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Factors influencing cane use for the management of knee osteoarthritis: a cross sectional survey.

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ABSTRACT

Objective: To investigate demographic, symptom-related and cognitive determinants of cane use for knee osteoarthritis (OA) and prioritise the factors that could facilitate cane use in people with no previous cane use.

Methods: A survey of people aged ≥45 years with a clinical diagnosis of knee OA was conducted. The survey included two sections: i) demographic and cognitive determinants of cane use assessed via subscales of the Cane Cognitive Mediator Scale; ii) 19 statements, underpinned by the Behaviour Change Wheel theoretical framework, relating to factors that could facilitate regular cane use. Logistic regression was used to examine determinants of cane use while a priority pairwise ranking activity (1000minds) determined the rank order of the 19 statements that could facilitate cane use.

Results: 529 people completed Part 1 (80% females; 35% cane users) and 231 people completed Part 2. Age (OR 1.06, 95% CI 1.03, 1.09), body mass index (BMI) (OR 1.03, 95% CI 1.01, 1.06), knee pain ≥3 years (OR 2.62, 95% CI 1.63, 4.21) and numeric rating scale pain level whilst walking (OR 1.19, 95% CI 1.09, 1.30) were significant independent determinants of cane use. In people who had never used a cane, statements relating to cane use technique, fitting, knowledge of benefits and motivation were ranked highest overall.

Conclusion: Independent determinants of cane use include older age, higher BMI, greater pain duration and greater severity of knee pain. Strategies targeting an individual's capability and motivation to use a cane may increase cane use among people with knee OA.

Significance and innovations

- Walking canes can reduce pain and improve function in people with knee osteoarthritis (OA) but are under-utilised.
- Identifying ways to improve self-management of this chronic condition is important, at both the provider level and the patient level.
- This study, utilising a behaviour change approach, found that older individuals with a higher body mass index, longer duration of knee pain and more severe pain whilst walking are more likely to use a walking cane.
- Clinicians should focus on making individuals feel more capable and motivated to use a walking cane in order to increase uptake rates.

Knee osteoarthritis (OA) is a highly prevalent condition affecting approximately 24% of the population and has a lifetime risk of almost one in two (1, 2). Pain and physical dysfunction are hallmarks of knee OA (3). Given that there is no cure for this chronic condition, treatments that emphasise self-management are preferred (4-6). Although limited, current evidence supports the use of a walking cane to reduce pain, improve physical function and improve medio-lateral knee load distribution in people with knee OA (3, 7, 8). Indeed, cane use is advocated by clinical guidelines as an adjunct to core treatments of exercise and weight loss (4-6).

Literature on assistive devices has largely focused on their use in older populations. This literature often focuses on the stigma associated with assistive device use and the connotations that assistive devices carry about being old or frail (9, 10). Older populations have described reducing falls as a motivating factor for using a walking frame or cane (11). In Parkinson's disease, cane use has been associated with poorer balance (12). There is much less literature investigating the use of assistive devices, specifically walking canes, in a population with knee pain where the primary goal is more often to reduce pain and improve physical function, rather than improve balance. Although walking canes are recommended by clinical guidelines for knee OA (4-6), use of a walking cane is reportedly an under-utilised self-management strategy in people with knee OA (9). There has been limited investigation into the factors that influence whether patients with knee pain use, or do not use, a cane (9, 10).

Some evidence suggests that older age, more severe symptoms and black race are associated with the use of a walking aid in people with rheumatoid arthritis or hip/knee OA (9, 10). The

role of cognitive factors in influencing cane behaviour has also been demonstrated in people with various arthritic conditions (9). Van der Esch et al (9) found that use of a walking aid in people with rheumatoid arthritis or OA of the hip or knee was associated with a less negative evaluation of the aid, meaning that people who viewed walking aids less negatively were more likely to use one. According to the Theory of Planned Behaviour, people will have a greater intention to use a cane if they have a more positive attitude toward using a cane and anticipate fewer difficulties in using a cane (greater perceived behavioural control) (13). Capability, opportunity and motivation are all important influences on behaviour (14). Motivation may be internal, relating to the individual level of bother associated with their symptoms, or external, such as advice to use a gait aid from a clinician or family member. Literature on the use of mobility aids in older people has found that physician encouragement is a strong motivating factor for use (15). No research to date has asked people with knee OA which factors are the most important to facilitate regular cane use. Further research to better understand determinants and facilitators of cane use is needed to identify target groups and guide the development and implementation of strategies aiming to promote cane use specifically amongst people with knee OA.

