

Videotape Instruction vs Brochure on the Effectiveness of Unsupervised Home Exercise Program in Patients with Knee Osteoarthritis



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ABSTRACT

The optimum treatment for osteoarthritis is a combination of education, medication, weight reduction, and exercise. However, the adherence to exercise decreases with treatment duration. This study aims at determining the effectiveness of a home exercise program in patients with knee osteoarthritis delivered through a brochure or videotape to improve compliance, pain and function; and also in the reduction of paracetamol intake.

Type of study This is a single-blind, randomized, controlled study in a home setting.

Participants One hundred and two participants with knee osteoarthritis were included in the study.

Intervention: The participants were randomly assigned into video and brochure groups and instructed to perform the exercises for six months. They were evaluated for one month during the program and immediately after the end of the intervention. Outcome measures were pain using the Visual Analog Scale, modified Knee Outcome Survey-Activities of Daily Living Scale, 6-minute walk test (6MWT), compliance, and paracetamol intake.

Results There were significant improvements in all outcome measures from baseline to one and six months in both groups. However, there was no significant difference between the mean change in all the outcome measures except for the mean change in the distance walked in the 6MWT at one and six months, which was significantly higher in the brochure group. Compliance to exercise and paracetamol intake decreased from one to six months in both treatment arms but was not statistically different for both groups.

Conclusion The provision of a home exercise program using either video or brochure could be effective in the management of osteoarthritis.

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INTRODUCTION

Osteoarthritis (OA) is the most common cause of musculoskeletal pain and disability despite medical advances (1,2). Elements of the joints, such as the synovial lining, periarticular bone, and supporting connective tissues are adversely modified by OA with structural changes which include continuous loss of articular cartilage, formation of new bone at joint margins, increased thickness of the subchondral plate, and growth of subchondral bone cysts (3). These structural alterations manifest in symptoms of pain, stiffness, increasing difficulty in gait and performance of activities of daily living (4). Research has shown that the optimum treatment for OA is a combination of education, medication, weight reduction, and exercise (5,6). Regular physical exercise not only effectively addresses the physical limitation brought about by OA, but also decreases the risk of conditions related to physical inactivity such as diabetes mellitus, cardiovascular disease, and obesity (2,6). According to Van Gool, adherence to exercise is a significant predictor of greater improvement in walking and decrease in self-reported disability in patients with OA (7). However, adherence to exercise decreases with intervention duration and has been estimated to range from 50% to 95% in clinical trials which could be much lower in the context of clinical practice (8). A study by Ettinger et al. showed that adherence to exercise fell from 85% after three months to 50% after 18 months (9). There is a complex array of factors that could possibly influence exercise adherence among patients with OA, which include individual and interpersonal physical factors, and intervention-related and disease-related factors (8). Direct supervision like home visits or therapist-led exercises was clearly influential on the treatment effect in patients with knee OA, since it promotes adherence to the program as compared to an unsupervised exercise program (3-10). However, resource implications would limit its applicability to a large number of patients with OA in the wider community, especially in a developing country like the Philippines where only 3.6% of the gross domestic product is used for healthcare and US \$142 per capita is spent on health (11).

Effective strategies to improve exercise adherence to unsupervised programs should be adopted. There are studies that have compared the use of videotaped instructions and brochures as a method of delivery of instructions for exercises. The study by Jay showed that videotapes could be a cost-effective mode of instruction, which could be utilized in teaching patients the proper forms during exercises (12). However, both studies had healthy adult participants which may not reflect in the understanding of the effectiveness of the videotape method for patients instructed to follow a home exercise program in the home setting.

There are studies that have determined the effectiveness of videotape use as instructional materials for home exercise programs for musculoskeletal and orthopedic conditions using clinical outcome measures for pain, function, global patient assessment, and compliance rate (13-15). Of these studies, the studies of Schoo and Ravaud implemented the home exercise program for patients with knee or hip OA (13,14). Both the studies used brochure and videotape together as modes of instruction for the home exercise program in OA. However, the effect on videotape alone and brochure alone as an effective mode of instruction was not determined. This study aims to investigate the effectiveness of a specifically designed home exercise program delivered through two different modes of instruction, brochure and videotape in patients with knee OA in terms of compliance; improving pain, function, and cardiovascular endurance; and reduction of paracetamol intake.

METHODS

The Institutional Review Board of the University of Santo Tomas Hospital granted ethical approval for the study.

Design of the Exercise Program and Production of Video and Brochure

A literature search was done in different databases such as Medline, ScienceDirect, Cochrane Library, Cinahl, HighWire Press, and Pubmed to look for systematic reviews and randomized control trials on the effectiveness of exercises in the management of knee OA. The papers included were those which enumerated and discussed exercises that were employed in the intervention, written in English, and published

between 2000 and 2011. Exercises used in the intervention were extracted from the studies. From the search, three studies met the criteria (5-10). After a thorough review, there were four types of exercises commonly prescribed to patients with OA which included stretching exercises, isometric exercises, and isotonic strengthening exercises for the lower extremities, and walking as a form of aerobic activity.

