Abstract

Purpose

Pain and disability associated with lower limb osteoarthritis (OA) may contribute to difficulties at work. This study aimed to understand the perspectives of workers with lower limb OA on difficulties, concerns and coping strategies used at work.

Methods

Twenty-two individuals with lower limb OA and who working in paid employment participated in semi-structured interviews. Data were qualitatively analysed using an inductive thematic approach. Codes were identified and refined through review of interview transcripts and discussion with the research team.

Results

Six themes were identified in relation to experiences working with lower limb OA. Themes were: weight-bearing physical demands are challenging; lower limb OA can affect work performance; emotional consequences of pain; concerns about work in the future; positive experiences of supportive colleagues and managers; and minimal effects on sedentary work. Three themes were identified relating to strategies to manage at work: adjustments at work help manage pain and avoid exacerbations; regular strategies to manage pain; and healthcare professionals are consulted, but usually not specifically for work.

Conclusions

Workers with lower limb OA experience physical and emotional difficulties at work that can impact work performance. Workers are concerned about longevity and job security and use a range of strategies to manage symptoms and remain at work. Employers, employees and healthcare professionals may need to work together to create workplace accommodations to help workers with lower limb OA confidently remain in work.

Introduction

Osteoarthritis (OA) is a prevalent health condition, that affects more than 303 million people globally [1]. Lower limb OA is associated with high pain and disability [2–4], with hip and knee the most affected joints [5]. Although OA has been considered a disease of older age, it also affects adults in their peak income-earning years (24–55 years) [6]. OA has a considerable impact on individuals and society [7] and can affect all aspects of life, including work [8, 9]. Impairments and activity limitations associated with OA can negatively affect work participation [10, 11].

A recent systematic review found that young and middle-aged adults with arthritis have poorer work outcomes than healthy populations [8]. Osteoarthritis has become a leading and rapidly growing concern for reduced productivity and premature exit from work [12, 13]. Analysis of a US employer benefits database identified that workers with OA had significantly greater absenteeism (26.2 more days in a calendar year) than workers without OA [14]. Another study showed that individuals with OA reported more hours lost due to productivity loss (3.62 hours versus 2.21 per worker per week) than those without OA [15].

Despite reports of reduced work productivity and greater absenteeism among workers with OA, little is known about factors that impact work performance [16, 17]. Work-related outcomes are commonly measured through validated tools, economic costs and/or employment rates [18, 19]. These measures provide objective information on work-related outcomes, but do not provide in-depth perspectives of worker' experiences. A deeper understanding of the difficulties that individuals with lower limb OA experience at work and how they overcome these difficulties will inform future interventions. The aim of the study is to explore the perspectives of workers with lower limb OA on their experiences at work, including any difficulties or concerns they have, and strategies they use to manage at work.

Methods

Research Design

This study used a qualitative approach to collect in-depth experiences from workers with lower limb OA in paid employment. The study was underpinned by the theory of relativism, in that all perspectives are different, and no singular reality exists [20]. Data were collected through semi-structured interviews. The interview guide enabled participants to describe their individual experiences of working with lower limb OA and strategies they used at work.

Participants

Participants were recruited using online newsletters/adverts, social media (e.g., Facebook, Twitter), and paper and electronic advertisements. Individuals who responded to advertisements were directed to an online survey to assess eligibility. Individuals were eligible for inclusion if they were ≥ 18 years of age; employed in paid work or self-employed; had OA of the hips, knees, ankles and/or feet; experienced pain or activity limitations due to their lower limb OA for more than three months; and able to read and write in English. They were required to either be clinically diagnosed with hip, knee, ankle or foot OA by a healthcare practitioner or meet the National Institute for Health and Care Excellence (NICE) guidelines for a clinical diagnosis of OA (e.g., ≥ 45 years of age, activity-related joint pain, and no or minimal (resolves within 30 minutes) morning joint-related stiffness) [21].

