

# A self-management support intervention on knee functional status and health-related quality of life among middle-age women: A randomized controlled trial

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## Abstract

**Aim:** To determine the effectiveness of a self-management support intervention on knee functional status and health-related quality of life among middle-age women with knee osteoarthritis.

**Design:** Randomized controlled trial.

**Methods:** The participants were 40 middle-aged women who had been clinically diagnosed with knee osteoarthritis for more than 3 months and randomly assigned into intervention and control groups equally. After IRB approval code 02-05-2562 was obtained, data collection was carried out from July – November 2019 at the Outpatient Department of Orthopedics, Thasala Hospital, Thailand. The modified Thai version of the Western Ontario and McMaster University Osteoarthritis Index (WOMAC) and the Short Form Survey (SF-36) were used to measure knee functional status and health-related quality of life at baseline (T1), immediately after completing the intervention (T2) and 4 weeks after the intervention (T3). The participants in the intervention group received a self-management support program developed by the researcher based on the Individual and Family Self-Management Theory and a review of related literature plus routine care. The implementation consisted of eight sessions over 4 weeks. The control group received only routine care from the hospital. Two-way repeated measure ANOVAs were used to analyze the data.

**Results:** The findings revealed that the participants in the intervention group had better knee functional status and HRQOL than those in the control group at follow-up. Additionally, in the intervention group, both knee functional status and HRQOL significantly improved from pre- to post-intervention and follow-up.

**Conclusions:** The findings indicate that this self-management support intervention is effective.

**Impact:** For women, the prevalence rate of knee OA rises dramatically post-menopause due to lower oestrogen levels. Policy makers and healthcare providers could obtain and promote this intervention as part of standard practice. This should lead to improved knee functional status and HRQOL among middle-aged women.

**Thai Trial Registration number:** TCTR20191223003. on February 5th, 2019

## KEYWORDS

health related quality of life, intervention, knee functional status, knee osteoarthritis, middle-aged women, nurses, randomized controlled trial, self-management support, Thailand

## 1 | INTRODUCTION

The most common form of arthritis, knee osteoarthritis (knee OA), is a growing public health problem in adults and a leading cause of disability worldwide (Madry et al., 2012). Knee OA is a degenerative disease characterized by low grade cartilage and synovium inflammation resulting in the loss of joint structure and progressive deterioration of cartilage leading to joint stiffness, swelling, pain and loss of mobility (Musumeci et al., 2015). In addition, knee OA often causes interference with work productivity, diminishes the ability to walk with the addition of a particularly unsteady gait and eventually results in knee disability (Cross et al., 2014). Ultimately, disability leads to difficult mobility, social isolation and loss of work opportunities (Bhatia et al., 2013; Palazzo et al., 2016). Moreover, knee OA has a significantly negative impact on health-related quality of life (HRQOL; Hoogeboom et al., 2012). Patients with knee OA frequently have chronic pain and disability potentially leading to a reduction in HRQOL (Losina et al., 2015; Zamri et al., 2019).

### 1.1 | Background

By 2040, an estimated 26 percent of all adults, or over 78 million people will have arthritis (Centers for Disease Control & Prevention, 2016). The overall prevalence of OA is in the range 20.5–68.0%. Most of the Asian populations reported to have knee OA are in the range of 13.1–71.1% in various Asian countries (Zamri et al., 2019). The risk factors of knee OA are mainly associated with excess weight, obesity, female gender, and exposure to long durations of heavy physical activity such as sitting on the floor (praying and other sitting religious worship) and squatting. Thai people also seem to be prone to these associated risk factors (Roopsawang, 2015). In Thailand, there was a survey among the elderly in the community aged more than 50 years using a history of knee pain and X-ray findings. It was found that the prevalence of knee OA ranged from 34.5%–45.6%. (Kuptniratsaikul et al., 2002).

Having multiple responsibilities during this period, menopause and its side effects, changes in physical appearance and body, weight gain, retirement, financial problems, empty nest syndrome, and onset of chronic diseases are some of the common changes in middle-aged women (Ayranci et al., 2010). As previously stated, the prevalence and severity of OA are higher in females than in males (Boyan et al., 2013). Moreover, the prevalence rate of knee OA rises dramatically post-menopause due to lower oestrogen levels. Menopause also frequently influences many changes in body composition such as increased body fat or obesity with impact on bone density, reduced cartilage volume and loss of bone and muscle strength (Riddle et al., 2015).

