain and discomfort:

> *Whereas now, I don't do this job any more, I do have a rest in my day. So when I feel really painful I can actually sit down.* (Anna, 43)

Overlapping themes between "PA negotiations" and "SB negotiations"

The life context

PA and sedentary experiences were taking place within certain social and physical environments. All participants referred to the influence of life circumstances on their PA and SBs. Type of work and family commitments especially, left a small window for choice. Work-related PA was variant in the sample, from sedentary (e.g., Brian, office worker) to active (e.g., Chris, sports instructor) with in between combinations of moving and sitting (e.g., Anna, part-time carer). Work also influenced leisure PA and SBs. Those working long hours, in shifts or stressful jobs, appeared more inclined towards sedentary activities the remaining of the day. Similarly, family commitments could involve PA, but could also mean less personal leisure time for PA:

> *Just running around after my family to be honest! [] keep tidying up after them, it just keeps me going.* (Gail, 55)

Factors like owning a dog (David, Emma, Florence, Irene), commuting on foot, living in a house with stairs and big garden, a walkable neighbourhood and longer days, positively predisposed towards PA:

> *I do a lot of walking. One 'cause I don't drive, two, cause I've got a dog.* (Irene, 49)

Those commuting by car on the other hand, tended not to take it into consideration when accounting for SBs.

> *So stay seated for up to 2 hours a day, maybe an hour and a half home at night…* [Later in the interview:] *I commute to [City] every day [] and that can take 1-1.5 hours' drive each way.* (Helen, 45)

In essence, social and physical-environmental circumstances were facilitating (or inhibiting) PA/SBs. To an extent these seemed to account for the discrepancy between desired and actual behavior. Financial issues, for example, were mentioned as related to less leisure choices than preferred (Florence, Jane), but also to physically overworking (Anna).

Finding a balance

Participants talked about the need for or a constant attempt to make optimal PA or sedentary choices—firstly, for short-term symptom management; secondly, for long-term symptom management and preservation of mobility. Regarding temporal symptom management, more symptomatic participants described how they had to constantly alternate between sitting, standing and moving, because too much of any triggered pain, stiffness or discomfort. For those, there seemed to be a behavioural continuum between PA and SBs:

> *The more I sit down, the worse it is… Whereas if I'm active then I don't get this problem, but if I'm doing it for a longer period then my- it's when hip kicks in.* (Anna, 43)

With a long-term perspective, participants were trying to find a balance between keeping active without overdoing it, enjoying life at present while ensuring future mobility and enjoying sitting without sitting too much. Regarding PA engagement in particular, which was perceived as more relevant to long-term OA-management, finding a balance was discussed as a process of trade-offs, which they did to the best of their understanding and abilities.

> *And I'd rather just keep to my normal pattern of walking every day than take the chance of doing the Zumba and [my knee] going off…So I do miss that, but it's just one of those things…*(Irene, 49)

One participant agreed by contrast to the need for balanced PA:

> *There has to be a balance, I think, and that's one thing I've never got right, that balance of taking a bit of rest when I probably needed rest.* (Chris, 49)

Discussion

This study explored in-depth how people living with OA experience PA and SB in their daily living. PA and SB were multifaceted experiences, related to the burden of OA, the need to keep mobile, keep enjoying life, and one's life context. Pain and other movement limitations, distress and uncertainty, as well as life commitments were "negotiated" against the need to be independent, enjoy PAs and managing OA and overt behaviour was the outcome of these negotiations.

The importance of a "balanced" lifestyle of PA engagement and reasonable SB aligns with the findings from a recent systematic umbrella review of PA in hip and knee OA,

where intermediate PA levels, even below the US guidelines, sufficed to gain benefits for pain and physical function, whilst being safe regarding disease progression (Kraus et al., 2019). PA experience was inseparable from OA, but also connected to participants' sense of well-being as a means of coping, enjoyment and living life to the fullest. PA as a painful and distressing experience, limited by OA, is a well-grounded finding (Busija et al., 2013). But present findings highlight PA as a positive experience too, a way to hold and move on in a valued and meaningful life. This is in line with conceptualisations of successful ageing that emphasise the role of PA and subjective well-being (Martínez et al., 2018). Participants were consciously trying to preserve their mobility and living status for as long as possible. Those who appeared to maintain an active lifestyle, made choices to engage in PA in the present with an eye on the future. This need for continuation of life in a meaningful way and the future perspective in present choices has been illustrated in qualitative research on musculoskeletal conditions (Snelgrove & Liossi, 2013; Leventhal et al., 1992; Whalley Hammell, 2007; Morden et al., 2011).

The observed correspondence of personal experiences, beliefs, motivation and PA behaviour is aligned with existing research (Busija et al., 2013; Kanavaki et al., 2017; Dobson et al., 2016; Quicke et al., 2017) and theoretical frameworks of health/PA behaviours (Bandura, 2004; Leventhal et al., 1992; Ryan & Deci, 2000; Brand & Ekkekakis, 2018). For example, Social-cognitive theory (SCT) underscores the role of beliefs and self-efficacy, which is greatly influenced by mastery experiences (Bandura, 2000). Positive PA experiences and beliefs can reinforce each other over time (Rimal, 2001). The central role of valuing mobility in PA experience as an impetus to "keep going", its link to a life fully lived, and appreciation of the "feel-good" factor are consonant with Self-determination theory (SDT) (Deci & Ryan, 2008; Ryan & Deci, 2000), that is satisfaction of the need for autonomy and competence brings a sense of vitality, well-being and increase of intrinsic motivation. Existing quantitative research on arthritis patients has also provided support for the model (Yu et al., 2015).

