



# RELATIONSHIPS AMONG WALKING SPEED, SELECTED CLINICAL SYMPTOMS, AND EXERCISE SELF-EFFICACY IN INDIVIDUALS WITH KNEE OSTEOARTHRITIS

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## ABSTRACT

**Purpose.** Osteoarthritis (OA) is characterised by a combination of joint symptoms and signs stemming from defects in the articular cartilage and adjacent tissues, such as bone, synovial joint capsule, muscles, and ligaments. Knee OA is among the most common causes of pain and disability in middle-aged and older people. This study investigated the relationships among selected clinical symptoms (pain, stiffness, physical function), walking speed, and exercise self-efficacy in individuals with knee OA in Ibadan, Nigeria.

**Methods.** The study involved 100 individuals diagnosed with knee OA. Exercise self-efficacy was assessed with the exercise self-efficacy scale. Pain, stiffness, and physical function were evaluated with the Western Ontario and McMaster (WOMAC) Osteoarthritis Index questionnaire. Walking speed was determined during the 20-meter walk test. Data were analysed with descriptive statistics and Pearson's correlation test, with significance level set at 0.05.

**Results.** Significant correlations were observed between pain intensity and walking speed ( $\rho = -0.38$ ), stiffness and walking speed ( $\rho = -0.19$ ), physical function and walking speed ( $\rho = -0.40$ ), pain intensity and exercise self-efficacy ( $\rho = -0.43$ ), stiffness and exercise self-efficacy ( $\rho = -0.46$ ), physical function and exercise self-efficacy ( $\rho = -0.41$ ). More than 50% of the participants with knee OA had low exercise self-efficacy and moderate walking speed. Individuals with higher levels of pain, stiffness, and functional limitations showed lower levels of exercise self-efficacy and lower walking speed.

**Conclusions.** Individuals with knee OA presented low exercise self-efficacy, low walking speed, and reduced physical function, probably because of the debilitating effects of the condition.

**Key words:** osteoarthritis, joint symptoms, physical function, exercise self-efficacy

## Introduction

Osteoarthritis (OA) is a heterogeneous group of conditions characterised by a combination of joint symptoms and signs stemming from defects in the articular cartilage and changes in the adjacent tissues, such as bone, synovial joint capsule, muscles, and ligaments [1]. It is a common degenerative joint disorder, and its morbidity increases with ageing in both genders, especially if it affects the knee joint [2]. OA occurs all over the world, but the pattern and prevalence of the disease varies amongst nations [3]. In Nigeria, knee OA is most prevalent, followed closely by hip OA [3]. A point prevalence of symptomatic knee OA of 19.6% was reported in South West Nigeria [4].

OA can affect the main surfaces of the knee joint and the cartilage under the patella. This is probably due to the loading effect during weight-bearing activities [5]. In patients with knee OA, pain and disability are major problems. This in turn leads to decreased physical functioning and greater difficulty in performing activities of daily living. Physical disability is associated with the derangement of locomotor functions such as walking, ascending or descending stairs, sitting and standing, which are essential for the maintenance of daily activities [2].

Walking speed is a common performance measure of mobility and an important indicator of current health and well-being in older adults [6]. Individuals with knee OA have difficulty with walking, and tend

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to walk slower than controls [7]. In these patients, decreased walking speed is associated with joint space narrowing, increased concentrations of inflammation mediators, and pain [8]. To achieve optimal health benefits, it is imperative that individuals with knee OA are able to maintain a relative physically active lifestyle contrary to sedentariness which is inflicted by the osteoarthritic condition. This underscores the importance of being physically active in spite of the health condition and, in essence, emphasizes the role of exercise self-efficacy.

Previous studies indicate that exercise self-efficacy is a powerful predictor of physical activity behaviour, which enhances health and wellbeing for older adults [9–12]. Self-efficacy is a cognitive mediator that molds the shape of illness and may improve compliance with prescribed therapies and exercise regimens [13]. According to Bandura [14], self-efficacy is defined as an individual's judgment of their capability to organize and execute actions needed to perform an activity, and is largely influenced by past performance and accomplishments. Accordingly, self-efficacy explains a large portion of the variance in performance of physical activities like walking in older adults with knee OA [15, 16]. In view of the prevalent nature of knee OA in the Nigerian populace [3, 4], it is quite important to investigate the possibility of any relationship that may be in place among selected clinical symptoms (pain, stiffness, and physical function), walking speed, and exercise self-efficacy in individuals with knee OA. This could enable effective planning of interventional strategies and setting rehabilitation goals for individuals with knee OA.