There are several interventions attempted to improve knee OA (Bhatia et al., 2013). However, the length of the program and the mode of delivery vary greatly among programs and illnesses. In view of the high prevalence of knee OA and the absence of unequivocal evidence of program effectiveness, self-management support programs have been tested in quality assurance projects and randomized controlled trials (RCTs), the results of which show improvement

in pain, quality of life, and function compared with control groups (Neogi & Zhang, 2013). In addition, self-management support programs have been proven to be effective in various diseases such as arthritis, stroke, and asthma (Yip et al., 2007a, 2007b). Effective self-management among adults with knee OA can improve symptoms, prognosis, and quality of life (Kao et al., 2016). Therefore, understanding how patients manage their symptoms is essential for health care providers to effectively support knee OA patients' needs, especially in middle-age women.

### 1.2 | Conceptual framework for the study

The Individual and Family Self-Management Theory (IFSMT; Ryan & Sawin, 2009) was used to guide the study. This theory combines and expands prior work related to individual and family self-management, focusing on individuals and dyads in the family. The IFSMT suggests a dynamic model of self-management consisting of: (a) condition-specific factors and physical/social environments (context); (b) knowledge and beliefs, self-regulation skills and abilities, and social facilitation (process); and (c) cost, health status, and HRQOL (outcomes). The IFSMT attends to the contextual factors known to affect self-management and its processes in addition to proposing relationships among contextual and process dimensions. Self-management support involves providing knowledge and beliefs, encouraging self-regulation skills and abilities and improving social facilitation to manage chronic conditions or engage in healthy behaviours, whereas self-management interventions facilitate the development of self-management skills and activities designed to enhance health behaviour modification and increased quality of life. The concepts of individual self-management have proven useful in understanding human response to illness and are often the target of nursing interventions (Grey et al., 2010). Therefore, the study applied the IFSMT in the context of individual middle-aged women.

## 2 | THE STUDY

### 2.1 | Aim

This study aimed to determine the effectiveness of a self-management support intervention by comparing knee functional status and health-related quality of life in middle-aged women with knee OA between the experimental and control groups at pre-intervention (T1), post-intervention (T2), and at the 4-week follow-up (T3).

### 2.2 | Design

A RCT was conducted with 3-time repeated measures: baseline or pre-intervention (T1); immediately after completing the intervention (T2); and 4 weeks after the intervention (T3).

## 2.3 | Participants

The target population of this study was middle-aged women aged 40–59 years old who had been clinically diagnosed with knee OA. The patients were receiving services at the Outpatient Department (OPD) of Orthopedic Clinic, Thasala Hospital, Nakhon Si Thammarat province in southern Thailand in 2019. This clinic was used as the venue for implementing the intervention with permission granted by the director of the OPD. According to medical records in the hospital database, the target patients were 230 cases. The inclusion criteria were as follows: (a) Middle-aged women diagnosed with knee OA for more than 3 months (a chronic medical condition; MedicineNet, 2016); (b) No history of any major knee injury; (c) No knee surgery or steroid use; and (d) Ability to understand communicate well in Thai language. The following criteria excluded participants: (a) Serious co-morbidity such as stroke; and (b) Symptomatic injury to the knee joint with inflammatory joint disease.

### 2.3.1 | Sample size

The sample size was calculated by using a power calculation with the G\*power program (Version 3.1.2.9; Faul et al., 2009). Power analysis involved *F* test for ANOVA repeated measure within-between factors with a power = 0.80, a significance level = 0.05 and an effect size = 0.61, all of which were obtained from a previous study on self-management intervention for knee OA (Coleman et al., 2012). These measures were repeated three times with a total minimum sample size of 30 participants. With an estimated attrition rate of 30 percent based on previous studies, a total of 40 participants was finally recruited and randomly assigned with 20 participants per group.

### 2.3.2 | Sampling

Two hundred and thirty patients from a list of medical records were diagnosed with knee OA for more than 3 months, had never used steroids, had no serious comorbidity and communicated well in Thai language. Three of them had knee OA from major injuries such as car accidents and ninety-seven were unable to be reached by phone. Therefore, one hundred patients were excluded and the remaining was one hundred and thirty patients who met the study inclusion criteria. Randomization by a computer-generated program limiting the cases from 130 cases to 40 cases was performed. All the selected participants were contacted by telephone, verbally informed and invited to participate voluntarily in the study. Five patients declined participation for various reasons, the most common reason being lack of time. We randomly selected and repeated the process again until reaching a total of 40 participants who were willing to participate. After that, we sent by post written information and appointment schedules to these participants to meet at the Orthopedic Clinic of Thasala Hospital where written informed

consent was obtained. Random assignment was performed after the baseline measurement.