We therefore conducted a survey of adults with knee OA to i) investigate demographic, symptom-related and cognitive (attitudes and perceived behavioural control) determinants of cane use; and ii) prioritise factors that could facilitate regular cane use in people with no previous cane use.

Material and methods

Study design

A descriptive, cross-sectional survey was undertaken.

Participants

People living in metropolitan and regional areas of Australia were recruited between July 2016 and January 2017. Recruitment was through advertisements on the Centre for Health, Exercise and Sports Medicine website and social media (Facebook and Twitter), and from our existing volunteer database. Inclusion criteria were: i) age 45 years or over; ii) activity-related knee pain on most days in the past month and; iii) either an absence of morning joint-related stiffness or morning stiffness lasting no longer than 30 minutes. These criteria are consistent with the National Institute for Health and Care Excellence recommendations for a

clinical diagnosis of knee OA (4). Participants with a history of neurological illness affecting lower limb function or walking were excluded. Ethics approval was granted from the University of Melbourne Human Research Ethics Committee and participants gave consent prior to completing the survey.

Survey

A two part custom-designed survey was administered online to eligible participants via SurveyGizmo (www.surveymonkey.com) and 1000Minds (www.1000minds.com), respectively.

Part A ascertained participant demographics (such as age, sex, body mass index (BMI)), symptoms and attitudes to, and confidence about using, a cane during walking. Using an 11-point numeric rating scale (NRS) with anchors of 'no pain' (score=0) and 'worst pain possible' (score=10), participants rated their average pain during walking over the previous week (16). Difficulty with physical function was assessed using the 17-item physical function subscale of the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC, scores range 0-68, with higher scores indicating worse function) (17). Subsections of the Cane Cognitive Mediator Scale (CCMS, a scale validated in community-living older adults with or without cane use experience based on constructs of the Theory of Planned Behaviour) (18), were used to assess attitudes about the consequences of cane use, as well as perceived behavioural control (confidence) in overcoming potential difficulties associated with cane use. The CCMS attitude subscale contains 13 statements in total, 7 positive attitude statements and 6 negative attitude statements. One statement from the positive attitude subscale ('using a cane would keep me from falling') was omitted from the survey given its similarity to another statement in this section ('using a cane would make me feel safe from falling'). Items were scored on a 5-point Likert scale and ranged from very unlikely (-2) to very likely (+2), with negative attitude statements being scored in reverse. Scores for each attitude subscale ranged between -12 to +12, with higher scores indicating a more favourable attitude to cane use. The CCMS perceived behaviour control subsection includes 7 statements, also scored on 5-point Likert scale ranging from very unlikely (+2) to very likely (-2). All statements in this subsection were framed negatively, so scoring was reversed (range -14 to +14), such that higher scores indicated greater perceived control (confidence) over the ease with which a cane could be used.

