Kertas Asli/Original Articles

Impact of a Tailored Self-Management Education Programme for Older Adults with Knee Osteoarthritis in a Multi-Ethnic Country

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ABSTRAK

Program pendidikan pengurusan kendiri (SMEP) adalah penting bagi pengurusan osteoartritis (OA) sendi lutut. Walaupun kelebihan SMEP yang khusus telah dilaporkan di dalam literatur, bukti mengenai kesan SMEP tersebut bagi OA sendi lutut dikalangan populasi pelbagai budaya seperti di Malaysia adalah masih terhad. Oleh itu, matlamat kajian ini adalah untuk menjalankan kajian intervensi ke atas SMEP yang dikhususkan untuk orang dewasa berumur 60 tahun dan ke atas di Malaysia yang mempunyai OA sendi lutut. Individu berumur 60 tahun dan ke atas dengan diagnosis OA sendi lutut telah direkrut. Intervensi terdiri daripada 4 minggu SMEP berstruktur dan berkumpulan yang dibangunkan khusus untuk populasi di Malaysia. Keterukan gejala OA dan prestasi fungsi fizikal dinilai pada peringkat awal dan pada peringkat susulan pada minggu ke enam dengan menggunakan soal selidik Skor Hasil Kecederaan Lutut dan Osteoartritis (KOOS), ujian 30 seconds sit to stand (30sST), time up and go (TUG), chair sit and reach (CSR), back stretch (BS), handgrip strength (HGS) and two-minute walk (2MW). Daripada 32 individu yang direkrut, 30 peserta, purata umur 66.77 (±6.42) tahun, telah menyelesaikan penilaian pasca-intervensi. Terdapat peningkatan dalam min skor untuk domain KOOS antara 1.3% - 8.6% dari garis dasar. Perbezaan ketara antara skor pada garis dasar dan skor susulan telah direkodkan untuk ujian 30sST (p <0.05), TUG (p <0.001) dan 2MW (p <0.001). SMEP yang khusus yang disampaikan secara bersemuka oleh fisioterapi dapat meningkatkan kekuatan otot anggota bawah badan, mobiliti, keseimbangan dan stamina. Kajian terkawal secara rawak yang lebih besar ke atas kesan jangka panjang SMEP untuk populasi ini adalah diperlukan.

Kata kunci: Radang sendi lutut, warga emas, pendidikan pengurusan kendiri.

ABSTRACT

Self-management education program (SMEP) is essential in the knee osteoarthritis (OA) management. While the benefits of tailored SMEP have been highlighted in the literature, evidence on the effects of tailored knee OA SMEP for multi-ethnic populations, such as in Malaysia, remains limited. Therefore, the aim of this study was to conduct an intervention study on a tailored SMEP among Malaysian older adults who aged 60 years and above with knee OA. Participants aged 60 years and over with a diagnosis of knee OA were recruited. The intervention comprised four weekly structured group SMEP which was developed specifically for the multicultural population in Malaysia. Symptom's severity and functional performance were assessed at baseline and six-week follow-up using the Knee Injury and Osteoarthritis Outcome Score questionnaire (KOOS), 30 seconds sit to stand (30sST), time up and go (TUG), chair sit and reach (CSR), back stretch (BS), handgrip strength (HGS) and two-minute walk (2MW) tests. Of the 32 individuals recruited, 30 participants, mean age of 66.77 (±6.42) years, completed the post-intervention assessment. Improvements in mean KOOS domains scores were observed by between 1.3% - 8.6% from baseline to follow-up. Significant differences between baseline and follow-up scores were identified for 30sST (p < 0.05), TUG (p < 0.001) and 2MW (p < 0.001) tests. A 4-week tailored SMEP delivered face to face by a physiotherapist, improved lower limb muscle strength, mobility, balance and endurance. Larger randomized controlled trials regarding the long-term effects of SMEP for older adults with OA is warranted.

Keywords: Knee osteoarthritis, older adults, self-management education.

