

Correlation of physical activity with step-length and step-width in healthy young adults

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ABSTRACT

Background: Gait is one of the most complex neuromuscular phenomena which require perfect coordination between the brain, spine, and muscles. Due to the adverse effects of physical inactivity, physical activity it is now considered as the biggest health issue of 21st century. Physical activity effects the gait parameters to variable extent, thus affecting the quality of life. International analyses showed a clear reduction in youth physical activity.

Objectives: The purpose of our study was to identify the gait impairments present in the younger adults and modify their activity levels to avoid impairments and disability in later years of age. The objective was to determine the correlation between physical activity and step-length in healthy adults.

Methods: Gait parameters were assessed in 40 individuals including both males and females. Subjects with any musculoskeletal conditions, neurological impairments and individuals those were unable to follow verbal commands were excluded. Outcomes measure included International Physical Activity Questionnaire (IPAQ) to access physical activity level and observational method to access gait parameters step-length and step-width. The data was analyzed using SPSS 21 software.

Results: Physical activity measured through the IPAQ and step-length through observational method showed no significant correlation of physical activity with step-length ($p > 0.05$, $r = 0.226$) and step width ($p 0.37$, $r = -0.145$).

Conclusion: Change in physical activity levels does not have any impact on step length and step width.

Keywords: Gait, Physical Activity, Young Adult.

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Introduction:

Human gait is a manner of walking or moving on foot. It is considered as one of those neuromuscular actions which are complex in origin requiring spine, brain and muscles to work in perfect coordination. It is also known as a procedure which is cyclic in nature and it requires feedback from sensory and visual system in order to perform all the movements effectively.(1) Fall and injuries can be result of gait disorders and thus cause an increase in reduction in life quality. In early stages of a disorder in gait there can be an acute lesion in the nervous system or problems of proprioception but it can also be a result of harmful or side effects of medications

and some systemic problems or disease.(2) The prevalence of Gait disorders increases from 10% in 60-69 years old community dwelling subjects to 60 % in 80 years old community dwelling subjects. Most of the gait disturbances or problems start in primarily in the age group between 60 years and 9 years, with almost one third of the said population a gait abnormality.(3)

Physical inactivity is indicative of one's level of immobility, chronic latent diseases and aging.(4) Physical inactivity is predictable as one of the risky health problems due to excess of adolescent physical inactivity and viewed a dramatic universal drift.(5) Physical inactivity tends to raise the risk of any health diseases including diabetes, heart diseases and cancers of many types including breast and colon cancers.(6) Due to the adverse effects of physical inactivity, physical activity it is now considered as the biggest health issue of 21st century.(7) International analyses showed a clear reduction in youth physical activity. Regular physical activity is one of the key determinants of health in the younger population.(4) Different analyzes were undertaken, revealing the contrary

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interaction between physical training and good health. Physical inactivity only expands the risk factors of many health challenges, including gait troubles. The significance of physical activity and its implications on gait parameters are significantly impacted.(4) Physical activity and exercise can help to decrease the negative impact of age, on the body and the mind, indeed physical activity is a promising non-pharmaceutical intervention to prevent age-related cognitive decline and neurodegenerative diseases.(8) Another study compared eighteen young adults and twelve elder subjects walking on an instrumented treadmill was calculated where the speeds were self-select, the step width variation was found to be a more clinically significant variable for the assessment of locomotive control in younger subjects as compared to the step length variability.(9) A study conducted by Jennifer F Brach et al 2005, conducted the study in older population find out the association between gait parameters and the risk of fall. He conducted that gait parameters i.e. step-length and the step-width which are affected by physical activity. He stated that greater step-width is associated with the increased risk of fall in older adults. He further concluded that with age, step-width tends to increase, that further affects the gait hence increase the risk of fall in older adults.(10) A study conducted by Jennifer F. Brach et al. 2007, conducted in adults found out the relationship between the gait parameters, step-length and step-width. He concluded that with age these parameters are altered and hence gait speed is affected. Gait speed then tends to affect the mobility in the older adults and is associated with the decrease mobility in the older individuals and risk of fall in them hence, complemented our study.(11) Gait variability that is mostly affected with increasing age. He conducted that with decreasing age there is a decrease in gait variability and gait variability increases as the age progresses. Gait variability is a prominent indicator of fall and hence with increasing age the risk of fall also increases.(12)

Age related change in the spatial-temporal parameters is prominent in the older population and is not prominent in younger adults. It's still affecting the young age but the change is not significant during this age.(13) The study aimed to determine the correlation between physical activity step-width and step-length in healthy adults.

