ORIGINAL RESEARCH

Adherence to Exercise Training and Physical Function in Older Adults Diagnosed with Knee Osteoarthritis

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ABSTRACT

Background

Knee osteoarthritis (KOA) provokes pain, muscle weakness, and consequent impairment in activities of daily living. On the other hand, adherence to exercise training (ET) is associated with the attenuation of the impairments. The aims of the present study were to a) investigate adherence to ET in older adults with KOA diagnosed attending public service; and b) to analyze the physical function of the older adults with KOA who did not adhere to the ET in public service.

Methods

The adherence to ET programs was analyzed retrospectively from each patient's date of KOA diagnosis. After assessing the adherence to ET, the physical function of these older adults diagnosed with KOA (n=19) was analyzed and compared with another group composed of asymptomatic sedentary older adults without evidence of KOA (ASKOA) (n=17).

Results

Although all older adults with KOA received guidelines to practice ET, only 58% were able to start a program. Additionally, 100% of the sample could not perform ET uninterruptedly. According to the findings, close to 80% of older adults had difficulties scheduling ET sessions in public places. Subjects with KOA (12.1±3.1; IC95%:10.6–13.6) had worse lower limb functional capacity than ASKOA (8.1±1.0; IC95%:7.6–8.6; p<.001; δ=4.0 sec; d=1.7). Likewise, they had a lower dynamic balance than KOA (12.4±2.7; IC95%:11.1–13.7 vs. 8.0±1.1; IC95%:7.4–8.6; p<.001; δ=4.4 sec; d=2.1).

Conclusions

The investigated sample has a lack of ET adherence by difficulties in scheduling ET sessions in public places. In addition, it demonstrated impairment in physical function in older adults with KOA.

Key words: aging, osteoarthritis, physical function, exercise

INTRODUCTION

Aging is a complex process characterized by progressive loss of the individual's physiological integrity, which eventually leads to deteriorated physical function.[1] Over the years, there is a decrease in muscle mass and strength, an increase in visceral fat, a decrease in aerobic capacity, and an increased risk of diseases such as hypertension, diabetes, and osteoarthritis.[2-5]

Osteoarthritis (OA) has an extremely high incidence worldwide and has become a very common joint disease in older adults.[6] Prevalent cases of OA increased globally by 113% in nearly three decades according to the data from the Global Burden of Disease Study 2019,[7] more than doubling from 247.5 million cases in 1990 to 527.8 million cases in 2019. In addition, the study estimated that the age-standardized prevalence rate slightly increased from 6,173.38 per 100,000 in 1990 to 6,348.25 per 100,000 in 2019. Additionally, according to Coimbra *et al*.[8] in 2019, the prevalence of OA was 33% in the Brazilian adult population, with most patients not receiving any form of treatment in the early stages of the disease.

OA in large joints, such as the knee and the hip, is considered to cause the largest disability and may require joint replacement at end-stage, if available.[9-11] The Global Burden

of Disease Study 2019 estimated the annual percentage changes was 0.32 for the knee and 0.28 for the hip,[7] with knee OA (KOA) noted as contributing most to the overall burden. KOA is a health problem characterized not only by pain, but also by muscle weakness (especially of the quadriceps muscle, which acts as a joint shock absorber), and consequent impairment in the ability to walk, stand up, and climb stairs, causing dependence in activities of daily living.[10-12] Additionally, chronic KOA in older adults commonly leads to pain, fear of movement, loss of physical functioning, and disability,[12] thus negatively affecting the quality of life and increasing the risk of depression, anxiety, and social isolation.[13,14]

On the other hand, strengthening training in combination with other types of exercises (e.g., functional exercise) significantly improved pain relief, physical function, and quality of life in KOA patients.[15] Pain has also eased after performing aerobic training, resistance training, or combined training in KOA patients.[16]

Hence, recommended non-pharmacological treatment in older adults diagnosed with KOA includes supervised practice of resistance exercises, aerobic exercises, balance exercises, stretching exercises, and yoga.[17-20] However, structural and functional adaptation requires continuous ET[21-25]—which highlights studies that investigated adherence to ET in older adults with KOA.[26-28]

It has been shown that factors such as lack of personal guidance and motivation, physical problems, lack of family support, low socioeconomic status, and lack of transportation can influence non-adherence to exercise. However, little is known about the barriers older adults with KOA face to joining ET programs in public spaces.[26-28]

Thus, this study aimed to a) investigate the adherence to ET in older adults diagnosed with KOA who attend public services; and b) analyze the physical function of the older adults with KOA who did not adhere to the ET in public service.

