



Original Research Article

Comparison of speed of walking with and without visual distraction in subjects with Osteoarthritis of knee

Dharita Manubhai Khatri^{1*}, Neeta Jayprakash Vyas², Megha Sandeep Sheth³

¹P.G. Student, ²Principal, ³Lecturer

S.B.B. College of Physiotherapy, V.S. Hospital Campus, Ahmedabad, Gujarat, India

*Corresponding author email: 21dharitakhatri@gmail.com

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Abstract

Introduction: Knee osteoarthritis (OA) is a major public health problem. Knee OA leads to impaired balance and reduction in speed of walking, which is accentuated under dual-task conditions. Walking relies on continuous visual processing to obstacles as one navigates through a visually defined environment.

Objectives: The study aimed to compare the speed of walking with and without visual distraction in subjects with OA knee and with normal individuals.

Material and methods: Fifteen subjects with OA knee and 15 without OA knee of same age and gender were selected. Subjects were selected according to inclusion and exclusion criteria. Experiment was carried out over straight path of 50 m length and 2.5 m width. Subjects walked on two consecutive days at preferred speed 3 times back and forth covering total distance of 300 m. Charts were shown on either of the two days. Subjects passed 12 times through charts of various objects held by two assistants. Some objects were kept upright or inverted and subjects needed to reply by saying 'yes' or 'no'. Charts of various colors were also shown and they were asked to identify them. The speed was noted. They also walked same distance without distraction. Level of significance will be kept at 5%.

Results: Wilcoxon test was used for within group analysis for speed of walking with and without distraction. Significant difference was seen for both subjects with OA knee ($W=-2.897$, $p=0.004$) and normal subjects ($W=-3.266$, $p=0.001$). Mann Whitney U test was used for between groups analysis.



With distraction groups showed significant difference ($W=-2.219$, $p=0.026$). But there was no significant difference in analysis in between groups without distraction ($W=-1.701$, $p=0.089$).

Conclusion: Visual distraction leads to reduction in speed of walking in subjects with OA knee as compared to normal subjects.

Key words

Osteoarthritis of knee, Visual distraction, Speed of walking, Gait, Dual tasking.

Introduction

Knee osteoarthritis (OA) is a major public health problem. Subjects with knee osteoarthritis are usually frustrated by knee pain, joint stiffness, limited joint range of motion, muscle weakness and proprioceptive deficits [1, 2].

Walking relies on continuous visual processing to control heading and avoiding obstacles as one navigates through a visually defined environment [3, 4]. A subject's ability to increase or decrease walking speed above or below a comfortable pace suggests a potential to adapt to varying environments and tasks demands. It also varies with increasing age [5]. Processing of visual information for postural control and obstacle avoidance interferes with processing of visual information for concurrent task [6]. This is more pronounced in people with history of falls [7].

Knee OA leads to impaired balance and reduction in speed of walking, which is accentuated under dual-task conditions [8]. Persons with knee OA show altered gait and speed of walking [9]. This slower freely chosen walking speed may be because of visual problems or as a result of disease (OA) progression or both [5].

The objective of the present study was to compare the speed of walking with and without visual distraction in subjects with OA knee and with normal individuals of matched age and gender.

Materials and methods

A non experimental study was conducted at SBB College of Physiotherapy, Ahmedabad over sample size of 30 subjects for study duration of 2 months from 2014. Convenience sampling was used. Subjects with diagnosis of osteoarthritis according to American College Of Rheumatology Criteria and referred by orthopedic outpatient department including both males and females and subjects able to walk independently without a walking aid were included. Subjects having any other musculoskeletal or neurological disorder or non-ambulatory status or significant cognitive impairment were excluded.

Procedure

Subjects were divided into two groups: Group A included subjects with OA knee and Group B included age and gender matched subjects without OA knee. Informed consent was taken.

Study was carried out over straight path of 50 m length and 2.5 m width. Subjects walked at preferred speed 3 times back and forth covering total distance of 300m. Subjects walked on two consecutive days.