Data Collection/procedure/interviews

Eligible participants were contacted by a researcher to obtain verbal and written consent to participate. Semi-structured interviews were conducted between May and September 2020. Interviews were

conducted online via Zoom, (San Jose, CA: Zoom Video Communications Inc), audio recorded and 15–40 minutes in duration.

A semi-structured interview guide using open questions and prompts was developed based on a review of the literature and discussion amongst the research team (Supplementary file 1). The interview guide was piloted and revised prior to data collection. Interview topics included: experience of living with OA; job demands; ability to perform work; work-related concerns/difficulties; coping strategies at work; and support of employer and colleagues. Based on the responses to these questions, follow-up exploratory questions were asked to obtain more in-depth information [22].

Data Analysis

Interviews were transcribed verbatim, and transcripts were crosschecked by one member of the research team (YSA) to confirm accuracy against the audio recordings. Descriptive thematic analysis using an inductive approach was used to give meaning to the data [23]. Analysis was iterative, which allowed researchers to move between stages of analysis to gain a better understanding of the data. First, one researcher (YSA) read all transcripts and developed preliminary notes. The research team met to generate initial codes, before three members of the research team (MHR, VJ and MDS) coded the entire dataset and refined the analysis into provisional themes and subthemes. Based on analysis of interview data, it was determined that no new themes were emerging, and data collection was ceased. The research team met again to review, define and name themes and subthemes before returning to the entire dataset to refine the analysis and finalise the coding.

Results

Forty-three individuals completed the eligibility survey and provided their contact information, with 22 individuals (51%) agreeing to participate in the study. Participants had a mean (standard deviation) age of 59.5 (8.2) years and worked in a range of occupations. The majority of participants were female (82%; n = 18), and just over half had knee OA (54%; n = 12). Characteristics of study participants are shown in Table 1.

Table 1
Characteristics of study participants

	Age	Sex	BMI	Site of OA	Education	Occupation	Employee/ Self-employed	Hrs/week
P01	70	F	27.1	Knee	Diploma	Community nurse	Employees	6
P02	67	F	20.9	Knee	University degree	Oral/maxillofacial surgeon	Self-employed	40
P03	57	M	49.4	Knee	Certificate I-IV	Building services officer	Employee	38
P04	56	F	43.3	Knee	University degree	Teacher	Employee	60
P05	66	M	27.8	Knee	University degree	Mortgage broker	Self-employed	30
P06	56	F	25.7	Foot	University degree	Change management lead	Employee	40
P07	48	M	26.5	Knee	Certificate I-IV	Pest management	Employee	40
P08	65	F	36.9	Knee	University degree	Gallery assistant	Employee	37
P09	64	F	31.2	Hip	University degree	Trainer and counsellor	Employee	24
P10	74	M	28.4	Hip	University degree	Food vendor	Self-employed	20
P11	68	F	28.5	Ankle	Diploma	Accounting and training specialist	Employee	23
P12	57	F	25.2	Knee	Diploma	School crossing guard	Employee	10
P13	62	F	55.5	Ankle	Secondary school	Accommodation assistant	Employee	30
P14	62	F	25.2	Foot	University degree	Teacher	Employee	40
P15	64	F	31.6	Foot	Diploma	Records manager	Employee	23
P16	50	F	20.0	Hip	University degree	Public servant	Employee	75

Education level refers to the highest level of education completed.

Abbreviations: F, female; M, male; BMI, body mass index (kg/m^2); OA, osteoarthritis, Hrs/week, Hours worked per week

	Age	Sex	BMI	Site of OA	Education	Occupation	Employee/ Self-employed	Hrs/week
P17	56	F	27.8	Ankle	University degree	Office administration	Employee	22
P18	57	F	23.7	Foot	Diploma	Yoga teacher	Self-employed	15
P19	47	F	27.3	Knee	University degree	Public servant	Employee	36
P20	41	F	41.4	Knee	University degree	Health and safety advisor	Employee	40
P21	60	F	33.2	Knee	Diploma	Account manager	Employee	45
P22	60	F	31.5	Knee	Diploma	Office worker	Employee	36

Education level refers to the highest level of education completed.