The exercises were then assessed by two physical therapists and a physiatrist based on the following criteria: Easy to follow, no exacerbation of knee pain, and can improve muscle strength and endurance or cardiovascular endurance. A Likert scale of 1 to 5 was used with a rating of 5 wherein the assessor strongly agreed that the exercise was able to meet the criterion and 1 when the exercise was not able to meet the criterion. For each exercise, the rating provided for the three criteria was added and divided by 3 (number of criteria). After this, the mean and standard deviation of scores of all the assessors was computed. The mean cut-off score was set at 4, which meant that the exercise almost always met all the criteria and was included in the protocol without any need for modification. If the mean score was less than 4, the exercise was either modified or not included in the protocol based upon the comments of the assessors. Evaluation of the exercises showed that the mean scores ranged from 4.17 ± 0.24 to 5 ± 0 for all the exercises. Based on these results, all the exercises were included in the brochure and video. Figure 1 illustrates the exercises used in the program.

The technical staff discussed and planned the design, layout, and format of the instructional materials. They deliberated on how the exercises were to be illustrated and demonstrated as well as what instructions should be delivered and written. Both English and Filipino were used in the brochure and video.

Assessment of the video home exercise program was performed by two physiatrists, two physical therapists, and two patients with OA using the Video Evaluation Instrument. This tool analyzed the instructional design and media quality. The validity of the instrument is $ICC = 0.618-0.905$ and the reliability is $r = 0.90$ (16). The instrument was divided into three general areas namely content, instructional plan, and technical production. The content determined the accuracy and usefulness of the video; instructional plan assessed if the video had an introduction,

body, and closure while technical production evaluated the characteristics of video quality with regard to transcendence, attention, detail, special effects, economy, independence, and interdependence. The instrument had a total of 16 questions and each question was graded from 1 to 5 with a grade of 1 if it was poor and 5 if it was exceptional.

The brochure home exercise program was assessed using the Suitability Assessment of Materials instrument (SAM) (17). SAM objectively assessed the suitability of health information materials for a particular audience in a short time and rated the materials on factors that affected readability and comprehension. It rated the instructional material in six areas namely: content; literacy demand; graphics; layout and type; learning stimulation and motivation; and cultural appropriateness. There were three questions per criteria with a total of 18 questions and each question graded as superior, adequate, and not suitable with corresponding scores of 2, 1, and 0, respectively. The reliability of this instrument was $r = 0.93-0.99$ while validity was $ICC = 0.60-0.73$ (18).

The mean scores and standard deviation of the assessors were computed. Analysis of variance was used to determine if there was a significant difference among the assessors. A p value of less than 0.05 was considered significant.

Evaluation of the video and brochure using the assessment tools showed that there was no statistically significant difference among the scores of the evaluators for all the criteria. With regard to the video, the mean scores for content, instructional plan, and technical production were 13.8 ± 0.41 , 35.5 ± 1.04 , and 22.5 ± 1.76 . With regard to the brochure, the mean scores for the following criteria are: 5 ± 1.26 for content; 8 ± 1.55 for literacy demand; 8.5 ± 1.76 for graphics, illustrations, lists, tables, charts; 5.5 ± 0.55 for layout and photography; 4.8 ± 0.98 for learning stimulation; and 3.5 ± 0.55 for cultural appropriateness. For both the brochure and video, the mean scores for all the criteria were near the highest attainable score.

Subject Selection

Based on the study by Deyle, a sample size of 51 was needed for each group in order to obtain a power of 0.80 and an alpha of 0.05 (19). Participants were recruited from the outpatient department of a university hospital and Senior Citizens' Associations of five

Stretching Exercise	Isotonic Strengthening Exercise
 <p>• Standing calf stretch – three repetitions with 30-second hold</p>  <p>• Supine hamstring stretch – three repetitions with 30-second hold</p>  <p>• Sidelying quadriceps stretch – three repetitions with 30-second hold</p>	 <p>• For quadriceps: In the supine position with the contralateral limb knee flexed, the exercised limb was raised with the knee in full extension, then was lowered to the initial position (straight leg raise – SLR).</p>  <p>• For hamstrings: In a supine position with both legs resting on a triangular support with the knees flexed at 30-degree angle, one leg was straightened, and then returned to flexed position. This was repeated with the other leg.</p>
Isometric Exercise	 <p>• For quadriceps – in the supine position with knees straight, perform ankle dorsiflexion, done with a 6-second hold for 10 repetitions.</p>  <p>• For hamstrings – in the supine position with knees slightly bent, perform ankle plantar flexion, done with a 6-second hold for 10 repetitions.</p>  <p>• Hip abductors: In sidelying position with the knee and hip of the lower leg bent while the upper leg was kept in a straight position, the upper leg was raised while keeping it straight.</p>  <p>• Hip adductors: In a supine position with both legs straight, a ball or towel was placed in between the knees and the thighs were adducted.</p>
Aerobic Exercise	<p>Initially, 20 repetitions were performed for first two weeks which was progressed to 40 repetitions for the 3rd week and subsequent weeks. A 0.5 kilogram weight was used.</p>
<p>After initial strengthening program of 2 weeks, aerobic activity (walking) was initiated daily for 10 minutes using a comfortable pace.</p>	