Charts (distraction) were shown on either of the two days. Subjects passed through 12 charts (distraction) of various objects held by two assistants. To exclude any difficulty in perceiving and recognizing the objects they were of large size and high contrast. Subjects who wore corrective eyeglasses on arrival continued to wear them during the study. Charts were shown



at a distance of around 1 m from the subject. Charts of various objects were presented upright or inverted. Subjects were instructed to respond to the object by saying 'YES' if inverted and 'NO' if not inverted. Charts of various colours were also shown and they were asked to identify the colors. The time of walking was noted. They also walked same distance without visual distraction. Speed was calculated for both tasks by averaging the 3 trials. Level of significance was kept at 5%.

Results

Demographic data of the subjects was as per **Table - 1**. Mean walking speed in both the groups was as per **Table - 2**.

Wilcoxon test was used for within group analysis. Mann Whitney U test was used for between group analyses.

Subjects with OA knee and normal individuals both showed significant difference in walking speed with and without distraction as per **Table - 3**.

Between groups analysis showed significant difference with visual distraction between both groups and no significant difference was found for without visual distraction between both groups as per **Table - 3** and **Table - 4**.

Discussion

This study found that there is significant difference in walking speed with visual distraction in both subjects with and without osteoarthritis. There was no significant difference in walking speed between both groups without visual distraction. However there was a significant difference in walking speed between both groups with visual distraction.

This shows that there is reduction in walking speed because of visual distraction in both subjects with OA knee and subjects without OA knee. This may be the effect of aging. Bock O, et al. concluded in 2011 that the visual distracter task degraded the gait of elderly subjects but completely spared young ones, that this effect is not due to degraded proprioception, and that it rather might reflect the known decline of executive functions in the elderly [10].

There was also a significant difference in walking speed between both groups with visual distraction. Subjects with OA knee showed significant decrease in walking speed with distraction as compared to normal individual of same age and gender. This shows that there is (more) reduction in speed with degenerative conditions like OA. Joseph A Zeni Jr, et al. in 2009 concluded that compared to a healthy control group, persons with knee OA demonstrate differences in joint kinetics and kinematics and reduction in speed of walking [5]. Al-Zahrani, et al. concluded that the observed gait abnormalities were due to instability of the knee joint in stance and may have important clinical implications for the rehabilitation of patients with severe OA of the knee [11].

There was no significant difference in walking speed between both groups without visual distraction. This shows that as compared subjects without OA knee walking speed without visual distraction was not significantly reduced in subjects with OA knee. Scott C, et al. concluded in 2007 that fast walks did not increase or bring out any biomechanical differences between the OA and control groups that did not exist at self-selected walks [12].

Reduction in walking speed in OA knee subjects may be because of impaired balance and proprioception [8], a reduced potential to adapt



to varying environments and tasks demands, processing of visual information for postural control and obstacle avoidance interfering with processing of visual information for concurrent task [6] or there may be slower freely chosen walking speed rather than a result of disease (OA) progression [5].

Limitation of the study was a small sample size and the speed of walking was not correlated with severity of osteoarthritis.

Clinically dual tasking can be emphasized in subjects with OA knee during gait training with appropriate distractions.

Conclusion

Visual distraction leads to reduction in speed of walking in both subjects with OA knee as well as normal subjects. But in subjects with OA knee there is more reduction in speed of walking as compared to normal individuals.

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Table - 1: Demographic data.

Group	Mean age (years) \pm SD	No. of males/females
Group A	53.8 \pm 9.973	5/10
Group B	52.53 \pm 9.613	5/10

Table - 2: Mean walking speed in both groups with and without distraction.

Group	Mean \pm SD walking speed (m/s)
Group A with distraction	1.08 \pm 0.253
Group A without distraction	1.19 \pm 0.256
Group B with distraction	1.28 \pm 0.283
Group B without distraction	1.33 \pm 0.299

Table - 3: Mean difference within groups with and without distraction.

Group	Mean difference \pm SD	W value	p value
Group A	0.117 \pm 0.062	-3.408	0.001
Group B	0.051 \pm 0.036	-3.266	0.001

Table - 4: Mean difference between groups with and without distraction.

Group	Mean difference \pm SD	U value	p value
With distraction	0.208 \pm 0.371	-2.219	0.026
Without distraction	0.142 \pm 0.386	-1.681	0.093

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