## Material and methods

### Participants

The study participants were individuals with clinical diagnosis of knee OA who had been managed in selected public hospitals, including University College Hospital, Ring Road State Hospital, and Adeoyo State Hospital, Yemetu – all in Ibadan, Oyo State, Nigeria. The hospitals were major referral centres in the Ibadan metropolis and their selection was based on convenience and availability of patients with knee OA. The participants were recruited after the rationale for the study had been explained to them.

### Instruments

1. The *Western Ontario and McMaster (WOMAC) Osteoarthritis Index questionnaire* was used to assess

pain, stiffness, and functional limitations in the participants [17]. It is a self-administered questionnaire consisting of 24 items divided into 3 subscales (American College of Rheumatology):

(i) *Pain (5 items)*: during walking, using stairs, in bed, sitting or lying, and standing.

(ii) *Stiffness (2 items)*: after first waking and later in the day.

(iii) *Physical function (17 items)*: descending stairs, ascending stairs, rising from sitting, standing, bending, walking, getting in/out of a car, shopping, putting on socks, taking off socks, rising from bed, lying in bed, getting in/out of bath, sitting, getting on/off toilet, heavy and light household duties.

Scoring: The Likert scale version of the WOMAC questionnaire was used, with the descriptors: none, mild, moderate, severe, and extreme, corresponding to an ordinal scale of 0–4. Then the scores were summed for items in each subscale, with possible ranges as follows: 0–20 for pain (0 = none; 1–10 = mild/moderate; 11–20 = severe/extreme), 0–8 for stiffness (0 = none; 1–4 = mild/moderate; 5–8 = severe/extreme), 0–68 for physical function (0 = none; 1–33 = mild/moderate; 34–68 = severe/extreme). The sum of the scores for all 3 subscales gave the total WOMAC score, used to grade the type of knee OA experienced by the participants (0–32 = mild knee OA; 33–64 = moderate knee OA; 65–96 = severe knee OA).

2. *Exercise self-efficacy scale*, created by Neupert et al. [18], is a modified version of Bandura's exercise self-efficacy scale [14]. It was used to assess exercise self-efficacy in the participants. The test questions were scored on a scale of 1–4, with the following descriptors: not sure at all = 1; a little sure = 2; pretty sure = 3; very sure = 4. The total score is calculated by summing the scores for all questions. This scale has a range of total scores of 9–36. The exercise self-efficacy was reported as low (9–18), moderate (19–27), or high (28–36).

3. *Twenty-meter walk test* was used to assess the walking speed of participants who walked 20 metres [19] at a self-selected pace at the hallway in the physiotherapy department of each hospital where data were collected. The time taken to walk this distance was evaluated with a stop watch. The procedure was repeated 3 times, and an average walking speed was evaluated, where walking speed (m/s) was calculated as 20 metres/time taken (s).

### Data analysis

Continuous variables were summarized with the use of means and standard deviation. Categorical vari-

ables were summarized with frequencies and percentages. As for the normality test, it was observed that most of the data were skewed hence Spearman correlation analysis was performed to establish relationships among selected clinical symptoms (pain, stiffness, and physical function), walking speed, and exercise self-efficacy of the study subjects while alpha was set at 0.05.

### Ethical approval

The research related to human use has been complied with all the relevant national regulations and institutional policies, has followed the tenets of the Declaration of Helsinki, and has been approved by the

Table 1. Socio-demographic profile of participants ( $n = 100$ )

Variables	<i>n</i>	%
Age (years)		
55–65	25	25.0
66–75	61	61.0
76–85	13	13.0
86–95	1	1.0
Sex		
Male	22	22.0
Female	78	78.0
Religion		
Islam	30	30.0
Christianity	70	70.0
Marital status		
Married	62	62.0
Not married	38	38.0
Tribe		
Yoruba	91	91.0
Igbo	8	8.0
Other	1	1.0
Occupation		
Unemployed	65	65.0
Employed	35	35.0
Highest level of education		
None	2	2.0
Primary	40	40.0
Secondary	12	12.0
Tertiary	46	46.0
Personal income		
Low	10	10.0
Middle	48	48.0
Moderate	27	27.0
High	15	15.0

authors' institutional review board or an equivalent committee.

### Informed consent

Informed consent has been obtained from all individuals included in this study.

### Results

The study involved 100 individuals with knee OA (22 males; 78 females), with modal age group 66–75 years, mean age  $69.6 \pm 6.3$  years. Most of them (69%) had bilateral knee OA (Table 1).

#### Relationship among clinical symptoms, walking speed, and exercise self-efficacy

Mean and standard deviation of walking speed of all the participants was  $0.38 \pm 0.09$  m/s and the range was 0.49 m/s, from 0.12 to 0.61 m/s. The modal group with 66 participants (66.0%) had moderate walking speeds of within 0.28–0.44 m/s. This is presented in Table 2.