Fig 1. Exercises for Osteoarthritis.

towns in Metro Manila. Patients were diagnosed by a physiatrist with knee OA based on clinical history and physical examination using the Altman criteria (20). Inclusion and exclusion criteria were also assessed by the physiatrist.

The inclusion criteria were the following: 1) knee OA; 2) males or females able to perform exercises; 3) good vision, reading ability, and English and/or Filipino speaking skills; 4) no dementia or other cognitive disability; 4) must be able to exercise and walk either independently or with an assistive device; 5) must have been discharged from a formal

physical therapy program for knee OA and advised to continue exercises at home; 6) must have access to a digital video disc player or computer.

Exclusion criteria included the following: 1) presence of other arthritic conditions; 2) peripheral neuropathy; 3) evidence of significant psychiatric or general medical morbidity like acute myocardial infarction, chronic pulmonary obstructive disease, and stroke that would either preclude them undertaking the exercises or their understanding of the nature of exercise treatment; 4) those who had received intra-articular steroid injections, viscosupplementation,

and surgical procedures in either lower extremity in the preceding six months; and 5) those taking pain medications for knee OA on a regular basis.

Outcome Measures

The outcome measures used were the following:

Visual Analog Scale for knee pain intensity using the 0-10 scale. The modified Filipino Knee Outcome Survey Activity of Daily Living Scale (mKOS-ADLS) which measured the performance in different physical functions (21). The Knee Outcome Survey Activity of Daily Living Scale (KOS-ADLS) is a patient self-reported measure of symptoms and functional limitations from various pathological disorders and impairments of the knee. The KOS-ADLS is divided into symptoms and functional limitations with 18 indices. Scoring is from 0 to 4 where 0 means there is no pain/difficulty, 1 with slight difficulty, 2 with moderate difficulty, 3 with severe difficulty, and 4 with extreme difficulty in performing the task. The scores across all items were summed and then divided by 85 and multiplied by 100 to transform it to a scale that ranges from 0 to 100. Higher scores represented the absence of symptoms and a higher level of function. It has a validity ICC of 0.85-0.94 and reliability of $r = 0.93-0.95$ (22). The KOS-ADLS had been modified and translated into Filipino with test-retest reliability of $r = 0.92$, p -value = 0.000. Its internal consistency was excellent with a Cronbach alpha = 0.92 (31). For the study, the scores for the overall mKOS-ADLS, mKOS-Symptom, and KOS-Functional Limitation (mKOS-Function) were used.

The six-minute walk test (6MWT) for cardiovascular endurance: Participants were asked to walk without physical assistance for 6 minutes in the fastest and most comfortable speed. Assistive devices could be used by the participants but should be kept consistent and used at all the assessment points. The distance was measured in meters. Its validity is ICC = 0.95-0.97 and reliability is $r = 0.63-0.79$ (23). Compliance of exercise was defined as performance of the exercise program for at least two sessions per week during the six months period which was based on the recommended frequency of strengthening and aerobic exercise for patients with OA by the American Geriatrics Society (24). This was based on the participants self-report and their daily log. Studies have used self-report to measure adherence to a required activity (13-26). Although people

may over-report or under-report, it was found that reporting was correlated with monitoring through electronic recording (26) and paracetamol intake as rescue medication for knee pain. One of the OMER-ACT recommendations for an optional outer core set of outcome measures for OA clinical trials was the consumption of analgesics (27). Paracetamol on a regular basis is recommended as an initial pharmacological approach in most clinical guidelines, despite its minimal effects on symptoms but in the presumption of acceptable safety and affordable price, especially in short-term use of less than 6 months (28). Paracetamol intake was divided into those who took medications more than twice in a month and those who did not take any medications or just once in the study period for exacerbation of knee pain.

Data Gathering Procedure

Informed consent was obtained from qualified participants at the start of the study. They were randomly assigned to either the video exercise group or the brochure group using the Excel random generation of number. Random allocation was done and placed in an opaque sealed envelope.

Prior to the study, three physical therapists were assigned as assessors, oriented to the study, and trained in the proper use of the Visual Analog Scale (VAS) and 6MWT. During the first testing day, baseline characteristics were obtained from the participants, which included demographic data such as age, address, cellular phone or telephone number, and data concerning OA such as bilateral or unilateral involvement of the knee, years diagnosed to have OA, and medications used. Outcome measures of VAS, mKOS-ADLS, and 6MWT were done by the assessors who were blinded to the allocation of the participants.