Abbreviations: F, female; M, male; BMI, body mass index (kg/m^2); OA, osteoarthritis, Hrs/week, Hours worked per week

Experiences working with lower limb OA

Six major themes were generated in relation to participants' experiences of working with lower limb OA (Table 2). Each theme and sub-theme are described below with participant quotes denoted using individual identifiers.

Table 2
Themes and subthemes

Themes and subthemes		Description
Experiences working with lower limb OA		
1	Weight-bearing physical demands are challenging	Participants with lower limb OA experience exacerbation of symptoms and difficulties performing weight-bearing job tasks (e.g., bending) and weight-bearing transportation (e.g., walking).
2	Lower limb OA can affect work performance	Work performance, quality, ability to perform tasks, and ability to work as desired is negatively affected by lower limb OA.
3	Emotional consequences of pain	There are emotional consequences to lower limb OA (e.g., anxiety, irritability, fatigue, attention) that impact productivity at work treatment and relationships with colleagues.
4	Concerns about work in the future	Participants have concerns about their futures at work
	a) Ability to remain in current job	Participants have concerns about being able stay in their current job in the future due to the perception that job demands will be too difficult with progressing age and worsening of OA.
	b) Perception of ageism and disability discrimination	Participants feel that they cannot show their age or any symptoms or disability associated with their lower limb OA in the workplace for fear of judgment, perceived weakness and pressures to retire.
	c) Worry about future employability	Participants felt that future employment options are limited because of physical limitations due to their lower limb OA.
5	Positive experiences of supportive colleagues and managers	Participants shared positive experiences associated with having supportive colleagues and managers
6	Minimal effects on sedentary work	For many people, lower limb OA has minimal effect on work when work is mainly sedentary
Strategies to manage work with lower limb OA		
1	Adjustments at work to help manage pain	Participants made adjustments at work to help manage pain and avoid exacerbations.
	a) Equipment adjustments	Participants change their workplace (e.g., desk, chair) and personal (e.g., external supports, footwear) equipment to help manage pain at work.
	b) Work schedule	Some participants adjust their work schedule to help manage their pain.
	c) Changing the way they work	Participants change how they do things at work how they undertake their work to manage their symptoms.

Themes and subthemes		Description
Experiences working with lower limb OA		
	d) Changing roles or jobs	Participants change job tasks, roles within an organization or change jobs to avoid exacerbating symptoms and to enable them to manage work.
2	Regular strategies to manage pain	Participants have strategies they use at work to help relieve and manage their pain.
	a) Changing positions and postures	Position and posture changes while undertaking work are used to relieve and manage pain.
	b) Taking breaks	Participants take a break from their work to go for a walk or move around to help manage their pain.
	c) Medications and other adjuncts	Medications and adjuncts such as topical creams and thermal modalities are used for pain relief as needed at work.
3	Healthcare professional consultation, but not usually specifically for work	Participants with lower limb OA often seek help from healthcare professionals for pain and symptoms affecting all of their lives, not just in relation to work.

Theme 1: Weight-bearing physical demands are challenging

Almost all participants described difficulties performing weight-bearing tasks (e.g., walking, bending, carrying load, standing for prolonged periods), with some individuals discussing activities they needed to do at work and others discussing their transportation to and from work. One participant said "*there was a lot of walking, a lot of up and down stairs involved, and it just became too painful*" (P17); whereas, another participant said "*…it's only the days that when there is the crouching down, carrying things… that I find that stresses my knee*" (P08). In terms of getting to work, a participant indicated their "*…biggest drama is the walking to and from the train station. And in fact, the job that I'm currently doing, I took that role because it was based close to the train station"* (P06). Weight-bearing physical activities were predominantly associated with pain, and sometimes other symptoms (e.g., loss of limb control, fatigue). For example, one participant said: "*…it always feels slightly more painful, and I always feel a little bit more uneasy going downstairs. …like I'm going to lose control"* (P19). At times, participants felt that their difficulties performing weight-bearing tasks impacted their colleagues/co-workers:

"*…if I'm trying to keep up with people, I can't walk as fast as them. And because in my role currently, I work in hospitals, so I need to move around pretty fast. And if I'm with a colleague, they tend to have to slow down for me… to accommodate my pace"* (P21).