Part B explored factors that could facilitate the behaviour of regular cane use in those participants who had not used a cane before. This was underpinned by the Behaviour Change Wheel (BCW) theoretical framework which posits that behaviour is determined by 'capability' (physical skills, psychological skills or knowledge), 'opportunity' (environmental, interpersonal and social influences) and 'motivation' (beliefs and emotional reactions) (COM-B) (14). As recommended, we adapted the 23-item COM-B Self-Evaluation Questionnaire to suit the behaviour of interest (14) via iterative discussion and consensus involving several authors (KLB, RN, AVG). Four of the 23 items were excluded as they were deemed irrelevant. This resulted in a final set of 19 statements (Figure 1) to address the behaviour of interest, regular use of a cane for knee pain (seven statements relating to capability, seven relating to opportunity and five relating to motivation). Participants were requested to rank the statements in order of perceived importance using the online software program 1000Minds (www.1000minds.com). This is a decision-analysis research tool that prioritises statements or criteria according to their relative importance to the participant (19). For this process, participants were presented with pairs of statements and asked to choose the one they considered more important for regularly using a walking cane. Participants repeated this process until the program was able to accurately rank all 19 statements using the minimum number of questions.

Data analysis

Data were downloaded from SurveyGizmo and 1000Minds and exported to Excel. Internet Protocol (IP) addresses and time stamps were matched across the two parts of the survey to ensure consistency across the online platforms. Data were analysed using the Statistical Package for the Social Sciences (SPSS, IBM corp., Version 21, Armonk USA). Descriptive statistics were calculated. Nominal and ordinal data were described as n (%) and continuous data as mean ± SD. To identify potential putative determinants associated with cane use, we first determined which variables differed between cane users (current or in the past) and non-users using Chi square tests or independent t-test as appropriate. Demographic, symptom-related and cognitive variables that were significantly different between cane users and non-users were then entered into a binomial logistic regression model for investigation. Statistical significance was set at $p<0.05$.

The data provided by the 1000minds software included an overall weighted preference value for each statement for the entire sample. A higher preference value indicates greater overall

importance of the statement to the participants in order for them to change their behaviour and regularly use a cane. The preference values of the 19 statements sum to 100 and reflect a weighting given by the software based on responses (not a percentage of the total responses).

Results

Screening questions were attempted by 1771 people with 772 (44%) determined eligible. Of those eligible, 529 (69%) participants had complete data for Part A and 363 participants (47%) had complete data for Part B. Participants were located in Australia, with all states and territories represented. Participant characteristics for the cohort are presented in Table 1. The cohort had a mean age of 61.5 years and most were female (80%). One hundred and eighty six (35%) participants had used a cane for knee pain at some point, while 343 (65%) participants had never used a cane before.

Participants who had used a cane were slightly older, had a higher BMI, had a longer duration (≥3yrs) of knee pain and reported more severe pain while walking (Table 1). Of these variables, the logistic regression model determined that each of these variable were significant independent predictors of cane use (Table 2). Specifically, the odds of using a cane were higher by 1.06 (6%) for every one-year increase in age, 1.03 (3%) for every one-unit increase in BMI, and 1.19 (19%) for every one-unit increase in knee pain. For participants who had knee pain for three years or longer, the odds of using a cane were 2.6 times greater than participants who had knee pain for less than three years. Overall, the model was able to correctly classify 66.9% of participants as cane users or non-cane users.

The overall weighted preference value for each statement relating to the importance of factors in facilitating the behaviour of regular cane use in people who have never used a cane (n=231) is shown in Figure 1. Statements relating to participants' capability to regularly use a cane were ranked highest overall, followed by statements relating to motivation. Statements relating to having the opportunity to regularly use a cane were ranked lower overall, with the exception of 'have a cane that is correctly fitted to me', which was ranked fourth highest out of the 19 statements.

Discussion

This study aimed to explore determinants of walking cane use in people with knee OA, as well as factors that people with knee OA perceive as most important in facilitating regular

cane use. We found that older age, higher BMI, longer duration of knee pain and more severe pain while walking were significant determinants of cane use. In addition, factors relating to an individual's 'capability' and 'motivation' were perceived to be the most important facilitators of regular cane use by people who had never used a cane. Collectively, these findings may help clinicians identify the subgroups of people with knee OA who may be more likely to consider using a cane as a self-management strategy, as well as inform the development of strategies aiming to increase cane use.

