

Biomechanical Analysis of Lower Extremity during Common Rehabilitation Exercises

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Purpose: Obesity rates have increased significantly in the United States over the years, with approximately 35% of adults now considered obese. No known analysis of balance during common functional strengthening activities has been performed. The purpose of this study was to analyze the balance of obese females while performing squat and lunge activities, as measured by center of pressure area and center of pressure mean velocity.

Methods: Ten obese females (mean age, 37.4 years; BMI 39.2 ± 3.7 kg/m²) and ten normal weight, age matched female controls (mean age, 38.1 years, BMI 21.5 ± 1.6 kg/m²) were analyzed for center of pressure area and center of pressure mean velocity during the squat and lunge activities at three difficulty levels (squat: 60°, 70°, and 80° knee angle; lunge: step of 1.0, 1.1, and 1.2 times tibial length). A three-dimensional motion analysis system with force plates was utilized to gather range of motion and sway data. Repeated measures ANOVA's were performed to analyze between- and within- group differences.

Results: During the lunge activity, there were significant differences between the obese and normal weight groups for both center of pressure area ($p < 0.001$) and center of pressure mean velocity ($p = 0.005$); large effect sizes were also observed. No within-group differences were seen at different difficulty levels for this activity. For squatting, no between-group or within-group differences were observed at any difficulty level ($p > 0.05$).

Conclusion: During lunging activities, obese females demonstrated poorer balance control than their normal weight counterparts. This difference was not seen during the squatting activity, though a trend was revealed with a medium effect size. Because of this finding, clinicians may want to consider balance control as a variable when prescribing lunge activities to obese individuals.