Weight-bearing job requirements and transportation to, from and around work was challenging for study participants and provoked lower limb OA symptoms.

Theme 2: Lower limb OA can affect work performance

Some participants indicated that their performance at work was at times negatively affected by their lower limb OA, particularly in relation to ability to fulfil duties, activity limitations and time to complete tasks. Participants described that their physical limitations affected their work performance. Examples include, "*…it inhibits my ability to be as active as I would be in my class"* (P15) and it "*…just slows me down. … I just can't get to places as fast, or far"* (P03). Other participants described the mental impact of being in pain, stating that because of their OA, their training "*…goes down a few notches"* (P11), or explaining that their job is "*…very mentally demanding…if I'm in constant pain…it could, on a bad day, reduce me down to 60% productivity"* (P22). Reflections from participants indicated that job performance and productivity could be negatively impacted by their lower limb OA.

Theme 3: Emotional consequences of pain

Participants described experiencing a range of emotions (e.g., anxiety, irritability, impatience and fatigue) due to the pain associated with their lower limb OA. Emotional consequences of being in pain influenced their interpersonal relationships (e.g., interactions with others and relationships with colleagues). One participant said "*…it makes me very irritable… it can make me short-tempered with the staff around me…"* (P02). Participants described being less social, feeling withdrawn and limiting interactions or collaborations with others: "*…sometimes you don't even feel like talking to people really, because you could be so down…"* (P12). Participants also said their lower limb OA pain "*…causes a lack of concentration"* (P22), or that they would "*zone out"* (P04) and not pay attention. These consequences resulted in feeling agitated, missing things and reduced work productivity (see Theme 2).

Theme 4: Concerns about work in the future

This theme had three sub-themes: *Ability to remain in current employment, Perceptions of ageism*, and *Concerns about future employability.* Participants described concerns about their ability to stay in their current job, due to the perception that their job demands will be increasingly difficult as their OA progresses and with increasing age (sub-theme: *Ability to remain in current employment).* One participant described being concerned that in the future "*…there'll be a lot less things that I'll be able to manage"* (P04). Some participants indicated they may retire/leave the workforce earlier than they would if they did not have lower limb OA. For example, one participant said:

"I'm approaching retirement and it is a factor in that because I'm thinking I'll retire earlier rather than later. If I felt a hundred percent physically capable, I might continue to work a couple more years, but with the factor of the knee, I do have the concern that I won't be able to keep up. I won't be able to do the job as effectively as I maybe should, and I don't want to be seen as being the weakest link sort of thing" (P08).

Some participants said that rather than leaving the workforce prematurely, they may instead consider taking different roles that they could manage with their OA. For example, one participant thought that they would:

"…stop taking roles that require me to catch public transport, require me to get off a train or walk to an office. I have thought that I have to start looking for roles where I'd get in my car and drive to the

workplace" (P06).

In the second subtheme, some participants described concerns about the *Perception of ageism.* Participants described feeling that they could not show their age, any limitations in their ability, or symptoms of OA in the workplace for fear they would "sound like an old person" (P14) and perceived as a "failing physically" (P21). Participants were concerned that if their workplace knew they had lower limb OA, they would be encouraged to take early retirement or be "*branded with a pre-existing health condition that might impact on my ability to do my job"* (P14). One participant feared they would be viewed as "*…a ticking time bomb…'let's get rid of her before we get some sort of claim' or something*" (P11). Self-perceived ageism led participants not to disclose or admit they had OA (and were in pain) to colleagues and/or employers. One participant said:

"*…if I said something [about my OA], I would be encouraged to retire. That's the way it rolls… There is this inherent thing with older people and health problems. The solution to everything is 'why don't you stay home and retire', and I don't want to do that*" (P14).