METHODS

Design

This is an analytical cross-sectional study conducted upon approval by the Ethics Committee at CEUMA University (number: 4.071.412). All participants signed an informed consent form after properly learning about the study approach, the procedures they would undergo, and the potential risks and benefits. The study was conducted following the Helsinki Declaration of 1975.

Participants

We recruited older adults using convenience sampling from the Filipinho Medical Specialty Center (CEM Filipinho), in São Luís, Maranhão, Brazil. The inclusion criteria for the participants were as follows: 60 years old or above; older adults with KOA diagnosis; asymptomatic sedentary older adults without evidence of KOA (ASKOA); psychomotor and cognitive abilities to perform the tests; ability to walk without a walking aid.

The 36 older adults enrolled in this study after applying the inclusion criteria (Figure 1) were divided into a group with KOA diagnoses (GKOA; n = 19) or a group composed of ASKOA (n = 17).

Procedures

All evaluations were conducted after a face-to-face lecture with all older adults interested in participating in the research

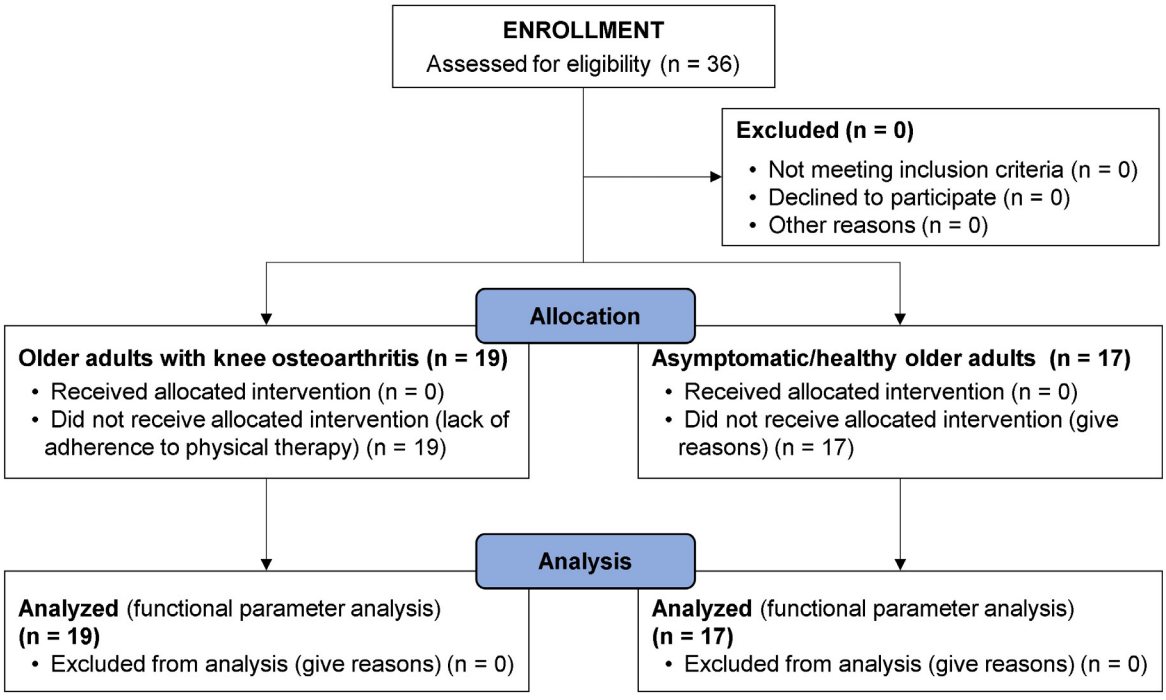

FIGURE 1. Flow diagram of participants

project. Detailed information on the research was given to the participants by physical education and rheumatology professionals. After obtaining written informed consent, a trained interviewer conducted a structured face-to-face interview.

