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Two-Dimensional Analysis for Comparison of Biomechanical and Gait Parameters between Male and Female Young Adults with Obesity

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ABSTRACT

Objective: To compare the gait and biomechanical parameters among obese adult males and femalesusing two-dimensional analysis.

Materials and Methods: This observational study included 42 obese young adults (21 males, 21 females) from Department of Sports Physiotherapy, MGM School of Physiotherapy, Aurangabad, Maharashtra, India, with age between 18 to 25. Participants were chosen based on the inclusion and exclusion criteria, and test method was explained to them. Informed consent was taken. Each subject was asked to walk on treadmill at a speed of 0.50 to 1.75 m/s. The videos and pictures of lower extremity were taken from three views i.e. anterior, posterior and lateral. The videos and pictures were then uploaded on the Two-Dimensional (2D) motion analysis software "Kinovea". All the parameters were analysed further.

Results: The normality test using the Shapiro-Wilk test revealed that the data for most variables were not normally distributed, as indicated by p-values less than 0.05 for several variables, suggesting the use of non-parametric tests for further analysis. In gender distribution, both males and females were equally represented (50% each), with 21 participants per group. Q-angle ($p = 0.001$) and Heel strike ($p = 0.044$) showed significant differences between both the populations, with males showing lower values compared to females. No significant differences were found for Tibial torsion and Leg heel alignment. Sagittal plane gait parameters showed significant differences in the maximum hip flexion ($p = 0.002$), maximum knee flexion ($p = 0.008$), and maximum knee extension ($p = 0.009$), with males demonstrating lower values for hip flexion and higher values for knee extension compared to females. However, no significant differences were observed in the maximum hip extension, maximum ankle dorsiflexion, and maximum ankle plantarflexion. Spatio-temporal gait parameters revealed significant differences in swing time ($p = 0.049$), toe-out angle ($p = 0.001$), and pelvic inclination ($p = 0.004$), with males showing shorter swing times, lower toe-out angles, and lower pelvic inclination compared to females. No significant differences were found in stance time, step length, or cadence.

Conclusion: Differences in Body Mass Index (BMI), Q-angle, joint movements, and pelvic inclination indicate distinct anatomical and biomechanical profiles between males and females. These variations have clinical implications, emphasising the importance of gender-specific treatment and rehabilitation strategies. The study highlights how understanding these differences can improve management of musculoskeletal conditions and optimise movement patterns based on gender.

Keywords: Body mass index, Gender, 2-D motion analysis

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