The participants in the brochure group received a detailed supporting handout containing instructions and illustrations of the exercises while the participants in the video group were given a DVD containing the step-by-step exercise guide. Participants in each group received detailed face-to-face instructions prior to the start of the intervention. They were reminded that the exercise should not exacerbate pain. They were instructed to perform the exercise two to three times a week for a period of six months.

A home program adherence log was given to the participants. They were instructed to record the date and duration of exercise, and the frequency of

paracetamol intake. After two weeks, the authors contacted the participants via telephone or short text message to follow-up patients enrolled in the study. They were asked if they were performing the exercise regimen as required, if exercise exacerbated pain, if they have taken paracetamol as rescue medication, and if they had any difficulty doing the exercises. This was done every two weeks for a period of six months.

The participants were reevaluated at the first and sixth month of the intervention to assess the short- and long-term effects of the program.

Treatment of Data and Data Analysis

All data were entered into a purpose-built MS Excel workbook and analysis done using the Stata (version 14).

For the randomized control trial, mean, standard deviations (SD), and percentages were used for the descriptive data of participants and outcome measures. For the VAS score of those with unilateral OA, only the involved knee was included in the analysis. If there was bilateral knee OA, the mean of the VAS scores of both knees were obtained. Repeated Measures Analysis of Variance (RMANOVA) was used to determine if there was a difference in the primary outcome measures of the two groups during the first and sixth month of exercise. A test of sphericity, the Mauchly's Test was done prior to testing for within-subjects effect to validate the hypothesis that the correlation between results at baseline and one month and six months post-exercise was the same as that between one month and six months post-exercise and further equal to that between one and six months post-exercise. If rejected, a correction was performed and the results based on the correction was interpreted. The p-value corresponding to the Huynh-Feldt correction was reported for testing within-subjects effects (both Time and Time*Group interaction). Chi-square was utilized to determine if there was a difference in the compliance of exercise and paracetamol intake. Intention to treat analysis was performed and a p-value of <0.05 was considered significant.

RESULTS

Subject Profile

Figure 2 shows the flowchart of the study. There were 141 persons screened for the study. Of these, 110

were eligible to participate in the study. However, eight eligible subjects refused to participate leaving 102 participants. Fifty-one participants were randomly assigned to each group. After one month, 92.2% (47/51) of the brochure group and 90.2% (46/51) of the video group complied with the exercises after the first month. By the end of the 6-month period, there was a decrease of participants doing the exercise program (60.8% vs 58.8% for the brochure and video group, respectively), but was not statistically different between the two groups.

Table 1 shows the profile characteristics of the participants. Most of the participants in the two groups were women. Thirty-six (70.59%) out of the 51 subjects had bilateral knee pain in the brochure group while 33 (64.70%) out of 51 subjects had bilateral knee pain in the video group. Only 15 and 18 participants had unilateral knee OA in the brochure and video groups, respectively.

The VAS score, mKOS-Symptom, mKOS-Function and mKOS-ADLS scores were not statistically different between the two groups. However, the mean distance traveled during the 6MWT for the brochure group was significantly lower as compared to the video group (p-value = 0.03).

Changes after one month and six months of exercise

VAS score, mKOS-ADLS, mKOS-Symptom, mKOS-Function (Table 2) (Fig 3).

The total VAS, regardless of the mode of instruction, significantly improved from baseline to one and six months of exercise. There was no significant interaction found between the mode of instruction and change in scores over time. However, there was evidence found that the videotape group significantly had lower total VAS mean score than their counterparts in the brochure group (p = 0.025) at the end of six months.

The mKOS-ADLS, mKOS-Symptom, mKOS-Function regardless of the mode of instruction, significantly changed from baseline to one and six months of exercise. There was no significant marginal group effect nor Time*Group interaction on all the three outcome measures (Table 2).

Six-Minute walk test (Table 2) (Fig 3)

Cardiovascular endurance, regardless of the mode of instruction, significantly improved from baseline to 6 months (p = 0.000). There is a