The adherence to ET programs was analyzed retrospectively from each patient's date of KOA diagnosis. After assessing the adherence to ET, the physical function of these older adults diagnosed with KOA was analyzed and compared with another group composed of ASKOA.

A researcher detailed the operational procedures, demonstrated the physical function tests, and evaluated the anthropometric parameters and the participants' motor patterns during the physical performance tests. All participants performed a familiarization trial to ensure they understood the tests. Two physical function tests were administered in the following order: five times Sit-to-Stand test (FTSST) and the Timed Up and Go test (TUG). These two tests were performed in triplicate and the best result was recorded.

Adherence to Exercise Training Evaluation

The analysis of the adherence to ET was performed retrospectively from the date of KOA diagnosis for each patient. Participants answered questions about the management of KOA: 1. When the diagnosis of KOA was performed? 2. After the diagnosis, any treatment for KOA was conducted? 3. Did you perform ET? 4. If your previous answer is yes, for how long? 5. If your previous answer is no, what were the reasons?

A session of ET consists of performing exercises for a certain time, being performed once a day. To be considered adherent to exercise, the training should last for eight uninterrupted weeks and be performed at least twice a week. These criteria were adopted based on studies on ET in older adults KOA diagnosed.[21-25]

Anthropometric Measurements

Total body mass (TBM) in kilograms (kg) and height in centimeters (cm) were measured using an anthropometric scale (PL-200, Filizola S.A. Pesagem e Automação São Paulo, SP, Brazil), with an accuracy of fifty grams and 0.1 centimeters, properly calibrated (NBR ISO/IEC 17025:2005). Body mass index ($kg.m^{-2}$) was determined by TBM (kg) divided by the square of height (m^2).

Five Times Sit-to-Stand Test (FTSST)

Participants were asked to stand up and rise from a standard armless chair five times as quickly as possible with arms folded across the chest. The stopwatch was started when participants raised their buttocks off the chair and was stopped when participants were seated back after standing up for the fifth time.[29]

Timed Up and Go Test (TUG)

The TUG involved getting up from a chair (total height: 87 cm; seat height: 45 cm; width: 33 cm), walking 3 meters around a cone placed on the floor, coming back to the same position, and sitting back on the chair. The volunteers wore regular footwear, sitting up against the back of the chair, arms resting on the arms of the chair, and feet flat on the ground. A researcher instructed the volunteers to get up once they heard "go!", walk as fast as possible without compromising safety on the 3 meters delimited on the ground, turn, go back to the chair, and sit down again. The stopwatch timing was started when participants got up from the chair and stopped when their back touched the back of the chair.[30]

Data Analysis

Statistical analysis was performed using Prism software (GraphPad Inc., San Diego, CA, USA, release 8.4.3, 2020). Continuous variables are presented as mean (standard deviation) after checking data normality using the Shapiro-Wilk test. The Levene's test is used to check the homogeneity of variance and comparisons between anthropometric, clinical, and functional parameters from GKOA and ASKOA groups were performed by Student's *t*-test for independent samples. All measurements were two-tailed, and *p* values were calculated with significance levels set at 5%. Cohen's effect size (ES) *d* was calculated with a confidence interval at 95% (IC95%) to determine the magnitude of the difference between the variables. An effect size between 0.20 and 0.49 was considered a small magnitude of effect, 0.50 and 0.79 a medium, 0.80 and 1.19 a large, 1.20 and 1.99 a very large, and an effect size ≥ 2.00 was considered huge.[23]

A post hoc power estimation was performed for an independent *t*-test using the G*Power software package (Heinrich-Heine-Universität Düsseldorf, Düsseldorf, Germany, release 3.1.9.4, 2019) after other statistical analyses. The input parameters were as follows: statistical test = *t*-tests - Means: difference between two independent means (two groups); tails = two; effect size d=1.7; α err prob = 0.05; sample size Group One = 19; sample size Group Two = 17. As a result, the power of the study was 0.998.