### 2.3.3 | Randomization and Blinding

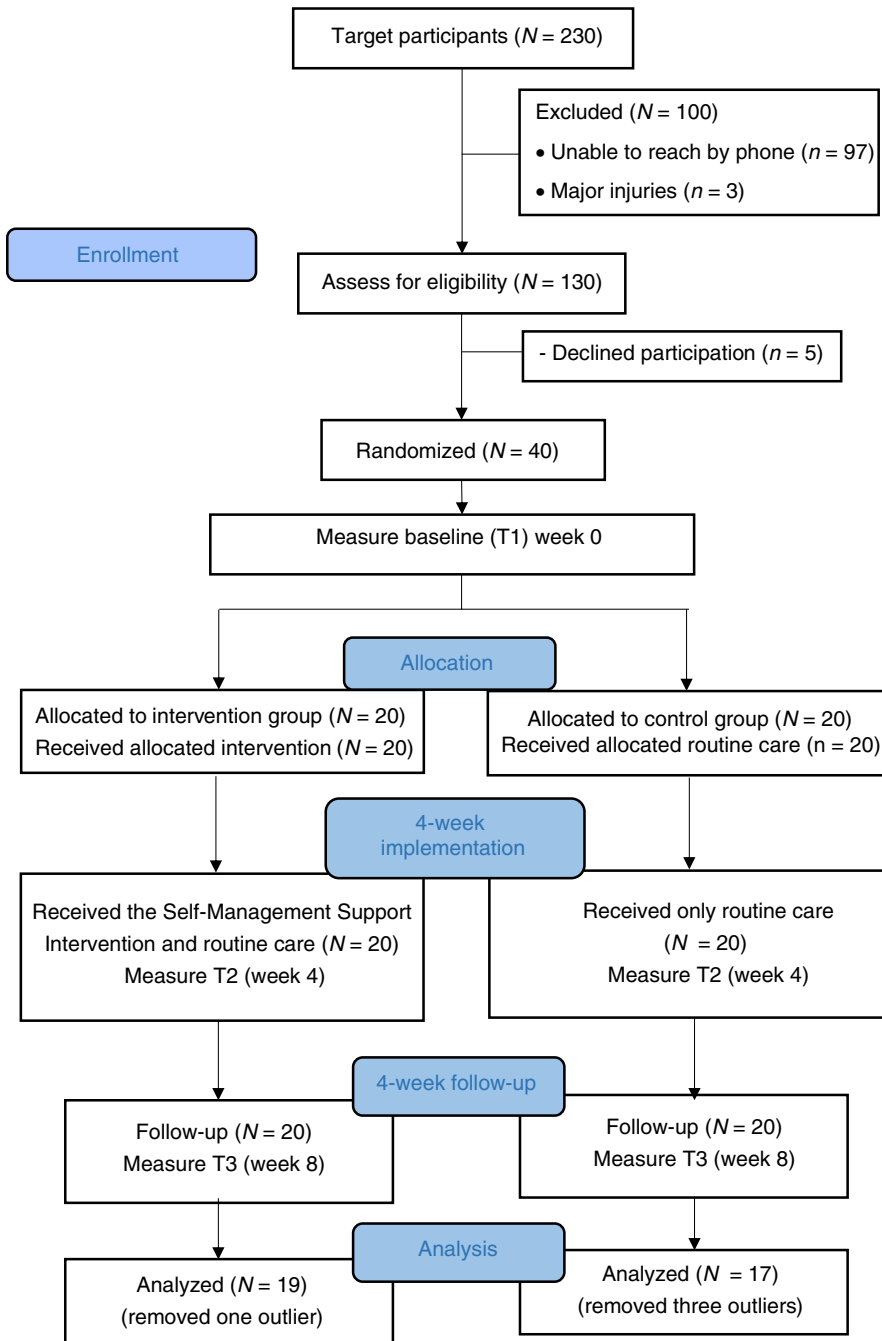
Simple randomization was used to allocate the forty participants to either the intervention or control group by a research assistant (RA). The RA is a registered nurse of Thasala Hospital who used her days off duty to assist in randomizing participants and collecting data of demographic information and outcome measures.

The RA assigned numbers from 01–40 to the participants individually. Then she wrote one number on a piece of paper from 1–40, then folded each numbered piece of paper and put them in a box. The first twenty numbers of participants that she drew were allocated to the intervention group and the rest of twenty participants were allocated to the control group. They were blinded to group allocation, but complete blinding of participants was not possible owing to the nature of the intervention. Figure 1 shows the flow diagram of the study.

