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Factors Affecting Postural Control under Dual-task Conditions among Physiotherapy Students With and Without Low Back Pain: Cross-sectional Comparative Study

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ABSTRACT

Introduction: Low Back Pain (LBP) has become a major musculoskeletal issue not only in the elderly but also among young adults, especially in physiotherapy students who are subjected to physical and academic stressors in the course of their studies. Dual-task paradigms provide insight into functional performance under real-life conditions by simultaneously assessing cognitive and motor demands, which are otherwise not captured in standard single-task assessments.

Aim: To compare postural control under dual-task conditions in physiotherapy students with and without LBP, and to identify the physical, cognitive, and psychological factors associated with dual-task performance impairment.

Materials and Methods: A cross-sectional comparative study was conducted on 92 physiotherapy students (46 with LBP, 46 without LBP). Outcome measures included the Visual Analogue Scale (VAS) for pain intensity, Stroop Test for cognitive performance, Depression Anxiety Stress Scale (DASS-21) for psychological assessment, and Mini-BESTest for dynamic balance. Postural control was also assessed using Timed Up and Go (TUG) under both single-task and dual-task conditions. Data normality was assessed using the Shapiro-Wilk test. Since all variables were non-normally distributed ($p<0.05$), non-parametric Mann-Whitney U tests were used for group comparisons, and univariate logistic regression was applied to examine individual predictors of dual-task performance impairment.

Results: Significant differences were observed between groups in VAS score ($U=312.0$, $p<0.001$), Stroop time ($U=375.0$, $p<0.001$), DASS Depression ($U=358.5$, $p<0.001$), DASS Anxiety ($U=349.0$, $p<0.001$), DASS ($U=325.5$, $p<0.001$), Mini-BESTest ($U=410.0$, $p<0.001$), TUG Single ($U=402.0$, $p<0.001$), and TUG Dual Task ($U=298.0$, $p<0.001$). Age and Body Mass Index (BMI) showed no significant group differences ($p>0.05$), confirming baseline comparability. TUG Dual Task was the most significantly impaired variable in the LBP group. Univariate logistic regression identified Stroop time (OR=1.09, $p<0.001$), Mini-BESTest score (OR=0.81, $p<0.001$), VAS score (OR=1.20, $p=0.001$), and DASS Stress (OR=1.07, $p=0.002$) as significant individual predictors of dual-task impairment.

Conclusion: LBP significantly impairs dual-task postural control in physiotherapy students. Cognitive load, psychological stress, pain intensity, and balance ability are key determinants of functional performance. LBP should be viewed as a multidimensional disorder encompassing neuromuscular, cognitive, and psychological systems. A multidimensional rehabilitation approach incorporating dual-task training, cognitive strategies, and psychological support is recommended to improve functional outcomes and prevent long-term disability among physiotherapy students.

Keywords: Cognitive-motor performance, Dual-task performance, Low back pain, Postural balance, Psychological stress.

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