RESULTS

No statistical differences ($p > .05$) were verified between the anthropometric characteristics of the KOA and ASKOA groups (Table 1).

Although all older adults with KOA were referred for ET programs, only 57.9% were able to start the treatment. Additionally, 100% of the sample could not perform eight weeks of ET uninterruptedly. According to the findings, nearly 80% of the older adults with KOA had difficulties in carrying out the marking of ET sessions in specific public places for people with KOA (Table 2).

Worse functional capacity of lower limbs according to FTSST (Figure 1) was observed in the older with KOA (mean: 12.1 ± 3.1 sec; IC95%: 10.6–13.6 sec) when compared to asymptomatic sedentary older adults without evidence of KOA (8.1 ± 1.0 sec; IC95%: 7.6–8.6 sec; $p < .001$; $\delta = 4.0$ sec) with a very large magnitude of clinical deficit ($d = 1.70$; IC95%: 0.93–2.46). In the same sense, a lower dynamic balance by TUG (Figure 2) was demonstrated for older with KOA (mean: 12.4 ± 2.7 sec; IC95%: 11.1–13.7 sec) when compared to asymptomatic sedentary older adults without evidence of KOA (8.0 ± 1.1 sec; IC95%: 7.4–8.6 sec; $p < .001$;

δ = 4.4 sec) with a huge magnitude of clinical deficit (*d* = 2.09; IC95%: 1.28–2.90).

DISCUSSION

The main findings of the present study are the non-adherence to ET programs and the impairments in the functional parameters of older adults with KOA diagnosed. This conclusion is supported by impairments in the functional capacity of the lower limbs and dynamic balance from older with KOA diagnosis. Although 58% of older adults KOA diagnosed had started ET programs, nobody performed eight weeks uninterruptedly. Scheduling of ET sessions in public places since the date of KOA diagnosis appears as the main reason for this.

Studies have demonstrated that factors such as lack of personal guidance and motivation, physical problems, lack of family support, low socioeconomic status, lack of transportation, sadness, loneliness, depression, and pain can influence non-adherence to exercise.[26-28,31,32] On the other hand, to our knowledge, this is the first study to investigate adherence to ET in older adults with KOA attending public services. More studies are needed to confirm our findings and raise the awareness of public authorities about the reality pointed out in this research.

This study had difficulties making appointments at public services, which may be due to the lack of specialized care for older people with KOA. Normally, ET programs are generalized and offered to older adults with knee and/or hip osteoarthritis or those without such a diagnosis. Thus, the number of older adults seeking ET programs at public services seems much greater than its capacity.

Given such a lack of adherence and the damage to physical function, health authorities must devise strategies for people with KOA, creating specific public places for them. Additionally, more employees must be hired to ensure greater flexibility in service hours. As well, ET with flexible

TABLE 1.
Clinical and anthropometric characteristics of the participants (N = 36)

Variables	*KOA (n = 19)*	*ASKOA (n = 17)*	*p*
	Mean ± SD	*Mean ± SD*	
Age (yrs)	67.1 ± 4.6	67.1 ± 7.0	.997
Body mass index (kg/m^2)	29.1 ± 4.0	27.3 ± 2.9	.200
Time of knee osteoarthritis diagnosis (yrs)	8.1 ± 5.8	-	-
Knee osteoarthritis degrees, %			
Grade I	31.6	-	-
Grade II	63.2	-	-
Grade III	5.3	-	-
Use of pharmacological treatment, %	94.7	-	-
Medications prescribed for KOA treatment, %			
Diacerein	15.8	-	-
Glucosamine and chondroitin	57.9	-	-
Unhydrolyzed type II collagen	26.3	-	-

KOA = knee osteoarthritis; ASKOA = asymptomatic sedentary individuals without evidence of knee osteoarthritis; SD = standard deviation.