## 2.4 | Intervention

The Self-Management Support Intervention was developed based on the IFSMT (Ryan & Sawin, 2009) and the review of the related literature (Coleman et al., 2012; Yip et al., 2007a, 2007b). The participants in the intervention group were split into two subgroups of 10 participants and each subgroup participated in the eight 4-week sessions. The process of activities for the implementation consisted of eight sessions (twice per week on Monday and Wednesday; or Tuesday and Thursday) with approximately 50–75 min per session. The intervention involved providing knowledge and beliefs, encouraging self-regulation skills and abilities and improving social facilitation to manage chronic conditions or engage in healthy behaviours. Homework guidelines were formulated for the participants for present activities to be discussed in the following week. Weekly homework assignments were given for the researcher to assess the participants' understanding and problems. Lastly, the booklet and QR code of VDO clips on knee OA consisted of information about knowledge of knee OA, pathophysiology, signs and symptoms, pain management, knee exercise, and treatment were given to all participants (both groups) at the follow-up period. The researchers implemented all the steps outlined in the function-based intervention plan and the RAs aided in data collection at the 3-point times. The implementation was carried out from July to November 2019.

Routine care (both groups) involved common suggestions about weight control and knee exercises provided by nurses and physicians in the examination room. In the monthly activity of the orthopaedic clinic, nurses provided health education about knee care and some tips for reducing pain from knee OA. Brochures and some booklets related to knee OA and other orthopaedic diseases were also available at the clinic.



**FIGURE 1** Consort flow diagram of the study

## 2.5 | Outcome measures

### 2.5.1 | Knee functional status

Knee functional status was the primary outcome and was measured by using the functional dimension of the Modified Thai version of the Western Ontario and McMaster University Osteoarthritis Index (WOMAC; Kuptniratsaikul & Rattanachaiyanont, 2007), a self-report scale containing 22 items. There were three subscales for assessing pain (5 items), stiffness (2 items), and function (15 items). The participants were asked to rate each item on 0–10 point-rating scales from “0” (no or least problem) – “10” (very much or most problem). Total scores ranged from 0–220 with higher scores indicating lower knee

functional status and low scores interpreted as greater knee functional status. In this study, Cronbach's alpha coefficient was 0.80.

### 2.5.2 | Health-related of quality of life

Health-related of quality of life (HRQOL) was the secondary outcome and was measured by the Short Form Survey (SF-36) – Thai version (Tangtrakulwanich et al., 2006), which contains 36 items in the following eight domains: physical functioning (10 items), role limitations due to physical problems (4 items), physical pain (2 items), general health perceptions (5 items), social functioning (2 items), vitality (4 items), role limitations due to emotional problems (3 items)

and general mental health (5 items) and reported health transition (1 item). The scores of each item varied from 1–2 points in physical functioning, 1–3 points in general health, and 1–6 in the physical pain, social functioning, and mental health domains. The total scores of each domain required a transformation into 100-point scales. The aggregated SF-36 components were scored where higher scores represented better HRQOL. In this study, Cronbach's alpha coefficient was 0.81.

## 2.6 | Validity and reliability of research instruments

Details of the planning and process for the self-management support intervention were validated by a panel of three content experts, consisting of two orthopaedists and a nursing instructor who specialty is in women's health in the community. They were asked to consider and provide comments and suggestions about all the content in terms of comparability and appropriateness with the concepts that were to be used and the guideline for knee OA. Then the researchers made revisions responding to all the experts' comments and suggestions.

Content validity of the modified Thai versions of WOMAC and the SF-36 had already been tested in previous studies (Kuptniratsaikul & Rattanachaiyanont, 2007; Tangtrakulwanich et al., 2006). Internal consistency reliability in this study showed Cronbach's alpha coefficients of 0.80 and 0.81, respectively.

## 2.7 | Ethical consideration

This study was approved by the Faculty Ethics Committee of a university in Thailand (No. 02-05-2562). The first author (PI) explained the goals and procedures of the study, research objectives, data collection procedures, risks and benefits of the study after agreement to participate had been obtained and informed consent forms had been signed. This was registered with the Thai Clinical Trial registry (TCTR20191223003).