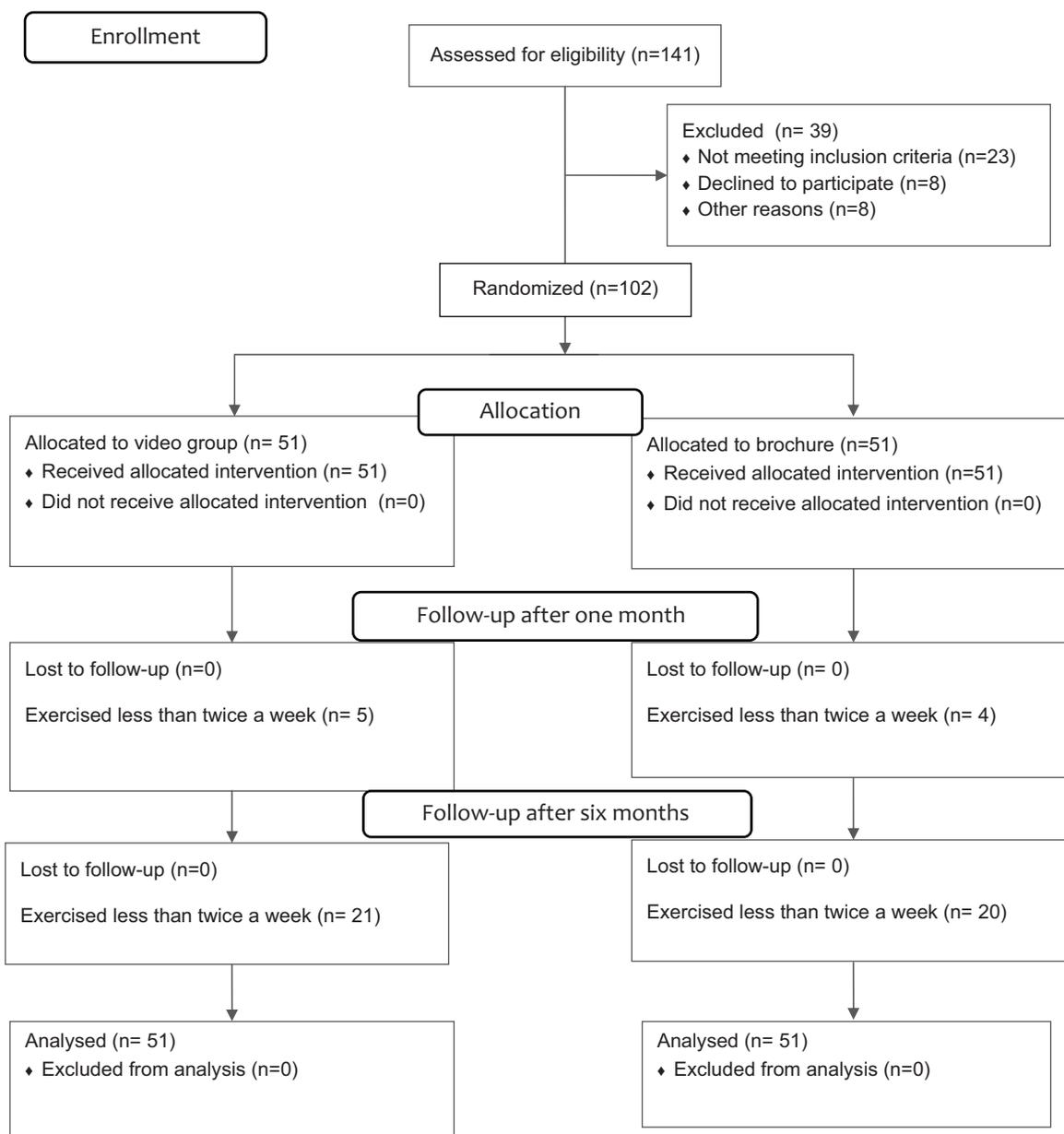


Fig 2. Consort Diagram.

significant interaction between exercise program and the change in cardiovascular endurance over time ($p = 0.001$). The brochure group had a sharper rate of increase (from 275.3 ± 96.0 m to 339.2 ± 97.6 m) than the videotape group (from 323.0 ± 124.0 m to 353.1 ± 123.4 m). At six months, patients in the brochure group had higher cardiovascular endurance (369.9 ± 95.9 m) than those in the videotape group (352.2 ± 127.9). The interaction between Group and Time was significant, which means that the brochure group had a significant increase in cardiovascular endurance as compared to the video group after one and six months.

Compliance

Ninety-two percent of the brochure group and 90.2% of the video group complied with the exercises after the first month. By the end of the six-month period, there was a decrease of participants doing the exercise program (60.8% vs 58.8% for the brochure and video group, respectively, but was not statistically different between the two groups) (Table 3).

Amount of paracetamol intake

After one month of exercise, only 23.5% and 19.6% of the brochure and video group took medications

Table 1. Subject Profile of the brochure and video groups.