We found that 35% of people had ever used a cane for their knee pain. This is consistent with our prior research evaluating use of non-pharmacological non-operative treatment strategies in people with hip and knee OA, which showed that 14% of 591 people had used a gait aid (20). Other studies have also reported relatively limited use of canes and other assistive walking devices in patients with OA (9, 10). For example, a survey of 187 people with OA found only 30% used a walking device (9), while a prospective cohort study involving 874 patients with knee pain found that 12% initiated use of assistive walking devices during a 3-year period (10). However, the use of canes may be greater in those with more advanced OA, given that a study of 161 patients awaiting total hip joint replacement found that 76% were prescribed a cane and of these, 86% were adherent (21). It must be recognised that canes are not necessarily appropriate for all patients with knee OA, and this is reflected in clinical guidelines where canes are recommended as an adjunctive rather than core treatment (5, 6). Nonetheless, it appears that canes may be under-utilised and as such many people with knee OA may be missing out on the potential benefits of this simple and inexpensive self-management strategy. Indeed, the benefits of cane use have been shown in a randomised controlled trial where daily use of a cane for 8 weeks resulted in improved pain, function and some aspects of quality-of-life (3).

We found that people who used a cane were older, had a higher BMI, longer pain duration and more pain when walking compared to cane non-users, and all factors were determinants of cane use. Previous studies have also found demographic and physical factors related to cane use were older age and greater symptoms, as well as black race, acetaminophen use, history of eye disease, and poorer balance (9, 10). A longer duration of pain might compel patients to try a number of treatment options, including a cane, in an attempt to manage their chronic condition over the longer-term. Additionally, the embarrassment and stigma associated with using a cane may become less important as a person ages (11). Taken

together, the literature overall suggests that older patients with higher BMIs, more severe and prolonged OA symptoms and with risk factors for balance difficulties and falls might be more amenable to considering canes as a treatment option.

In this study, cognitive factors as measured by the CCMS were not found to be determinants of cane use. This is consistent with previous research that found that neither attitude nor perceived behavioural control scores on CCMS were significant predictors of cane use over 6 months in a group with knee OA (23). It is important to recognize that the scale has only been validated for use in a group of community-dwelling older adults, not necessarily with knee pain. Additionally, the scale only covers some aspects of cognition, namely the potential benefits and drawbacks of using a cane. Other cognitive factors may still play a role in influencing one's decision to use a cane. A previous smaller survey found that a less negative evaluation of a walking aid was associated with cane use in people with rheumatoid arthritis and hip/knee OA (15), suggesting that cognitive factors play a role in influencing one's decision to use a cane. However, the authors did not use the CCMS to assess the cognitive factors associated with cane use, and instead formulated their own questions.

Our study also extends previous research by examining potential facilitators for regular use of a cane based on the BCW theoretical framework (14). This framework explains cane use behaviour as the interaction of an individuals' physical and psychological 'capability', their 'motivation', as well as the 'opportunity' afforded by the physical and social environment. Our findings showed that factors relating to 'capability' and 'motivation', were ranked highly overall as facilitators for regular cane use. Specifically, participants felt that having a cane correctly fitted for their body size (opportunity), and learning the best technique to walk with a cane (capability), were important. This has important clinical implications. Not all people with knee OA are advised to use a cane in the course of a clinical consultation with a healthcare professional where they may be taught the correct technique for using a cane. Instead, many people purchase canes over-the-counter from department stores and pharmacies, in the absence of any advice from a qualified health professional. Our data highlight how important it is for healthcare providers to recommend gait aid use to people with knee OA. Clinicians also play an important role in assisting patients to obtain a correctly fitted gait aid and in teaching appropriate technique for walking with the cane. Furthermore, although the exact technique of using a walking cane to reduce pain is unknown, research suggests people should apply enough body weight through the cane in order to reduce

loading in the affected knee by 10% (7), and that people are unlikely to achieve this degree of knee unloading without instruction (23). Another facilitator of cane use that has particular clinical relevance is improving an individual's strength, stamina and balance. This may be achieved clinically through the provision of an appropriately tailored exercise program. Participants also felt that understanding the benefits of cane use was important to facilitate regular cane use, and as discussed previously, highlights the need for patient education by clinicians. Lastly, motivational factors were also highly ranked which, according to the BCW, can be addressed though education, persuasion and incentive based strategies (14).