The final subtheme, *Concerns about future employability*, encompassed participants concerns about the future in terms of their ability to secure employment, limited job options, and concerns about job security in current roles. One participant said they felt "*…uncomfortable and worried about the future…[because] if I'm feeling pain now, it's only going to get worse"* (P16). Participants discussed that they have been unable to accept job opportunities because of their lower limb OA. For example: *"I know if I went back to teaching, I would be very much in demand as a mathematics or a science teacher, but I physically can't do that"* (P17) and "*…there are some jobs that I've been offered that… would require a lot of walking. And, I've said no to them, because it's so painful to walk"* (P06). Participants with specialized or in-demand skills, and those who were eligible for the aged-pension tended to have less concerns about job security.

Theme 5: Positive experiences of supportive colleagues and managers

Participants with lower limb OA shared positive experiences associated with having supportive colleagues and managers: "*We compare notes because obviously my colleagues are of similar age to me and a few of us suffer the same way. We whinge to one another a bit*" (P02). Participants said that sharing the load, "*discuss[ing] it with someone who knows the feeling…*" (P10) and having others who understood their situation had a positive impact on their well-being. Participants also described the positive impacts of having helpful and supportive employers and colleagues who do not have OA. Participants described colleagues helping to manage their lower limb OA pain/symptoms by "*reminding me to get up and move around,"* (P20) and giving "*me a lift if I need one…"* (P03). Participants who were comfortable disclosing their lower limb OA/pain to their managers/employers felt that this led to a positive work experience, where employers would ask if they "*…need to go home or need to rest*" (P07) and permit them to "*…do what you have to do, if you need to get up and walk, do it"* (P16). However, this was not always the case. Some participants said they had not discussed their lower limb OA/pain with

the employers and/or colleagues because they felt they would not understand, it would not make any difference, or due to fear of ageism and job security (see Theme 4, subtheme 2 and 3).

Theme 6: Minimal effects on sedentary work

Participants described their experiences with sedentary jobs, noting that sedentary jobs were more manageable than jobs with higher physical demands. One participant with a desk-based job said their "*… knee pain does not affect my ability to work at all. I am perfectly fine to do the job I'm doing"* (P19). While many participants said their lower limb OA didn't affect their ability to complete their job demands, they still described experiencing difficulties: "*If the pain is really bad, then sometimes it's difficult to sit for long periods. And when I stand up, I get pain…"* (P22). Participants reported mixed experiences and impacts of their lower limb OA on sedentary work.

Strategies to manage work with lower limb OA

Participants with lower limb OA also described strategies to manage their pain and symptoms at work. These strategies were related to three main themes and seven sub-themes, which are described below (Table 2).

Theme 1: Adjustments at work to help manage pain

Participants described a range of adjustments used at work to help manage pain and avoid exacerbations that related to four sub-themes (Table 2).

In the first sub-theme, *Equipment adjustments*, participants explained how they made adjustments to workplace equipment (e.g., ergonomic office chairs, sit-stand desks and footstools) to help manage their pain. In relation to their sit-stand desk and ergonomic chair, one participant said:

"*…the flexibility to be able to stand up when I need, it means I don't have to leave the office as often to go walking, to get it going and having the ergonomic chair supports both my knee and my hip…. So, there are two things that really, I found changed a huge dynamic of how I work"* (P04).

Fewer participants described making changes using personal equipment at work to manage their pain. One office worker said they "*…wear the good shoes. If the pain gets really bad, I'll actually wear my sneakers to work*" (P06). Other participants described using braces, external supports and orthotics.