	Brochure Group (n = 51)	Video Group (n =51)	P value
Male	7 (13.7%)	4 (7.8%)	
Female	44 (86.3%)	47 (92.2%)	
Age	65.37 ± 9.70	63.94 ± 9.70	NS
Diagnosed with OA			
Involvement			
Unilateral	15 (29.41%)	18 (35.50%)	
Bilateral	36 (70.59%)	33 (64.70%)	
VAS Score	4.5 (95% CI:3.90, 5.10)	3.89 (95% CI:3.28, 4.50)	NS
mKOS-Symptom	24.51 (95% CI:22.50, 26.51)	23.73 (95% CI:21.79, 25.66)	NS
mKOS-Function	33.71 (95% CI:30.94, 36.47)	33.04 (95% CI:30.05, 36.23)	NS
mKOS-ADLS	68.97(95% CI: 63.37, 73.61)	66.62 (95% CI: 61.42, 71.83)	NS
6-minute walk test (meters)	275.32 (95% CI: 248.31, 302.33)	322.97 (95% CI: 288.10,357.84)	0.03*

NS - not significant

VAS: Visual analogue scale; mKOS-Symptom: modified Knee outcome survey-activities of daily living scale-symptom component; mKOS-Function: modified Knee outcome survey-activities of daily living scale-functional limitation component; mKOS-ADLS: modified Knee outcome survey-activities of daily living scale

more than twice a month. By the end of the sixth month, only 13.7% and 9.8% of the brochure and video group took medications more than twice a month. However, there was no statistically significant difference between the two groups one- and six-months post-intervention (Table 3).

DISCUSSION

Our study showed that an unsupervised exercise program regardless of modes of instructions had similar compliance rate at one and six months of exercise of about 90% and 60%, respectively. Both modes of instruction were able to improve pain and function in participants with OA but the group utilizing the brochure had higher cardiovascular endurance.

Compliance to exercise is an important factor in order to optimize and maintain its benefit in the management of OA (1,24,25). A variety of interventions had been utilized to improve adherence to exercise such as modification of exercise, different modes of delivery of exercise, and the use of cognitive behavioral therapy. In the Cochrane systematic reviews on exercise adherence and exercise for knee OA, it has been emphasized that directly supervised exercise either by clinic-based treatments, home visits, and

monitored classes significantly influence the treatment effect for pain and physical function and was more effective than the unsupervised exercise program (10,25). Our study was able to prove that unsupervised home exercise program regardless of the medium of instruction was effective in the management of OA. Our study was similar to the study of Shoo et al. where patients with OA received face-to-face instructions and a brochure on how to perform and comply with an 8-week home exercise program with an additional audio or videotape of the exercise (13). Compliance rate after four weeks ranges from 89% to 93% and after 8 weeks from 82% to 90%. He concluded that verbal instruction together with an illustrated brochure was able to improve compliance and the provision of additional videotape or audiotape did not further enhance outcome. The study focused on the accuracy of performing the exercises but no outcome on pain and function was included in this study. In contradistinction, the study of Ravaud failed to demonstrate a short-term symptomatic effect of home exercise in patients with OA receiving nonsteroidal anti-inflammatory medication (14). In his study, there was a low compliance rate of the patients and most of the patients indicated that the program was troublesome and constraining.

Table 2. Pain Score, modified Knee outcome scale-Activity of Daily Living Scale and 6-minute walk test of groups at baseline, after one month and six months of intervention.

Outcome Measures	Group	Mean ± Standard Deviation	RMANOVA Tests
Pain Score (Visual Analogue Scale)			
At baseline	Brochure	4.5 ± 2.1	Time Effect(+) p = 0.000 Time*Group Interaction(+)
	Videotape	3.9 ± 2.2	
	Total	4.2 ± 2.2	
After one month of intervention	Brochure	3.1 ± 1.6	p = NS Group Effect p = 0.025
	Videotape	2.4 ± 1.6	
	Total	2.8 ± 1.6	
After six months of intervention	Brochure	2.5 ± 1.5	Sphericity Test p = 0.000
	Videotape	1.8 ± 1.4	
	Total	2.2 ± 1.5	
mKOS-Symptom			
At baseline	Brochure	24.5 ± 7.1	Time Effect(+) p = 0.000 Time*Group Interaction(+)
	Videotape	23.7 ± 6.9	
	Total	24.1 ± 7.0	
After six months of intervention	Brochure	27.1 ± 5.8	p = NS Group Effect p = NS
	Videotape	27.9 ± 5.5	
	Total	27.5 ± 5.7	
After one month of intervention	Brochure	28.1 ± 4.7	Sphericity Test p = 0.000
	Videotape	29.2 ± 5.6	
	Total	28.6 ± 5.2	
mKOS-Function			
At baseline	Brochure	33.7 ± 9.8	Time Effect(+) p = 0.000 Time*Group Interaction(+)
	Videotape	33.0 ± 10.6	
	Total	33.4 ± 10.2	
After one month of intervention	Brochure	39.2 ± 7.5	p = NS Group Effect p = NS
	Videotape	39.0 ± 9.8	
	Total	39.1 ± 7.5	
After six months of intervention	Brochure	41.4 ± 6.0	Sphericity Test p = 0.000
	Videotape	39.4 ± 7.5	
	Total	40.4 ± 6.9	
mKOS- ADL			
At baseline	Brochure	68.5 ± 18.2	Time Effect(+) p = 0.000 Time*Group Interaction(+)
	Videotape	66.6 ± 18.5	
	Total	67.6 ± 18.3	
After one month of intervention	Brochure	77.9 ± 13.6	p = NS Group Effect p = NS
	Videotape	78.0 ± 15.0	
	Total	78.0 ± 14.2	
After six months of intervention	Brochure	81.7 ± 10.6	Sphericity Test p = 0.000
	Videotape	80.6 ± 13.5	
	Total	81.2 ± 12.1	
6-MinuteWalk Test (meters)			
Baseline	Brochure	275.3 ± 96.0	Time Effect(+) p = 0.000 Time*Group Interaction(+)
	Videotape	323.0 ± 124.0	
	Total	299.1 ± 112.9	