INTRODUCTION

Knee osteoarthritis (OA) is a prevalent musculoskeletal disorder associated with old age (Li et al. 2020). Population-based studies found that nearly 60% of individuals aged 60 years and over had symptomatic knee OA (AlKuwaity et al. 2018; Hong et al. 2020; Lee & Kim 2017; Li et al. 2020; Muraki et al. 2013). With rapid global population ageing as well as the increasing prevalence of obesity, the absolute number of individuals with knee OA is also expected to increase (Overgaard et al. 2020; Kulkarni et al. 2016). Geographical differences exist in the prevalence of knee OA, with Asian countries reporting a higher prevalence compared to European and American continents (Cui et al. 2020).

Knee OA is closely associated with increasing number of years lived with disability in many countries (Safiri et al. 2020). Even though knee OA is not considered fatal, it has a profound impact on health and wellbeing (Ahmad et al., 2018; Wallis et al. 2019), leading to severe disabilities and functional dependency (Ponvel et al. 2019; Singh et al. 2018). Individuals with knee OA often require long term medical and therapeutic care involving a wide range of healthcare services (Kamsan et al. 2020). Healthcare usage and cost are high among the knee OA and likely to represent a sizeable proportion of the increasing healthcare cost associated with population ageing (Hunter et al. 2014; Kamsan et al. 2021; Turkiewicz et al. 2014). Self-management support in the management of chronic conditions associated with lifestyle risk factors such knee OA have been found to reduce healthcare burden and hence represents a potential solution towards curbing the increasing healthcare costs (Dineen-Griffin et al. 2019)

International guidelines have emphasized on self-management programs for the management of knee OA (Bannuru et al. 2019; Kolaskinski et al. 2020). Such programs equip individuals with fundamental knowledge related to knee OA and skills related to self-management. Both generic and tailored versions of self-management education program (SMEP) for knee OA have previously been developed (Kamsan et al. 2021). Compared to generic SMEP, tailored SMEP appear to yield more promising results with adaptations for either individuals or specific populations (Elbers et al. 2018).

In Malaysia, there are three major ethnics groups which are Malay/Bumiputra (69.6%), Chinese (22.6%) and Indian (6.8%) with four prominent religions which are Islam, Buddhism, Christianity, and Hinduism (Department of Statistics Malaysia, 2020). The cultural practices of Malaysian population involve range of everyday activities which require sitting on the floor, particularly in the traditional and religious contexts. As for Muslims, Buddhists and Hindus for example, symptoms of knee OA such as pain, swelling, stiffness and joint instability may inhibit them to exercise their spiritual activities as the praying activities require them to kneel sitting and cross sitting. Given these unique needs, self-management strategies for OA may need to be tailored to meet the needs of these population group.

To date, information on the benefits of a tailored knee OA SMEP for multi-ethnic population in Malaysia is still unavailable. Such information may help the local healthcare policies to provide an effective continuous care for this population. Therefore, this study was aimed to examine the impact of a tailored SMEP specifically on knee function and functional performance in Malaysian older adults with knee OA.

METHODOLOGY

STUDY DESIGN

This study used a single group pre- and post-tests design. The methodology of this study was retrospectively.

PARTICIPANTS AND SAMPLE SIZE

Participants were recruited using a convenience sampling strategy as this sampling strategy enable the researcher to recruit participants who were readily reachable and available (Stratton 2021). A list of potential participants was obtained from a geriatric unit at a teaching hospital in a capital city of Malaysia. The participants were contacted by the researcher randomly from the list. They were briefly introduced about the study and were recruited if they were met the predetermined criteria and willing to participate. The process of enrolment was terminated when the required sample size was reached (Martínez-Mesa et al. 2016).

The sample size for this study was calculated using G power analysis 3.1, using confidence level of 95%, significant level of alpha 0.05 and 80% of power. A dropout of 20% was set during the calculation to compensate for the number of participants who unable to complete the study (Gupta et al. 2016). Based on the calculation, the number of samples required in this study was 32.

ELIGIBILITY CRITERIA

Participants were initially screened for the inclusion and exclusion criteria of the study via phone calls. The inclusion criteria of this study were Malaysian, aged 60 years and above (which in Malaysia is the age where a person is considered as an older person), with an established

diagnosis of knee OA by a physician or fulfilling the American College Rheumatology knee OA clinical criteria (Salehi-Abari 2016) and able to walk independently with or without a walking aid.