## 2.8 | Data collection procedures

Before commencing with data collection, the PI explained the purpose of the research to the director to obtain permission for data collection and prepared materials such as the booklets for the participants. Then the PI trained the research assistants to use the data collection instruments by describing the meaning of each item to the research assistants. For the experimental group, the information collected before the interventions were implemented was referred to as a pre-intervention (T1). The PI explained the intervention objectives, procedures, evaluation, and follow-up assessment to all participants. Next, the participants were requested to sign informed consent forms. Eight 60-75-min sessions were provided by the PI. The self-management supported intervention was used to manage the participants' personal health and

well-being for as many health needs as possible, including health education and engagement in healthy activities known to produce positive outcomes. Immediately after completing the 8-session intervention (post-intervention; T2) and a 4-week follow-up after the intervention (T3), knee functional status, and HRQOL were measured. For the control group, the PI explained the research objectives, procedures, evaluation and follow-up assessment to all participants. Lastly, the PI provided booklets and study material to the participants to practice by themselves.

## 2.9 | Data analysis

Data were analysed by using a SPSS version 26.0 with statistical significance set at  $p < 0.05$ . Descriptive statistics in terms of frequency, percentage, mean, standard deviation and range were used to describe the participants' characteristics and study variables. Chi-squared and Fisher exact tests were used to compare the participants' characteristics. Two-way repeated measures ANOVA (one-way between-subjects independent variable and one-way within-subjects independent variable) was used to determine the differences in mean scores for knee functional status and HRQOL, comparing the experimental and control groups at three time point measures, namely: pre-intervention (T1); post-intervention (T2); and follow-up (T3).

## 3 | RESULTS

### 3.1 | Characteristics of the participants

The total of the participants in the intervention group was 19 and in the control group was 17, resulting from removing 1 and 3 univariate and multivariate outliers after assumption testing of statistical use in the study. The average age of both groups was about 52–53 years old and average BMI was about 27–29 kg/m<sup>2</sup> indicating being overweight. Comparing the participants' characteristics at baseline by using Chi-squared and Fisher exact tests found no significant difference (Table 1).

### 3.2 | Outcome evaluation

#### 3.2.1 | Knee functional status and HRQOL of the participants across 3 times of the intervention and the control groups

Knee functional status was indicated by a total score of WOMAC and HRQOL was indicated by a total score of SF-36. These were measured three times at baseline (pre-intervention [week 0, T1]), post-intervention (week 4, T2) and follow-up (week 8, T3). The means and standard deviations of total and subscale scores of WOMAC and SF-36 for both the intervention and the control groups among 3-time measures are presented in Table 2.

**TABLE 1** Characteristics of the participants

Characteristic	Intervention group (N = 19), n (%)	Control group (N = 17), n (%)	t	$\chi^2$	p
Age (years)	Mean = 52.35 (SD 5.82, range = 40–59)	Mean = 53 (SD 5.47, range = 42–59)	0.62		0.24
BMI (kg/m <sup>2</sup> )	Mean = 27.12 (SD 3.87, range = 20.44–34.13)	Mean = 29.29 (SD 4.61, range = 22.77–38.05)	–1.61		0.12
BMI $\geq$ 25	15 (75)	17 (85)			
Duration of knee OA (years)	Mean = 3.20 (SD 3.41, range = 1–12)	Mean = 3.30 (SD 2.54, range = 1–10)	0.11		0.92
Marital status					
Single	1 (5)	2 (10)		0.68 <sup>a</sup>	1
Married	16 (80)	16 (80)			
Widow/divorce	3 (15)	2 (10)			
Education					
No literate	1 (5)	0 (0)		6.66 <sup>a</sup>	0.12
1° school	12 (60)	15 (75)			
2° school	6 (30)	4 (20)			
Diploma/Bachelor	1 (5)	1 (5)			
Underling disease					
No	11 (55)	12 (60)		0.10	0.75
Yes	9 (45)	8 (40)			
Hypertension	6 (30)	9 (45)		2.5	0.11
Diabetes	5 (25)	5 (25)			
Monthly Income (Thai baht)					
3,000–5,000	11 (55)	8 (40)		0.06	0.572
5,001–10,000	9 (45)	7 (35)			
>10,000	0 (0)	5 (25)			
Occupation					
House worker	7 (35)	9 (45)		5.84 <sup>a</sup>	0.17
Farmer	9 (45)	3 (15)			
Small business	1 (5)	4 (20)			
Employee/Labour	3 (15)	3 (15)			

<sup>a</sup>Fisher's exact test.