The result of Spearman correlation analysis to determine the relationship between selected clinical symptoms (pain intensity, stiffness, and physical function) and walking speed, as well as exercise self-efficacy is presented in Table 3. Significantly weak negative correlations were observed among the selected clinical symptoms and walking speed. Furthermore, pain intensity of knee OA individuals significantly and weakly correlated negatively with exercise self-efficacy, while stiffness and physical function were significantly but moderately negatively correlated with exercise self-efficacy.

### Discussion

This study investigated the relationships between some selected clinical symptoms (pain, stiffness, and physical function), walking speed, and exercise self-efficacy among individuals with knee OA. The mean total WOMAC score of the participants showed that most had mild to moderate knee OA. This is in agreement with the findings of Gleicher et al. [20], who revealed that older adults, aged 60 years and above, had mild to moderate knee OA rather than severe or disabling knee OA. In addition, about half of the participants reported low exercise self-efficacy and 66.0% had moderate walking speed. This is understandable because knee OA is a disabling condition and therefore may discourage active participation in exercise.

Table 2. Clinical characteristics of the participants (n = 100)

Variables	n	Mean ± SD	Median (IQR)
<b>Pain intensity</b>			
None	0		
Mild/moderate	77		
Severe/extreme	23	8.14 ± 3.2	8.00 (4.00)
<b>Stiffness</b>			
None	6		
Mild/moderate	66		
Severe/extreme	28	3.59 ± 1.62	4.00 (3.00)
<b>Physical function</b>			
Low	0		
Moderate	81		
High	19	23.2 ± 9.84	22.5 (15.5)
<b>Total WOMAC score</b>			
Mild knee OA	43		
Moderate knee OA	57		
Severe knee OA	0	34.93 ± 13.69	35 (22)
<b>Walking speed (m/s)</b>			
0.12–0.27	13		
0.28–0.44	66		
0.45–0.61	21	0.38 ± 0.09	0.39 (0.12)
<b>Exercise self-efficacy</b>			
Low	54		
Moderate	44		
High	2	17.90 ± 4.87	18.00 (6.0)

IQR – interquartile range, SD – standard deviation, OA – osteoarthritis

Table 3. Spearman correlation analysis showing relationships among clinical symptoms, walking speed, and exercise self-efficacy

Clinical symptoms	Walking speed		Exercise self-efficacy	
	ρ	p	ρ	p
Pain intensity	-0.368	0.001*	-0.330	0.001*
Stiffness	-0.234	0.019*	-0.497	0.0001*
Physical function	-0.370	0.0001*	-0.410	0.0001*

ρ – Spearman’s rho, p – probability

\* significant results

Previous studies by Harrison [15] and Maly et al. [16, 21] also reported that patients with knee OA had low self-efficacy and low walking speed. Most subjects in this study presented mild to moderate knee stiffness. Knee stiffness had a negative relationship with walking speed and exercise self-efficacy. This indicates that the greater the degree of stiffness experienced by individuals with knee OA, the slower their walking speeds and the lower their exercise self-efficacy. Dixon et al. [22] observed that knee stiffness in walking was significantly greater in the OA group than in the control group, reducing walking speeds.

Most of the participants had mild to moderate pain intensity, which negatively correlated with walking speed and with exercise self-efficacy. This may not be unconnected with the fact that self-efficacy has been established to be a treatment-responsive mediator of illness and shown to improve the clinical outcome in patients with several types of chronic disease, including arthritis and osteoporosis [23]. Knee OA and ageing are associated with functional limitation problems, and ageing is found to be more associated with knee OA than with other types of OA [24]. In this study, physical function was also negatively correlated with walking speed and exercise self-efficacy. This is in line with the findings of Kim et al. [25], who reported that physical disability associated with radiographic changes in knee OA had a strong influence on exercise self-efficacy in older adults. This reduction in physical function in individuals with knee OA also led to low physical performance and a decrease in their velocity of walking [26]. In essence, individuals with knee OA presenting with varied clinical symptoms had an indirect impact of these symptoms on their walking speed and exercise self-efficacy. It is therefore imperative that positive efforts need to be made to introduce effective techniques of management to individuals with knee OA to address their pain and physical function [27].

### Conclusions

In this study, individuals with knee OA had low exercise self-efficacy, low walking speed, and reduced physical function, probably because of the debilitating effects of the condition. The findings underscore the importance of effective management of clinical symptoms presented in patients with knee OA. This will in turn enhance their exercise self-efficacy and walking speed.

**Disclosure statement**

No author has any financial interest or received any financial benefit from this research.

**Conflict of interest**

The authors state no conflict of interest.

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