Participants were excluded from the study if they had difficulty understanding either Malay or English language, were suspected or confirmed with serious medical illnesses such as metastasis, inflammatory or infective disease, and central or peripheral neurological disorders, had a history of knee replacement, had planned for any type of surgery within 3 months, had corticosteroid injection less than three months, had other type of arthritis on the lower limbs and concurrent involvement in other research studies.

SELF-MANAGEMENT EDUCATION PROGRAM

Contents of the SMEP of this study were first derived from available literature on existing SMEP and international guidelines of knee OA management (Bannuru et al. 2019;

Kolasinski et al. 2020; McAlindon et al. 2014). Patients inputs were also obtained in which older adults with knee OA were interviewed about the information needed. The details about the interview steps and the inputs are described elsewhere (Kamsan et al. 2021). Experienced health personnel who were a senior physiotherapist and dietitian were also invited to provide feedback on the relevant information required. The emergent program known as 'Physiotherapeutic Self-Management Education Program' was delivered through four sessions. Each session lasted one and a half hours and the focus of each session is summarized in Table 1. The face to face, group-based intervention was delivered by a physiotherapist with experience in knee OA management. Exercise packages were provided to participants during the educational sessions. Participants were guided to perform the exercises within comfortable surroundings. Details about exercises were provided in a printed educational material in the form of a booklet.

Table 1. Structures of Physiotherapeutic Self-Management Education Program

Week	Components / Contents
1	Self-management concept Structure of knee joint Etiology of knee OA Treatment options for knee OA Exercise package 1: Stretching exercises and non-resistant exercises for lower limbs
2	Pain management Joint protection Physical activity for knee OA Healthy eating
3	Action planning in self-management The do and the don't for knee OA Healthy lifestyle for knee OA Exercise package 2: Stretching exercises and strengthening exercises with cuff weight and functional exercises for lower limbs
4	Adaptation strategy for floor activity Activity pacing for knee OA Exercises for knee OA

Note. OA = Osteoarthritis

DATA COLLECTION

Participants were allocated into a group of maximum 12 participants. Prior to data collection, the details about the study were explained and they were given a consent form to be completed. Baseline assessments were taken after they completed the consent form.

At the beginning of the session, participants were informed to attend four educational sessions as per scheduled. Attendance for each session was recorded. Those who missed the session received a follow-up phone call. To ensure the contents of the intervention were

delivered consistently, all sessions were conducted by the same physiotherapist. Participants were assessed at baseline and six weeks after the baseline. Both assessments were undertaken by the same assessors who were not involved in the study and were trained to perform the tests according to a standardized procedure.

The data of this phase were collected through several set of questionnaires and functional performance tests. The questionnaires were sociodemographic questionnaire and Knee Injury and Osteoarthritis Outcome Score (KOOS) questionnaire. The knee outcomes were measured using KOOS. The KOOS questionnaire has been used widely in

previous studies related to knee OA with established validity and reliability (Collins et al. 2011; Zulkifli et al. 2017). The questionnaire comprised five domains of pain, stiffness, activities of daily living, sports and recreation, and quality of life (Roos & Lohmander 2003). The score of each domain is summed up and a percentage score derived, with a higher score indicating better symptom, function and quality of life.

The functional performance tests employed in this study were 30 seconds sit to stand (STS), time up and go (TUG), chair sit and reach (CSR), back stretch (BS), handgrip strength and two-minute walk tests (2MWT). These tests have been highlighted as valid and reliable predictors for functional capacity of knee OA populations (Abizanda et al. 2012; Alghadir et al. 2015; Bhattacharya et al. 2016; Bohannon et al. 2015; Dobson et al. 2013; Gill et al. 2012; Sabirli et al. 2013). Procedures to perform each tests were first explained and demonstrated to each participant. They were allowed one practice attempt.