SB was mostly discussed in relation to a desired way of life: not excessively sedentary, but enjoyable in the sedentary activities participants chose. Negative connotations of sedentariness seem to be common in older adults (McGowan et al., 2021). SB was discussed in relation to OA primarily as temporal symptom management, i.e., sitting or interrupting sitting for relief from pain and discomfort, which is in agreement with previously reported findings in older women (Chastin et al., 2014). Shifting from sedentariness to PA and vice versa was often dictated by OA, which indicates that a behavioural continuum between PA and SB could be relevant to OA. Unlike findings from rheumatoid arthritis patients (Thomsen et al., 2015), being sedentary as a consequence of OA symptoms was not often brought up.

An interesting finding is that in participants' views, physical and psychological aspects of PA experience were hand in hand across themes: physical limitations and immobility coupled with mental distress; keeping mobile and feeling good when active. Well-being was not just a mental state, but an embodied experience. The concept of embodiment and bodily self-awareness has a long-standing phenomenological tradition (Williams, 1996; Zeiler, 2010) and is often encountered in research on musculoskeletal conditions (Snelgrove & Liossi, 2013). The exact mechanisms of physical and psychological interactions are difficult to unravel, but different aspects of the present findings have been supported quantitatively. In older adults,

engagement in moderate-to-vigorous PA was related to less chances of having depressive symptoms (Hamer et al., 2009). Longitudinal studies have also revealed a protective effect of life satisfaction (Collins et al., 2008) and positive affect (Ostir et al., 2000) on declines in physical function. Such findings support the relevance of the biopsychosocial factors to PA in OA and expand its application beyond pain experience and treatment outcome assessment (Kanning & Schlicht, 2008; Keefe & Somers, 2010).

The present study found that life circumstances appeared to play a significant role for PA and SB. In a way they seemed to set upper and lower boundaries in individuals' choices and could hinder or facilitate PA/SB. Work and family commitments were most often discussed, whereas commuting, seasonal influences and physical environment appeared less often. There are some differences from existing literature in the way social environment was discussed here, for example references to social and other healthcare professionals' support were very limited. Social support might be directly influential for participation in exercise programs (Kanavaki et al., 2017). Here, PA negotiations appeared as internal processes, like a dialogue with themselves trying to decide what is best to do. Limited contribution of social environment might reflect individuals who are already PA-conscious and engaged in an active lifestyle.

Strengths and limitations

The study offers an insight into lived experience of daily life PA and SB in individuals with knee and hip OA. The findings place PA and SB in the context of OA management, while keeping individual's personal values, present and future well-being into perspective. Findings are based on rigorous data analysis through an iterative approach and other processes to ensure trustworthiness, like peer debriefing and thick description. However, the study has certain limitations. All but one participants were sufficiently active in their daily lives, i.e. engaging in 150 min/week moderate-to-vigorous PA, accelerometer-measured. This raises the issue of transferability of findings to other individuals with knee and hip OA. However, it is the insight into this particular perspective of individuals who remain active despite the physical and psychological burden that was missing from the literature. Participants, as well as researchers, came from a white ethnic background. In other ethnic backgrounds, underlying assumptions about physical abilities, pain, values and behaviours are likely to differ. Finally, the influence of socio-environmental factors are not that prominent in participants' narratives and findings, as previously reported (Park et al., 2020), although these are known PA determinants. The study perspective indeed focused more on individual views and experiences, although the authors acknowledge that PA/SB is a multilevel phenomenon.

Implications for clinical practice and research

Firstly, HCPs when prescribing PA/exercise should acknowledge the conflicting aspects of PA and SB negotiations OA patients experience, and should (1) address worries around OA-appropriateness, also normalize uncertainty and PA trade-offs, (2) assess/build on previous experiences and PA/SB behaviour, (3) include personal values and sense of well-being in the conversation on behavior change and instigate

a vision for the future, e.g. through motivational interviewing. Secondly, for individuals who appear overwhelmed by pain and limitations, both pain management and need for psychological support could be addressed and precede PA discussions for maximising benefits. Psychological support might also be relevant to younger adults experiencing OA limitations. This could form part of a self-management pathway in OA care. Few programs adopting this approach show promise (Bennell et al., 2016; Somers et al., 2012). Acceptance and commitment therapy (Harris, 2011), which is in the cognitive behavioural tradition and emphasises working with a person's own values and goals, could be a promising component of intervention programs. Thirdly, acquiring positive PA experiences and consequently developing positive beliefs about PA should guide content and delivery choices for tailored behaviour change interventions.

Conclusion

Preserving mobility when living with OA is not a clearly marked path, and in reality it is a misty, uneven ground and a whole-person issue rather than a physical one. The first experience OA patients encounter is pain on movement and the most common lay belief is that moving "will make it worse". Most of this study's participants had moved past this first experience. They valued mobility and were proactively trying to preserve it by keeping active. This was not a linear process, but a constant negotiation of the OA burden, the need to feel able and enjoy life and other life circumstances. A balanced outcome involved keeping a satisfactory level of PA without overdoing it and enjoying SB without sitting too much.

Note

1. *[]* indicates omission of participant's words.

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Author contributions

Conceptualisation and design: AMK, JLD, AR, RK, AA, EH; Data acquisition: AMK; Data analysis: AMK; Interpretation: AMK, EH, JLD, AR; Draft preparation: AMK; Review and editing: AMK, EH, AR, RK, AA, JLD; Funding acquisition: JLD. All authors gave final approval.

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ORCID

Archontissa M. Kanavaki http://orcid.org/0000-0003-2630-1437
Alison Rushton http://orcid.org/0000-0001-8114-7669

Data availability statement

The data generated and analysed in this study are available from the corresponding author upon reasonable request, respectful of participants' privacy.

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