Table 2. Continued

Outcome Measures	Group	Mean ± Standard Deviation	RMANOVA Tests
After one month of intervention	Brochure	339.2 ± 97.6	p = .001
	Videotape	353.1 ± 123.4	Group Effect
	Total	346.2 ± 110.9	p = NS
After one month of intervention	Brochure	369.9 ± 95.9	Sphericity Test p = .005
	Videotape	352.2 ± 127.9	
	Total	361.1 ± 112.8	

mKOS-Symptom: modified Knee outcome survey-activities of daily living scale-symptom component;
 mKOS-Function: modified Knee outcome survey-activities of daily living scale functional limitation component;
 mKOS-ADLS: modified Knee outcome survey-activities of daily living scale;
 (+) under Huynh-Feldt correction;
 NS: not significant

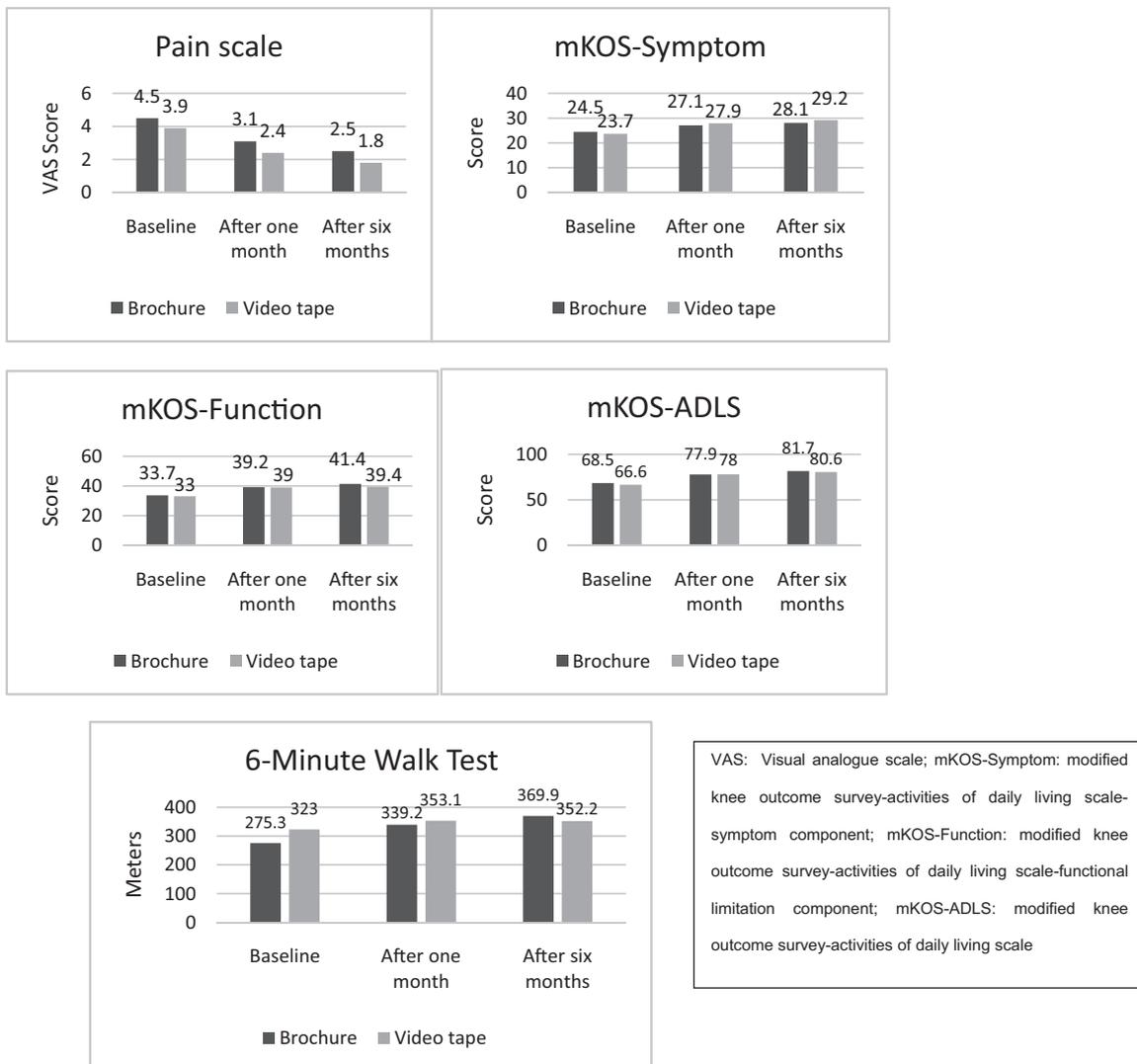


Fig 3. Pain Score, modified Knee outcome scale-Activity of Daily Living Scale and 6-minute walk test of groups at baseline, after one month and six months of intervention.