Strengths of our study include the relatively large sample size, particularly compared with most previous relevant research in samples of people with OA (9, 18, 22, 24), as well as use of questionnaires based on behaviour change theory. There are several limitations. First, recruitment via community advertisements may have introduced selection bias by preferentially attracting people with specific experiences or attitudes regarding cane use. Second, whilst we aimed to identify significant determinants of cane use, other potential determinants of cane use, such as history of falls, medication use, balance status, or strength were not assessed and may also be important. Third, the survey had a high rate of incompletion, with over half (53%) of the responses being incomplete. This is potentially due to the time-consuming nature of the survey (~30 minutes) and the possible perception that the same questions are being asked multiple times by the 1000Minds software. Our recruitment method meant that we had no information about people who chose not to respond or did not complete the survey. Therefore we do not know whether the characteristics of eligible participants differed to those of non-responders or incomplete responders. Fourth, this study included participants with self-reported knee pain consistent with clinical knee OA but there was no radiographic confirmation of the disease. Finally, it should be acknowledged that 'regular' cane use was not defined in the survey, and therefore was subject to participants' interpretation of what they would deem 'regular' use of a cane according to their lifestyle.

In conclusion, our results suggest potential target groups of people with knee OA who may be more likely to consider using a cane as a self-management strategy, and highlight important content for interventions aiming to increase cane use in people with knee OA. Providing education around the benefits of a cane, correctly fitting the cane, training in optimal cane technique and implementing strategies to motivate patients could promote use of this self-management intervention.

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Table 1. Demographic, symptom-related and cognitive factors in entire sample and comparing those who had and had not used a cane (n=529)

	All participants (n=529)	Participants who had never used a cane (n=343)	Participants who had used a cane before (n=186)	p-value
Demographic factors				
Age, mean ± SD years	61.5 ± 7.2	60.6 ± 7.2	63.3 ± 6.9	<0.001
Women, n (%)	425 (80)	270 (79)	155 (83)	0.210
Body mass index (kg/m²), mean ± SD	32.8 ± 8.2	32.1 ± 7.9	34.2 ± 8.5	0.004
Symptom-related factors				
Duration of knee pain, n (%)				<0.001
Less than 3 years	137 (26)	108 (31)	29 (16)	
3 years or more	392 (74)	235 (69)	157 (84)	
Knee pain site, n (%)				0.556
Unilateral	433 (82)	278 (81)	155 (83)	
Bilateral	96 (18)	65 (19)	31 (17)	
[†]NRS pain levels (0-10), mean ± SD				
Average pain over past week when walking	5.1 ± 2.3	4.8 ± 2.2	5.7 ± 2.2	<0.001
[#]WOMAC physical function (0-68) score, mean ± SD	39.3 ± 11.0	38.9 ± 10.8	40.1 ± 11.4	0.217
Cognitive factors				
Cane Cognitive Mediator Score (CCMS), mean ± SD				
Positive attitude score (-12 to +12)[^]	-0.2 ± 6.1	-0.2 ± 6.0	-0.1 ± 6.4	0.987
Negative attitude score (-12 to +12)[^]	0.3 ± 7.2	0.4 ± 7.4	0.2 ± 6.9	0.809
Perceived behavioural control score	3.3 ± 7.0	3.0 ± 7.2	3.9 ± 6.5	0.185

(-14 to +14)[œ]

[†]NRS: numeric rating scale; higher score indicates greater pain severity

[#]WOMAC: Western Ontario and McMaster Universities (WOMAC) Osteoarthritis Index; higher score indicates greater physical dysfunction

[^] A higher score indicates an attitude more favourable towards cane use, 0 indicates a neutral attitude, a lower negative score indicates a more unfavourable attitude.