In the second and third sub-themes, participants described making adjustments to their *Work schedule* and *Changing the way they work* to help manage their pain. Work schedule adjustments included reducing the amount they work by making "*each session shorter"* (P02) or working fewer days per week. Many participants described making *changes to the way they work*, such as changing their activity level, postures, load, and weight-bearing transportation, to avoid symptom exacerbation. Participants described "*…modifying how much weight I carry…"* (P21), "*…making sure I wasn't getting up and down too much… so…rearranging my work to make sure if I had to go to the printer, I would wait until I had lots of things ready to print"* (P17), "*…using a trolley and push it, rather than carrying the weight myself"* (P08) and "*…*

restricting my walking… I'll ask if I can get a parking place close to the office. I'll take the lift instead of walking up the stairs" (P13). Participants used these strategies to help manage their pain at work.

In the final sub-theme, participants described *Changing roles (e.g., job tasks) or jobs* to minimize their physicality at work. Participants changed job tasks/roles within an organization to avoid exacerbating activities or activities they were no longer able to do because of their lower limb OA, such as long periods of standing or active transportation. For example, one participant said they are now in a "*deskbound role, which is great for my knees"* (P19). When participants were unable to modify the demands of their job, they described "*pushing through*" the pain, taking sick leave, resigning, and/or taking up alternative employment. One participant said, "*Even if it's painful, I have to try and block it out*" (P12) and another described how they "*work around the pain…*" and that they would "*just get through it, limp through it…"* (P07). Participants who discussed the need to change jobs because of their lower limb OA, indicated that they "*had to re-evaluate how I'm going to live for the next 10 years"* (P11) and another "*had to resign from jobs because of foot pain… and too much time on my feet"* (P17). Changing roles within an organization or changing jobs were realities associated with lower limb OA.

Theme 2: Regular strategies to manage pain

Reactive strategies participants described to manage/relieve pain were related to three sub-themes (Table 2). In the first sub-theme, participants described *Changing positions and postures* for pain relief, such as changing from sitting to standing or vice versa, shifting load to the unaffected side, changing joint angles (e.g., straightening legs when sitting) and elevating the legs. One participant said they "*…shift position of my hip somehow, it makes it more comfortable…turning a little bit left or right, finding a position where the joint is less painful"* (P18) Others described changing the position of specific joints: "*… I flex [my ankles], because that seems to help a lot"* (P11), "*I'll straighten [my knee] out…"* (P04), and "*…I'll do a few swings…to prevent [pain]"* (P08). Some participants also described elevating their lower limbs to relieve pain, saying that at times, they've "*…got to put my feet up"* (P14). Participants recognized that they have "*adapted my behaviour"* (P08) to try to manage their lower limb OA pain at work.

In the second sub-theme, participants described *Taking breaks*. This commonly included walking or moving around, which while similar to changing postures, involved short breaks from job tasks. For example, one participant said they would "*…either stand up and then just have a stretch for a few minutes or else I would go for a walk for five minutes or so*" (P19). Participants described the need to do this relatively frequently "*…probably a least every hour, if not more often, I get up and move, go for a little walk…"* (P20).

In the final sub-themes, participants explained that they used *Medications and other adjuncts* at work for pain relief. They described using anti-inflammatories, paracetamol, topical creams, thermal modalities and hydrotherapy as needed to manage pain. Participants' willingness to take pain medication at work varied, with one participant describing taking "*a fairly mild painkiller, probably twice to three times a day…"* (P21), and another saying they only "*…occasionally take anti-inflammatories…"* and they *"..try not*

to" (P15). Together with medication, taking breaks and changing posture/position, participants used a range of strategies to deal with their lower limb OA pain at work.

Theme 3: Healthcare professional consultation, but not usually specifically for work

Participants described seeking advice from health professionals for pain and symptoms that affect all aspects of their lives, not only in relation to their work. One participant said they "*…see a physio and an exercise physiologist, regularly, more to help me overall, not just for the work perspective*" (P20). Participants applied general strategies provided by healthcare professionals for managing their pain to the workplace (e.g., *"wearing a support"* (P02), avoiding *"stairs and slopes"* (P22), and *"take painkillers"* (P05)). A few participants discussed receiving specific interventions at work, such as a "*workstation assessment*" (P16) and a 'check in' from "*workplace injury management people*" (P03), but it was more common for participants to report seeing healthcare professional for overall manage of their OA, and not specifically for work.