Furthermore, all the treatment groups were receiving nonsteroidal anti-inflammatory medication which could have diluted the results.

Our study has instituted strategies to improve the effectiveness and compliance of an unsupervised home exercise program. The components

Table 3. Compliance and intake of Paracetamol during the intervention.

	Brochure Group	Video Group	P value
Compliance			
After 1 month			
Less than 2 sessions/week for 1 month	4 (7.8%)	5 (9.8%)	
More than 2 sessions/week for 1 month	47 (92.2%)	46 (90.2%)	
p value	<0.0001 *	<0.0001 *	NS
After 6 months			
Less than 2 sessions/week for 6 months	20 (39.2%)	21 (41.2%)	
More than 2 sessions/week for 6 months	31 (60.8%)	30 (58.8%)	
p value	NS	NS	NS
Paracetamol intake			
After 1 month			
Less than twice for whole duration	39 (76.5%)	41 (80.4%)	
More than twice for whole duration	12 (23.5%)	10 (19.6%)	
p value	<0.0001 *	<0.0001 *	NS
After 6 months			
Less than twice for whole duration	44 (86.3%)	46 (90.2%)	
More than twice for whole duration	7 (13.7%)	5 (9.8%)	
p value	<0.0001 *	<0.0001 *	NS

* - Significant, NS - not significant

of the exercise program were evaluated by qualified healthcare professionals in order to safeguard safety, effectiveness, and non-pain provocation. No closed chain exercises such as lunges and squats were included because of the high risk of exacerbating pain if the load on the joint is not controlled properly (3,5,26). This is a likely event since the exercise program is performed at home and is unsupervised. Furthermore, strengthening exercises were instituted not only to the quadriceps but also to the hamstring, glutei, and iliopsoas. Although the systematic review of Roddy et al. has recommended quadriceps strengthening and aerobic exercise as the most effective exercise in patients with knee OA in decreasing disability, recent studies have shown that persons with OA have weakness of the quadriceps, hamstrings, and hip musculature and should also be provided strengthening exercises (2,29). The authors ensured that the exercises were performed correctly by giving a face-to-face demonstration of the exercises prior to initiation of the program. Moreover, patients were contacted either by phone calls or short text messages for constant follow-up. The study has shown that brief baseline instructions with continuing telephone contact and short text

messages are effective methods to promote compliance with long-term moderate intensity home exercise programs (5). Furthermore, newer remote delivery technologies such as cellular phone and Internet could have a specific applicability in improving adherence to exercise (24).

Exercise was able to decrease pain not only with utilizing VAS score as a direct measurement of pain but also with an indirect measure, which was the decrease of paracetamol intake for the duration of the study. By the end of six months, less than 15% of the study population was taking medications more than twice a month for both groups. This was similar to the study of Atamaz et al. which evaluated the combination of physical therapy agents, exercise, and education in the management of OA (30). It showed that paracetamol intake was significantly lower in groups with electrophysical agents and exercise when compared with those of the sham groups. However, there is no paper to our knowledge, which utilized this outcome measure in determining the effectiveness of unsupervised exercise program alone in knee OA.

This paper showed that there was a statistically significant difference in the mean change in the 6MWT scores after one and six months of exercise with the

brochure group having a higher gain. The participants claim that the brochure promotes convenience of use since it was tangible, easily accessible, and did not require the use of any electronic device. The need for a working DVD player, working speakers, and the cost of electricity prohibited some of the participants from continuous use of the video exercise. A survey of Steinberg et al. showed that even if 85% of Australians aged 50–94 years had videotape equipment, 16% of the population never used it (31). This survey was done in a developed country but the results could be similar in developing countries.

One of the limitations of the study was that we were not able to perform a sub-group analysis of

other potential predictors such as age, weight, and severity of OA that could influence adherence and improve pain and physical function in patients with OA.

In conclusion, providing a home exercise program using either a brochure or videotape is an effective means in the management of OA not only in improving pain and function but also in the reduction in pain medication intake. Home exercise programs remove barriers to exercise adherence in the clinical setting, such as lack of transportation and limited access to qualified therapists at times that suit patients (20). It is also more economical since no extra financial cost will be shouldered by the patients due to supervision by a health professional.

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