Variable	Measured time	Intervention (N = 19), M (SD)	Control (N = 17), M (SD)	F
Knee functional status				
Total score of WOMAC	1	73.58 (44.50)	68.65 (20.90)	1.32
	2	45.47 (41.32)	60.82 (8.44)	0.72
	3	21.90 (23.27)	76.41 (13.05)	19.28*
Health related quality of life				
Total SF-36 Score	1	57.17 (16.193)	58.87 (13.33)	0.87
	2	73.14 (14.31)	71.60 (5.79)	0.81
	3	90.65 (3.69)	70.61 (8.30)	90.86*

p &lt; 0.05.\*

**TABLE 2** Means and standard deviations of WOMAC and SF-36 measured three times

Repeated measure ANOVA was performed to determine the differences of the interaction and main effects of the intervention on the outcome variables (knee functional status

and HRQOL) between the two groups and in the intervention group. Tests of simple effects using Bonferroni-corrected t tests were analyzed to compare the time differences between

the groups after the main effect of time was found to be significant.

### 3.2.2 | Comparisons of knee functional status between the intervention and control groups, and within the intervention group

This analysis was to compare the effects of the Self-management Support Intervention on knee functional status between the two groups of the intervention and the control, and in the intervention group in regards to the change in time from baseline (T1) to post-intervention (T2) and to follow-up (T3). The main effects Group,  $F_{1,34} = 6.73$ ,  $p = 0.014$ ,  $\eta^2 = 0.17$  with respect to the between-subjects variance and Time (in the intervention group),  $F_{1,63,55,43} = 14.37$ ,  $p < 0.001$ ,  $\eta^2 = 0.20$  with respect to the within-subjects variance, were both statistically significant. These effects can be seen in the statistically significant Time\*Group interaction,  $F_{1,63,55,43} = 23.97$ ,  $p < 0.001$ ,  $\eta^2 = 0.33$  with respect to the within-subjects variance (Table 3 and Figure 2).

Subsequently, simple effects were tested. At baseline (T1) and post-intervention (T2), the mean WOMAC scores between groups was not different. However, at the follow-up (T3), the intervention group had a significantly lower WOMAC score than the control group ( $F_{1,34} = 19.28$ ,  $p < 0.05$ ; Table 3). These findings indicate that the participants in the intervention group had better knee functional status after receiving the self-management support intervention than before the intervention. For within the intervention group, the mean WOMAC score at the follow-up was lower than that at baseline and post-intervention ( $M_{diff} = -51.68$  and  $M_{diff} = -23.58$ ,  $p < 0.001$ , respectively) and at post-intervention was lower than that at baseline ( $M_{diff} = -28.11$ ,  $p < 0.001$ ). Thus, as the time period increased within the intervention group after receiving the intervention, knee functional status improved significantly (Figure 2).

### 3.2.3 | Comparisons of HRQOL between the intervention and control groups, and within the intervention group

The study compared the effects of The Self-management Support Intervention on HRQOL between the intervention and the control

groups, and within the intervention group as the time period increased. The main effects of Group,  $F_{1,34} = 6.34$ ,  $p = 0.017$ ,  $\eta^2 = 0.16$  with respect to the between-subjects variance and Time (within the intervention group from T1 to T3),  $F_{2,68} = 36.08$ ,  $p < 0.001$ ,  $\eta^2 = 0.42$  with respect to the within-subjects variance, were both statistically significant. These effects can be seen in the statistically significant Time\*Group interaction,  $F_{2,68} = 16.91$ ,  $p < 0.001$ ,  $\eta^2 = 0.19$  with respect to the within-subjects variance (Table 4 and Figure 3).