ANALYSIS

The Statistical package for social science (SPSS) software version 23 was used for the analysis (IBM™, Armonk, USA). Normality of the data were examined using the Shapiro-Wilks test as well as skewness and kurtosis statistics. Descriptive statistics were presented for baseline demographics as means with standard deviations or frequencies with percentages for continuous and categorical data respectively. The paired sample t-test was used to compare the means scores of KOOS and functional performance tests between baseline and follow-up assessments. A p-value of <0.05 was considered statistically significant.

ETHICAL APPROVAL

Ethical approval to conduct this study was obtained from the research ethic committee of Universiti Kebangsaan Malaysia (NN-2018-106). Written permission to access client database was obtained from the respective units. All participants were required to submit their signed consent from prior any data collection.

RESULTS

PARTICIPANTS' CHARACTERISTICS

A total of 32 participants were recruited to the study, two of them were unable to complete the program due to health and personal issues. Both baseline and follow-up assessments were completed by 30 participants. The mean age of participants was 66.77 (±6.42) years old, range 60 – 90 years. More than half of the participants were female (60%). As for clinical characteristics, half of the participants had been suffering with knee OA around three to five years (53%) and majority of them had unilateral knee OA either right or left knee joint (90%). The mean BMI of participants was 25.18 ±5.4 (ranging from 18.4 – 42.6) with more than 40% of them were being overweight. The participant's characteristics are as summarized in Table 2. With regards to the participants attendance, 90% of the participants had successfully attended all the four sessions while another 10% of the participants were able to attend the program for at least two sessions.

Table 2. Characteristics of Participants

Characteristics	Total sample, n (%)
Age in years, mean ±SD (age range)	66.77 ±6.42 (60 – 90)
Age range	
60 - 69	19 (63.3)
70 - 79	10 (33.3)
80 and above	1 (3.4)
Gender	
Males	12 (40.0)
Females	18 (60.0)
Duration of knee OA	
Less than five years	16 (53.3)
Less than ten years	4 (13.3)
Less than 15 years	7 (23.3)
15 years and above	3 (10.0)

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Affected joint	
Right knee	20 (66.7)
Left knee	7 (23.3)
Both knees	3 (10.0)
Ambulation aid	
Never used	26 (86.7)
Used	4 (13.3)
Height in cm, mean ±SD (range)	159.4 ±10.55 (127.0 – 183.0)
Weight in kg, mean ±SD (range)	64.24 ±15.75 (40.8 – 124.7)
BMI (Kg/m^2), mean ±SD (range)	25.18 ±5.4 (18.4 – 42.6)
BMI range	
<18.5 (Underweight)	2 (6.7)
18.5 – 24.9 (Normal weight)	15 (50.0)
25.0 – 29.9 (Overweight)	10 (33.3)
>30 (Obesity)	3 (10.0)

Note. SD = standard deviation, kg = kilograms, cm = centimeters, BMI = body mass index, OA = Osteoarthritis.

KOOS AND FUNCTIONAL PERFORMANCES

Table 3 summarizes baseline and follow-up scores for KOOS and functional performance measures. The findings revealed that significant differences at pre- and post-assessment were only evident for sit to stand (STS), time up and go (TUG) and two-minute walk (2MWT). STS score was increased by 9.5% and was found to be statistically significant at the level of 0.05, *(p < .05)*. The mean score for TUG improved at 9.2% and the improvement was statistically significance ($p < .001$). As for 2MWT, there was significant different between the two-point measurements ($p < .001$) whereby the score at post assessment was higher at 13.9%.

Table 3. Pre-Test and Post-Test Scores for KOOS and Functional Performance Measures