TABLE 2.
Exercise training (ET) adherence by older adults in specific public centers for people with KOA

Variables	*KOA (n = 19) n (%)*
Older adults with KOA referred for ET	19 (100.0)
Started ET	11 (11.0)
Performed ET lasting 8 weeks uninterruptedly	0 (-)
Main reasons for non-adherence to ET	
Difficulty in carrying out the marking of ET sessions	15 (78.9)
Difficulty in locomotion (low functional capacity)	2 (10.5)
Lack of financial resources	1 (5.3)
Mood disorder (depression)	1 (5.3)

ET = exercise training; KOA = knee osteoarthritis.

hours and easy-to-follow instructions is most likely to result in long-term adherence, according to elegant research conducted by Cheung *et al*.[33]

In addition to making it easier to schedule appointments, hiring more employees is essential to supervise ET in older adults. In this sense, according to the American College of Sports Medicine (ACSM),[20] older adults with non-transmissible chronic degenerative diseases that impair physical function need supervision during ET. Professional follow-up guides such patients to perform resistance, aerobic, balance, and stretching exercises cautiously (respecting physical limitations and pain), gradually increasing their volume and intensity.[20]

In addition to the non-adherence, this study showed impairments in physical function in older adults with KOA. Corroborating our findings, distinct studies have shown that older adults with KOA have impaired functional parameters.[6,13,14,15,34,35]

The findings of this research have great clinical applicability since impairments in physical function are associated with a greater risk of falls, depression, and poorer quality of life in this population.[36,37] Such impairments also diminish daily activities and, therefore, caloric expenditure, increase sedentary behavior, decrease cardiorespiratory system stimulation, increase the production of circulating inflammatory cytokines, and consequently pose a greater risk of cardiovascular mortality in this population.[5]

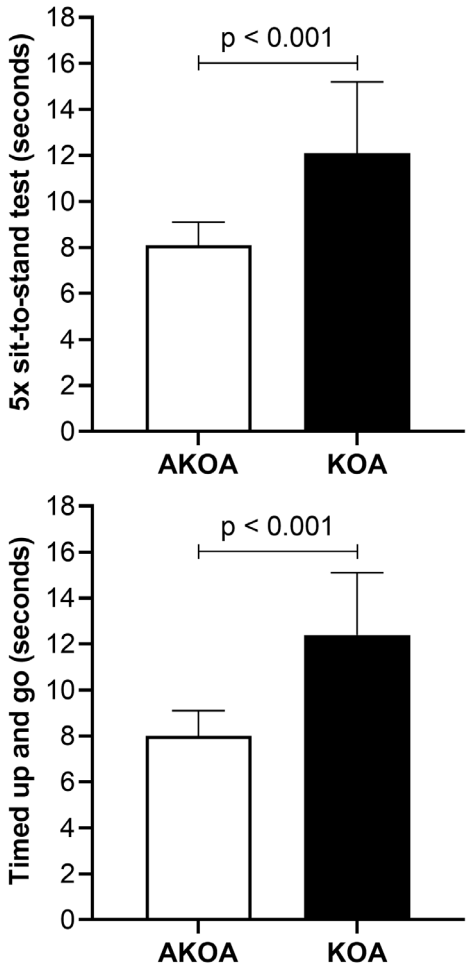

FIGURE 2. Comparison between older with knee osteoarthritis diagnoses (KOA; n = 19) and asymptomatic sedentary older adults without evidence of knee osteoarthritis (AKOA; n = 17) on the functional capacity of lower limbs (five times Sit-to-Stand test) and dynamic balance (Timed Up and Go test)

CONCLUSIONS

The investigated sample lacked ET adherence due to difficulties in scheduling ET sessions in public places. In addition, older adults with KOA had impaired functional parameters. Thus, health authorities must devise strategies for this population, creating specific public places for people with KOA. Hiring more employees to ensure greater flexibility in service hours is also necessary. Adherence is known to be multifactorial, but this study draws great attention to the fact that older people were not assisted to practice ET in public services. Hence, more studies on the topic addressed in the present one are necessary to investigate whether its findings reflect a local, regional, or national reality.

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CONFLICT OF INTEREST DISCLOSURES

We have read and understood the *Canadian Geriatrics Journal*'s policy on conflicts of interest disclosure and declare there are none.

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