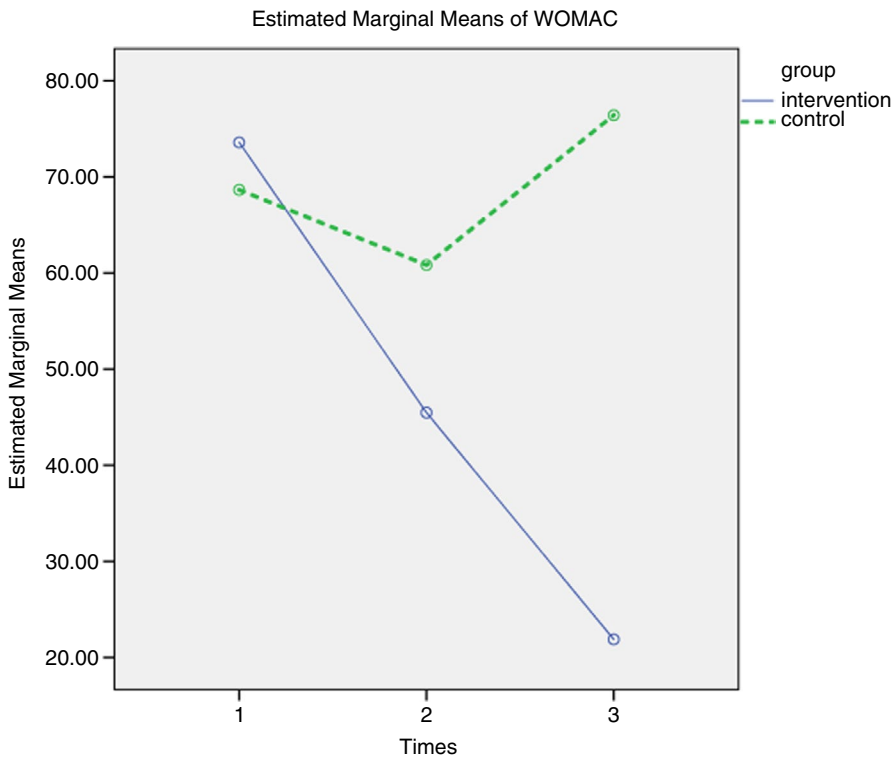
The simple effects were then tested to determine the effects of each group at each time. There was no difference of SF-36 scores between the two groups at T1 and T2, while at T3, the SF-36 score of the intervention group was significantly higher than that of the control group ( $F_{1,34} = 90.86$ ,  $p < 0.05$ ; Table 2). These findings indicate that the participants in the intervention group had higher HRQOL after receiving the self-management support intervention than before receiving the intervention. For within the intervention group, the SF-36 mean score at T3 was higher than that T1 and T2 ( $M_{diff} = 13.91$  and  $M_{diff} = 30.18$ ,  $p < 0.001$ , respectively). Furthermore, the mean SF-36 score at T2 was higher than that at T1 ( $M_{diff} = 16.27$ ,  $p < 0.001$ ). These findings indicate that as the time period increased within the intervention group after receiving the intervention, HRQOL also improved (Figure 3).

## 4 | DISCUSSION

The findings showed improving knee functional status and increasing health-related quality of life after the middle-aged women with knee OA received the self-management support intervention. This supported the IFSMT indicating that individuals and families using knowledge and beliefs, self-regulation skills and abilities together with the components of the process of self-management contribute to patient outcomes such as self-management behaviors, health status and quality of life (Ryan & Sawin, 2009). The findings were congruent with several previous studies (Brosseau et al., 2012; Coleman et al., 2012; Kao et al., 2016; McKnight et al., 2010; Yip et al., 2007a, 2007b). However, the interventions in the previous studies had a duration ranging from 16 weeks to 18 months follow-up while our intervention lasted for 8 weeks which is one and half times less. It could be because we allowed the participants to save the VDO clips, such as knee exercises and care for knee pain, on their smart phones so that they could re-watch these VDO clips and practice

**TABLE 3** Repeated measure ANOVA of total WOMAC scores

Source of variation	SS	df	MS	F	p-value
Between subject					
Group	12,610.61	1	12,610.61	6.73	0.014
Error	63,737.57	34	1,874.63		
Within subject					
Time	9,820.55	1.63	15,299.24	14.37	<0.001
Time*Group	16,388.04	1.63	10,627.99	23.97	<0.001
Error time	23,244.06	55.43	419.335		



**FIGURE 2** Comparison mean scores of WOMAC between two groups across 3-point time

**TABLE 4** Repeated measure ANOVA of total SF-36 scores

Source of variation	SS	df	MS	F	p-value
Between subjects					
Group	1,090.29	1	1,090.29	6.34	0.017
Error	5,847.47	34			
Within subjects					
Time	5,894.01	2	2,947.01	36.08	<0.001
Time*Group	2,763.24	2	1,381.62	16.91	<0.001
Error time	5,554.96	68			

and manage the exercises and care at anytime and anywhere they felt comfortable. When they had low or no pain in their knee, the middle-aged women were able to use their knee freely and that could improve their health-related quality of life.

Our intervention contained multi-components of care. Session 3 (pain management) and session 4 (knee exercises) seemed to be the most favourable to the participants. The fact that the internet and technology could be a crucial means to enhance and support health outcomes among people who can access, and this was supported by these findings. The VDO clips were not too long (approximately 7–10 min), communicated in lay language for general people and included infographics and photos which were attractive and interesting. These aspects are suggested in the design of further interventions using the internet and smart media. It is recommended that there should be a national policy that allows people to have access to the internet and smart media.