Measurements	Pre-test	Post-test	Paired differences		*t*	*df*	*p*-value
	Mean (SD)	Mean (SD)	Mean (SD)	95% CI (Upper, Lower)			
KOOS							
Pain	82.33 (±14.63)	84.63 (±14.95)	-2.30 (±12.43)	-6.94, 2.34	-1.01	29	.319
Other Symptoms	78.43 (±12.87)	79.70 (±16.52)	-1.27 (±13.79)	-6.42, 3.88	-0.50	29	.619
Function in ADL	84.47 (±13.81)	86.97 (±14.18)	-2.50 (±12.38)	-7.12, 2.12	-1.11	29	.278
Function in sport/recreation	62.83 (±21.84)	68.33 (±28.29)	-5.50 (±18.77)	-12.51, 1.51	-1.61	29	.119
Quality of life	66.97 (±22.49)	67.87 (±23.59)	-0.90 (±15.85)	-6.82, 5.02	-0.31	29	.758
Functional performance tests							
CSR RL	6.88 (±10.75)	8.70 (±12.08)	-1.82 (±8.58)	-5.02, 1.39	-1.16	29	.255
CSR LL	5.63 (±10.17)	6.92 (±10.23)	-1.29 (±8.41)	-4.43, 1.85	-0.840	29	.408
BST RL	-3.47 (±14.23)	-5.73 (±14.92)	2.26 (±11.41)	-2.00, 6.522	1.09	29	.286
BST LL	-6.50 (±16.75)	-8.27 (±16.39)	1.77 (±13.81)	-3.39, 6.93	0.70	29	.488
Handgrip Strength	24.17 (±8.11)	24.59 (±8.13)	-0.42 (±2.21)	-1.25, 0.41	-1.04	29	.309

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30sSTS	13.00 (±3.05)	14.24 (±3.9)	-1.24 (±2.56)	-2.21, -0.27	-2.61	28	.014
TUG	8.62 (±1.35)	7.83 (±1.35)	0.79 (±1.08)	0.37, 1.21	3.87	27	.001
2MWT	109.70 (±21.61)	124.90 (±26.33)	-15.2 (±15.27)	-20.90, -9.50	-5.45	29	<.001

Note. SD = standard deviation, CI = confidence interval, *t* = *t*-test, *df* = degree of freedom, *p*-value = significant value, KOOS = Knee Injury and Osteoarthritis Outcome Score, ADL = activity daily living, CSR = chair sit reach, BST = back stretch test, RL = right limb, LL = left limb, STS = sit to stand, TUG = time up and go, 2MWT = 2-minute walk test.

While improvements in the mean score between pre- and post- PSMEP for sit and reach of right and left limb and handgrip strength tests were notable (26.5%, 22.9% and 1.7% respectively), there were found not to be statistically significant ($p > .05$). The mean score for BST of right and left limb as at the post-assessment declined at 65.1% and 27.2% respectively. However, these findings were not statistically significant $(p > .05)$.

Regarding the KOOS outcomes, the findings revealed that the scores at post-test were higher than the pre-test in all domains. As for the first domain which is pain domain, the mean score at post-intervention was higher by 2.8%, compared to the score at pre-intervention. For the second domain which is other symptoms, the mean score had increased by 1.6% between the two observation points. The mean scores for function in ADL, function in sport/recreation and QOL were also improved at post-PSMEP by 3%, 8.8% and 1.3% respectively. The improvement of all the five domains however were found to be not statistically significance ($p > .05$).

DISCUSSION

A self-management education program for knee OA specifically tailored for the older Malaysian population was developed. Our intervention study found measurable effects on functional performance outcomes which included functional lower limb strength, mobility, balance, and cardiorespiratory endurance. While observed improvements were recorded handgrip strength, sit and reach and KOOS outcomes after 4-weeks of SMEP, these had not achieved statistical significance.

Improvements in STS test indicates improvements in functional lower limb muscle strength following just four weeks of SMEP. This implies that the participants were likely to have complied with the home exercises that were recommended in the program. Increases strength in the lower extremities have led to improvements in lower limb function. Improvement in the lower limb muscle strength with knee OA educational program was also reported in a previous study which showed significant improvement in STS (Marconcin et al. 2018).

SMEP participants also completed the TUG test in shorter time at follow-up compared to baseline indicating that improved functional mobility and balance (Ibrahim et al. 2017). Similar findings were also found in other SMEP studies among older adults with knee OA (Coleman et al. 2012; Wetzel et al. 2008). The concurrent improvements observed with STS and TUG further reinforces the beneficial effects of the exercises administered in the program. The association between lower limb muscles strength, balance and mobility has been extensively reported in the literature (Aartolahti et al. 2020; Borges et al. 2017; Cho et al. 2012; Muehlbauer et al. 2015).

