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# Older Adults Vs Middle-Aged Adults: Walking Velocity

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**ABSTRACT-** The objective of the present study was to evaluate walking velocity of middle-age adults and older adults. Ten adults (5 middle age adults and 5 older adults) were recruited from a local community. They were all physically healthy and not injured in the last 6 months. Their whole body landmark position data were collected during subsequent 5-minute walking on a straight track (15m long). The results indicated that walking velocity of middle-age adults were faster than that of older adults during their natural gait. The study concluded that middle-age adults' likelihood of falls may be higher than older adults' likelihood of falls.

**KEYWORDS -** WV, Middle age, Older, Foot force

## I. INTRODUCTION

Poor gait characteristics and balance control could lead older adults to falls, and falls were major health hazards that reduced the quality of their life [1].

Falls of older adults caused large economic and personal losses leading to lack of physical activities and house works [1]. Therefore, it was needed to provide interventions for the elderly and health professionals in order to increase social activity and functional exercises [2]. To reduce the losses and the risk, many research such as tribometric, biomechanics, sport science, motor control have looked for answers. Still, falls were a major cause of hospitalization [3].

In order for older adults to carry out daily activities such as reaching, standing, and walking, proper integration of sensory input and output, and muscle force development [4]. Postural balance while performing daily activities must be maintained appropriately to carry out daily activities properly [4]. Failure to maintain proper postural stability and to sense postural instability would increase the propensity of falls [5].

Among main factors that could affect falls, walking velocity was suggested to alter friction demand characteristics between shoe and floor surface [6]. With a fairly constant vertical foot force, horizontal foot force mainly would define friction demand chanracteristics of shoe and floor surface [7]. With a given body mass and the constant contact time during the heel contact phase of a gait cycle, horizontal foot force while walking would be directly proportional to horizontal foot force (impulse-momentum relationship [8]. Heel slips or foot slips happened if the horizontal foot force was larger than the available friction of the floor at the heel contact phase of a gait cycle [9].

As ageing, muscular strength gradually decreased [10]. A report indicated that middle-age adults were susceptible to injuries [11]. Middle-age adults were reported to be at a higher risk of musculoskeletal injuries compared to older adults [12].

There have been a little study looking in risk factors of middle-age adults although they were at high risk in adult disease and muscular skeletal diseases such as obesity, high blood pressure, diabetes, MSDs etc.

The present study was to compare walking velocity of older adults to that of middle-age adults.

## II. METHOD

### A. Participants

The subjects of the present study (n=10) were recruited from local community. Five were classified in older adults and another five were classified in middle-age adults. They did not have any injuries in the lower extremity in the past 6 months. They did not show any history of musculoskeletal injuries for the past 6 months before the experiment. Older adults were all over 65 years of age and middle-age adults ranged from 40 to 51 years of age (Table 1).

Table 1: Age, Height, Weight of Two Groups

| Group | Age(years) | Height(cm) | Weight(kg) |
|---|---|---|---|
| Middle-age | 46.5 | 179.2 | 78.7 |
| Older | 71.3 | 176.6 | 73.4 |

### B. Procedure

Twenty-eight markers were placed on the skin at anatomically significant landmarks to calculate the whole body center of mass (COM). They were asked to start walking at designated locations by standing with feet together at either side of the walking track (15m long). In

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order to define a gait cycle, two force platforms were used to identify the first and the second heel contacts of the right foot. A gait cycle was defined from the first heel contact to the second heel contact of the right foot. Walking velocities during a gait cycle were averaged for data analysis.

The position data of the markers were detected by eight-camera Prime 17W system (NaturalPoint, Inc, DBA Optitrack). Kinematic data (markers' locations) were sampled and recorded at 120Hz and kinetic data such as ground reaction forces were sampled at 1200Hz.

They were instructed to walking for 5 minutes at their natural speed. When their right foot consistently hit on the first force plate, kinematic samples were collected for 2 seconds.

### *C. Walking velocity*

The first heel contact of right foot was defined when the vertical ground reaction force from the first force platform (AMTI, #4767, Type OR-6-7-1000, AMTI, INC. USA) was larger than 7 newton. The instant walking velocity (WV) was computed using the formula:

COM velocity = $[X(i+1) - X(i-1)]/ 2\Delta t$, where X = COM,

X: COM position in horizontal direction
i: frame number

Then, all COG velocities from heel contact to heel contact were averaged.

## III. Results

One-way ANOVA results suggested that there was a significant difference (p=0.01, F=10.56, Table 2) in WV between older adults and middle-age adults. The results indicated that WV in middle age adults was higher than that in older adults (Figure 1).

Table 2. Data and ANOVA Summary in WV of Two Groups

| Data Summary (cm/sec) | | | |
|---|---|---|---|
| **Groups** | **N** | **Mean** | **SD** |
| Middle-Age Adults | 5 | 140.11 | 3.57 |
| Older Adults | 5 | 114.28 | 17.41 |

| ANOVA Summary | | | | | |
|---|---|---|---|---|---|
| **Source** | **Degrees of Freedom** | **Sum of Squares** | **Mean Square** | **F-Stat** | **P-Value** |
| | **DF** | **SS** | **MS** | | |
| **Between Groups** | 1 | 1667.97 | 1667.97 | 10.56 | 0.01 |
| **Within Groups** | 8 | 1263.41 | 157.93 | | |
| **Total:** | 9 | 2931.38 | | | |

Figure 1: One-Way ANOVA (Mean and SD)

## IV. Discussion

The study objective was to evaluate WV of middle age adults and older adults while walking on the leveled floor and to compare between the two groups.

A previous study reported that lower extremity strength of middle age adults was similar to that of older adults [10]. The results from the previous study [10] gave a great insight into running the present study. The results from the study [10] suggested that middle age adults' WV should be equivalent to older adults' WV since WV should be closely related to lower extremity strengths [5,12]. In addition, faster WV could be a factor in increasing the likelihood of falls [6]. In the present study, the results suggested that WV of middle-age adults was higher compared to that of older adults. This results could suggest that middle-age adults may be at a higher risk of falls than older adults.

## V. Conclusion

The study concluded that middle age adults' WV was faster than older adults' WV.

## VI. Research Question

1. What will be other factors influencing WV velocity besides age factor?
2. Why middle-age adults' WV is higher than older adults?

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