Knee exercise and pain management could be more effective in the early onset of patients with knee OA. However, medication and finally surgical treatment would be essential because knee OA is a degenerative disease. Appropriate management of knee OA condition together with regular recommended exercises could improve and maintain the knee function. Knee OA is also associated with obesity and overweight conditions, dietary factors and sedentary lifestyles (Musumeci et al., 2015). The American Academy of Orthopedic Surgeons (American Academy of Orthopedic Surgeons (AAOS), 2014) also recommends weight loss in addition to activity modification as a mean to reduce symptoms.

#### 4.1 | Limitation

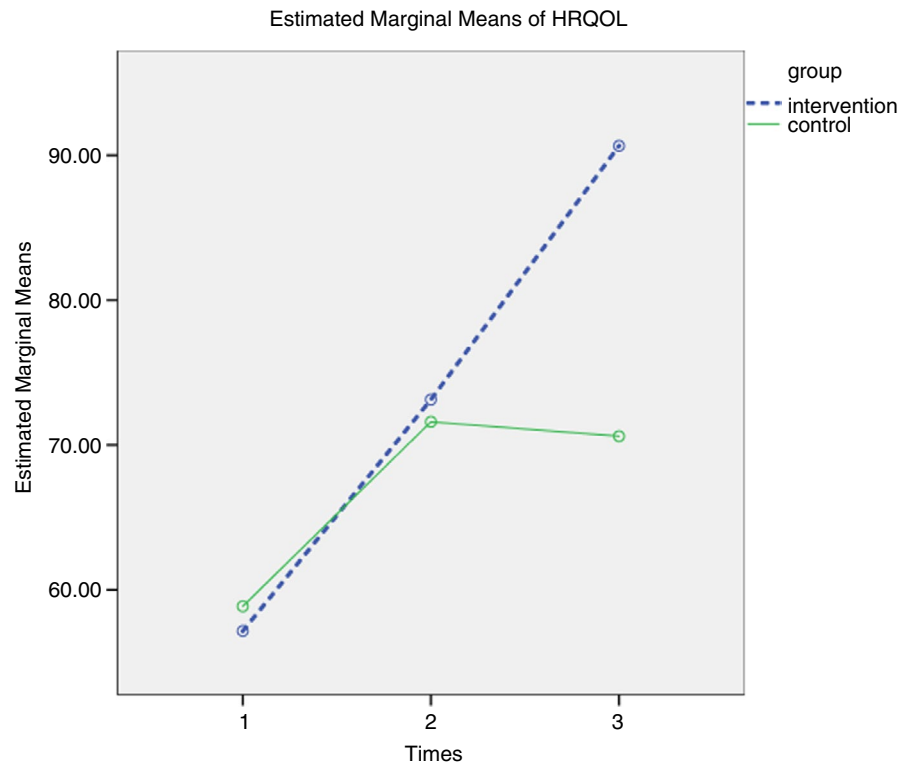
This study had some limitations. Participants in this study were recruited from only one setting, thus, generalizability may be minimal. Nurse researchers should apply this intervention to implement with extension of a larger size of sample. In addition, the effectiveness of this intervention should be designed to determine sustainability or long-term effects of the intervention. Moreover, other outcomes such as BMI, waist circumference, and fat composition are also suggested for future studies.

#### 4.2 | Nursing implications

This intervention offers an increased scope of practice for health professionals, nurses, or caregivers with evidence to support the use of a collaborative chronic care intervention. The findings provide



**FIGURE 3** Comparison mean scores of SF-36 between two groups across 3-point time



evidence to guide health providers in improving knee functional status and HRQOL in middle-aged women with knee OA. Knee OA raises important considerations for any attempt at progress and development of a consensus self-management support. Developing care for chronic disease policies and implementing policies into practice are viewed as integral to the provision of nursing care for knee OA. Implementation of a self-management support intervention for middle-aged women with knee OA is useful in reducing pain intensity. Health professionals and family members can start implementation and follow-up on self-management support for improving knee functional status and HRQOL.

## 5 | CONCLUSIONS

This study demonstrated that the self-management support intervention could improve knee functional status and HRQOL in middle-aged women. Education-integrated support from health professional and technology on smart media was the key success. Future studies should explore a longitudinal follow-up, a larger group of participants and expand a variety of settings. Moreover, other related outcomes, such as the range of motions of a knee joint, the participants' BMI, etc. should be assessed.

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## CONFLICTS OF INTEREST

The authors declare that they have no conflict of interest.

## AUTHOR CONTRIBUTIONS

TB and NC made substantial contributions to conception and design, and/or acquisition of data, and/or analysis and interpretation of data; participated in drafting the manuscript or revising it critically for important intellectual content; given final approval of the version to be submitted and any revision version; agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

## PEER REVIEW

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