Improvement in self-paced walking ability was also noted using 2MWT. This finding is supported by previous studies which demonstrated that SMEP improved walking distance in older adults with knee OA (Kwok et al. 2016; Marconcin et al. 2018). Increased walking distance in the participants could have been due to increase in the physical activity besides overall improvement in knee OA symptoms and other outcomes such as muscles strength and mobility. The importance and benefits of exercises and physical activity in older adults with knee OA had been highlighted in numerous studies (Bartholdy et al. 2017; Chmelo et al. 2013; Fransen et al. 2015; Holden et al. 2015; Kan et al. 2016; Zhang et al. 2017).

The mean handgrip strength scores recorded at baseline measurement of 24.2 kg for the study population was within the normative range previously reported for the Malaysian population of 22.3 kg to 34.2 kg (Lam et al. 2016). As no deficit in general body strength was present at recruitment, improvements in handgrip strength could not be expected. Non-significant improvements in HGS score was also in a similar study by Marconcin et al. (2018). Similarly, the mean score of CSR for the right and left limbs had improved in this study by 2 centimeters and 3 centimeters respectively but the improvements were not statistically significant. Chair sit reach is a measure of upper limb and truncal flexibility impairments which may not be affected by knee OA. Participants' CSR scores in the present study exceeded the normative values outlined in a previous study (Jones & Rikli 2002). Another SMEP related study showed similar findings whereby flexibility of the upper limbs did not improve with SMEP (Marconcin et al. 2018).

Improvements were observed in all KOOS domains though the observed score increments were not statistically significant. These minimum improvements may not even be clinically relevant as the differences between baseline and follow-up assessments were less than 10% (Roos & Lohmander 2003). Baseline scores for each KOOS domain was higher than that reported by previous studies (Cagnin et al. 2018; Marconcin et al. 2018; Mecklenburg et al. 2018) and were within the normal ranges established by Paradowski et al. (2006). The lack of statistically significant improvements could therefore be attributed to the lower symptom burden of our study population with majority having had knee OA for less than five years.

Participants' adherence toward the SMEP was considered good as more than 90% of the participants had participated in all SMEP sessions. The compliance toward the program could be due to the nature of the program which was tailored to the population's needs. A distinctive feature of our SMEP, as compared to existing SMEPs was, we included adaptation strategies for activities involving sitting on floor, which may have made the program more appealing to the participants. Previous literature highlights that customized program are likely to have high compliance rates (Makarm et al. 2021). High attendance rate in this study may also indicate there could be possible behavior change among older adults using the SMEP that was structured to provide awareness, knowledge and coaching for self-management of knee OA.

Despite these important findings, there are limitations to our study. First, our tailored SMEP was tested using a one group pre- and post- test design. As there was no control group involved, issues such as maturation bias cannot be eliminated and requires further investigation. However, given OA is a progressive condition, maturation bias is unlikely to play a significant role. Second, most participants had symptoms less than five years and appeared to demonstrate a high level of motivation, though this was not assessed in this study. In order to provide robust evidence on the short term and long-term effectiveness of SMEP designed in this study, future research may adapt the structures and contents of the program in larger multi-centered randomized control studies. Moreover, older adults with knee OA from diverse clinical backgrounds, particularly the varying levels of impairments, need to be further studied.

IMPLICATIONS TO PRACTICE

Tailored SMEP for older adults with knee OA which caters to the needs of the population could lead to a range of possible benefits including functional lower limb strength, functional mobility, and walking ability. A customized SMEP may enhance the program fidelity, improve compliance which in turn contribute improved health outcomes. From a clinical point of view, these findings highlight the importance of developing and implementing SMEP which recognize local population needs and preferences, which are likely influenced by a range of physical, social, cultural, and spiritual practices.

CONCLUSION

A tailored SMEP delivered face to face by a physiotherapist led to improvement in functional lower limb muscle strength, mobility, balance, and self-paced walking capacity at immediate follow-up. These findings support the potential of tailored SMEP in empowering older adults in engaging in self-management strategies besides maintaining their functional performance for overall health benefits. This finding of this study could inform future larger randomized controlled studies to evaluate SMEP in multicultural settings.

ACKNOWLEDGEMENT

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