Discussion

The purpose of this study was to explore the perspective of workers with lower limb OA about their experiences at work, including any difficulties or concerns they have, and strategies they use to manage at work. Emergent themes from interview data reveal that people with lower limb OA experience physical and emotional difficulties at work which can affect their work performance. Participants shared concerns about their ability to remain in their current employment and secure work in the future due to their lower limb OA. Workers with lower limb OA shared strategies they use in the workplace to manage their pain and symptoms which included modifying their work set-up, using specific equipment, adjusting their work schedule or the way they perform their work, taking breaks, changing positions or posture, and even changing roles or jobs. This information provides healthcare professionals and employers with a deeper understanding of the difficulties and concerns people with lower limb OA experience at work and suggests strategies that can be used to help workers with lower limb OA manage in the workplace.

Participants in the current study described the physical and emotional impact of lower limb OA at work. Weight-bearing requirements of their work (such as walking, bending, carrying load or standing for prolonged periods), and getting to work (e.g., walking from public transportation) were often challenging for people with lower limb OA. Pain associated with lower limb OA contributed to mental health and led to feelings of anxiety, irritability, impatience, and fatigue at work. People with lower limb OA associated difficulties experienced performing physical tasks and emotional consequence of symptoms with decreased work quality and productivity. These findings are consistent with survey data from workers with lower limb pain (aged 50–64 years) that found that physical work demands negatively affected ability to perform work [24]. Emotional exhaustion has been reported in office workers with musculoskeletal pain [25], and is an important consideration for work participation in people with lower limb OA.

Participants in our study expressed concerns about job security and their ability to remain in the workforce. Workers with lower limb OA discussed concerns that as their OA worsens with age, their ability to remain in work would diminish. This sentiment has also been conveyed by people with chronic knee pain who are worried about limited employment opportunities due increasing age and declining knee health [26]. Concerns about longevity in the workplace are supported by data showing people with hip and knee OA were more likely to be retired than those without OA [27]. In fact, several studies have shown that OA is a risk factor for early exit from the workforce, including retirement and unemployment [28–30]. This is concerning as sustainable and productive employment is important for health outcomes in individuals with chronic diseases and for maintenance of the workforce [31]. In Australia, exit from the workforce could exacerbate the labor shortages affecting society [32, 33].

To cope with difficulties, people with lower limb OA used a range of strategies to manage symptoms and try to limit the impact of their OA on their work including using ergonomic (e.g., ergonomic office chairs, sit-stand desks and footstools) and personal (e.g., braces, footwear and orthotics) equipment, adjusting their work schedule, changing the way they undertake their work, changing their roles within organizations and seeking alternative employment. They also acknowledged the need to take breaks, change postures/positions regularly and use medications or other modalities to manage pain throughout the day at work. The importance of implementing coping strategies to manage symptoms and disability at work is supported by a mixed-methods study on employees living with chronic musculoskeletal pain that found that coping strategies and workplace accommodations (e.g., flexible work organization) helped maintain productivity in the workplace [34]. Oakman et al [34] reported a range of coping strategies adopted by employees with pain, including having a supportive employer, job redesign (e.g., work schedule control), modifying the physical work environment (e.g., lifts, trolleys, and handles), taking medication, and personal characteristics (e.g., being more absorbed in work to distract from pain). Among these strategies, having a supportive employer was the key determinant of maintaining productive employment. Our study participants varied regarding disclosure of their lower limb OA. Some participants reported that employers and colleagues supported them physically and emotionally (e.g., providing flexibility to take breaks and rest), making it easier to work with lower limb OA. Other participants did not discuss their lower limb OA with the employers or colleagues because of concerns about ageism, ableism and job security. This finding is similar to a study of younger individuals (aged 18–50 years) with arthritis (including OA) which found that participants were hesitant to disclose their condition to their employer and colleagues due to the fear of unequal treatment in the workplace [35]. There are a number of factors that influence the decision about whether to disclose a condition to an employer including the employee's rapport with the employer [36], if the employer appeared dismissive [36] and knowledge of available workplace support [37]. Receiving support from an employer or colleagues benefits work productivity among people with musculoskeletal conditions [38, 39]. Thus, addressing barriers to the disclosure of lower limb OA to employers is important.