Methods:

A cross-sectional correlational study was conducted from February 2019 to July 2019 using non-probability sampling technique with a sample size of 40

young adults of both genders, age group 18-35 years. Ethical approval was taken from Foundation University Islamabad (FF/FUMC/215Phy/19). However, the adults having any musculoskeletal or neurological impairments or disability were excluded from the study. A written consent was taken from all participants. For step length, foot prints were obtained on 10 m walkway covered with brown glaze sheet. At the end, the subjects were requested to fill the IPAQ (long version) to determine physical activity level in terms of MET minutes per week. Data was analyzed using SPSS V 21.0. Qualitative data was presented in frequency and quantitative data was presented as means and standard deviations. To determine relationship between physical activity and step length and step width correlation analysis was conducted.

Results:

The total sample collected in this study was n=40 adults of 18-35 years of age. Gender wise distribution is shown in figure 1. All the subjects were from Rawalpindi, Islamabad and its premises. The mean age of participants was 25.15 years.

Table no. 1 shows the P value for spearman's test applied between physical activity and step length which was 0.161 which indicated non statistical significance of the result and the correlation coefficient value of 0.226 i.e. positive correlation between two parameters. The correlation even though was weak and not significant but positive relation shows with increase in physical activity step length will also increase. For spearmen's test between physical activity and step width the P value 0.37 indicated non-statistical significance of the result and the correlation coefficient value of -0.145 indicated positive correlation between two parameters. The correlation was weak and not significant but negative relation showed that with increase in physical activity step width will also decrease.

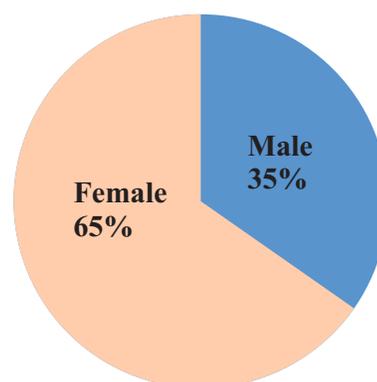


Figure 1: Pie chart showing gender distribution

Table 1 : Table showing correlation between physical activity levels and step length and step Width

Spearman's Test	Correlation coefficient	P value
Physical Activity X Step Length	0.226	0.161
Physical Activity X Step Width average	-0.145	0.37

Discussion:

Gait variability and physical activity has very strong relationship with each other, and has very marked effect on human gait performance. This study observed the correlation of physical activity with step width and step length in healthy adults of age (18-35 years). According to literature review many studies were conducted but they had included older population. Currently, studies are being conducted worldwide to explore the correlation with both cross-sectional and longitudinal designs, but in our study cross-sectional design was used. The result of our study revealed no significant correlation among level of physical activity and gait parameter.

A study was conducted by Daniela ET al. including population of healthy adult women that shows negative relationship between physical activity and step length.(1) In the same year another similar study conducted by fillip et al., study was composed of healthy and physically active adults and the study showed that there was a connection between preferred walking speed and quality of life.(2) Our study observed independent relationship between physical activity and step length. Our results are somehow similar with the previous study revealing that there is no change in step length by doing physical activity.

In contrast to our study another study conducted by zijklstra A. et al. evaluated step length frequency in physically healthy adult woman and they found negative relation with step length frequency and progressive age.(3) This research supported the result of our research.

A study was conducted by tasulu kimora in the year 2007. He performed a comparative study between young physical active boys and girls and non-physical active girls and boys. At the end of the study, it was concluded that step- width decreases with the age. This

research supported the result of our research.(14)

Limitations of the study were related to less sample size and time duration. More objective tools should be included in future researched to measure physical activity level and gait parameters. Future research should focus on the effect size and clinical applications of physical activity levels on gait parameters.

Conclusion:

It was concluded that in young adults physical activity has no significant relation with step-length and step- width.

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Authors' contribution:

Ahmed Z: Literature review, data collection and data analysis and write up.

Rasool F: Literature review, data collection and data analysis and write up.

Mir NN: Literature review, data collection and data analysis and write up.

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