[œ]A higher score indicates greater perceived control over the potential difficulties associated with cane use, 0 indicates neutral perceived control, a lower negative score indicates less perceived control over the potential difficulties associated with cane use.

Table 2. Association of demographic, symptom-related and cognitive factors with use of a cane

	Multiple logistic regression	
Ever used a cane, yes/no †	**Odd Ratio (95% CI)**	**P Value**
Age (year)	1.06 (1.03, 1.09)	<0.001
Body mass index (kg/m²)	1.03 (1.01, 1.06)	0.031
Duration of knee pain		
<3 years	1.0 (ref)	-
≥3 years	2.62 (1.63, 4.21)	<0.001
#NRS pain levels (0-10)	1.19 (1.09, 1.30)	<0.001

† Variable was coded yes=1 and no=0

#NRS: numerical rating scale; higher score indicates greater pain severity

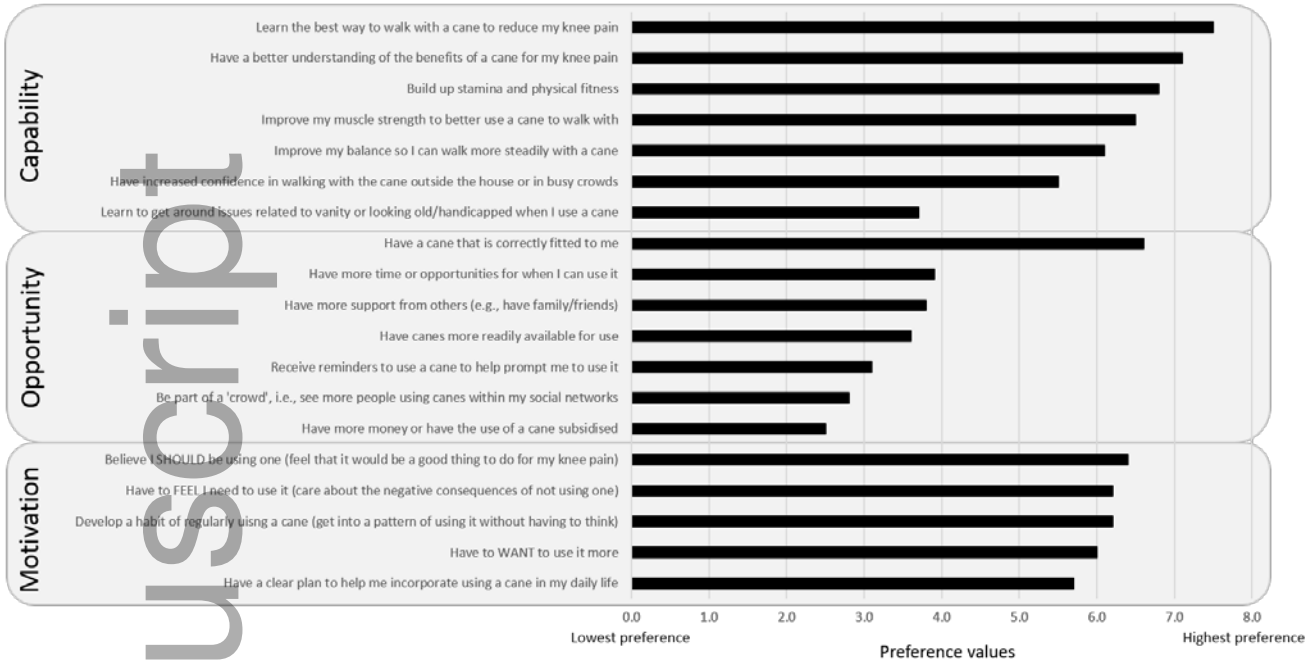

Figure 1. Scoring of the preference values from walking cane non-users, derived from the 1000minds decision-making software. A higher preference value means participants rated the statement as being of greater importance in facilitating regular use of a cane. Statements were derived from the COM-B model of behaviour.