This qualitative study provides valuable information from workers on their perspectives of working with lower limb OA [40]. The use of semi-structured interviews enabled each participant to share their individual experiences and perceptions without being influenced by the perspectives of a larger group. To

enhance validity and reliability of the findings, we used researcher triangulation by involving three researchers in the data analysis [41]. Despite the strengths of this study, there are limitations to consider. Participants were eligible for inclusion in this study based on self-report diagnosis of lower limb OA from a healthcare professional or the NICE criteria for a clinical diagnosis of OA. X-rays were not taken to confirm the presence of radiographic OA or to determine the level of severity. We also did not collect data on the level of disability participants experienced due to their lower limb OA. It is possible that challenges and concerns in relation to work and strategies to manage symptoms may differ between individuals of different stages of OA. This is a direction for future research. Further, we included participants with OA affecting any joint of the lower limb to provide an overarching picture of the impact of lower limb OA on work. While there is evidence of similar impairments among individuals with hip, knee, ankle and foot OA [42–45], the impact of these impairments on work may have differed based on the joint affected. As half of our participants had knee OA (54%), the data may be most reflective of this specific population. Finally, our sample was predominantly female (82%), which is consistent with the demographic most commonly affected by OA (18% of females compared to 10% of males [46]). However, our data may not be representative of males, who are more likely to work in physically demanding roles than females [47].

Sustainable and productive employment benefits both society and the individual, providing opportunities for better financial and health outcomes than early retirement for those with chronic diseases [31]. The results of this study demonstrate that people with lower limb OA experience physical and emotional difficulties, have concerns about their current and future work abilities, and adopt a range of strategies to manage at work. With the right support from employers and healthcare professionals, workers with chronic illness can continue to make meaningful contributions at work [48]. Our most prominent recommendation is for employers and healthcare professionals is to work with employees to enable workers with lower limb OA to have timely access to health and job support to promote sustainable work ability and productivity. While this is a shared responsibility, specific responsibilities of employers (e.g., provide accommodations to assist workers manage difficulties at work) and healthcare professionals (e.g., screen workers to identify barriers for work) should be defined. This collaborative approach is only possible if workers trust the employer sufficiently to disclose concerns. Monitoring the effectiveness of interventions and strategies is necessary to increase knowledge on effective and efficient work-related support. This study focused on workers' perspectives. Future studies should focus on multi-stakeholder perspective and study the employer and healthcare professional views on facilitators for workers with lower limb OA to remain in productive and meaningful work.

Conclusions

Lower limb OA is often associated with challenges at work and limited work productivity. Workers make adjustments and employ strategies to manage their OA symptoms and disability at work, which could be expanded and further developed by collaboration with employers and healthcare professionals. The study findings can be used to raise awareness and educate employees, employers and healthcare professions about working with lower limb OA.

Declarations

Ethics approval and consent to participate

This study was approved by The University of Queensland Human Research Ethics Committee (approval number: 2019002852) and all participants provided informed consent prior to study participation.

Author Contributions

The authors confirm contribution to the paper as follows: study conception and design (MDS and VJ); data collection (YSA, MDS, and VJ); analysis and interpretation of results (YSA, MHR, MDS, and VJ). The manuscript was written by YSA, MHR and MDS, and reviewed by the authorship team. All authors read and approved the final manuscript.

Availability of data and material

All data is available upon the request from the authors.

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Conflict of interest

All authors declare they have no conflicting interests.

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