

Association of Ocular Mobility and Gravitational Insecurity in Children with Down Syndrome: A Cross-sectional Study

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ABSTRACT

Introduction: Down syndrome is commonly associated with hypotonia, delayed motor development, impaired balance, vestibular dysfunction, and deficits in sensory integration. Impairment in ocular motor control may contribute to gravitational insecurity, characterised by excessive fear, anxiety, or avoidance during movement and positional changes. However, limited studies have investigated the relationship between ocular mobility and gravitational insecurity in children with Down syndrome.

Aim: To determine the relationship between ocular mobility and gravitational insecurity in children with Down syndrome.

Materials and Methods: This cross-sectional observational study was conducted among 70 children diagnosed with Down syndrome aged 8-12 years, recruited from special schools and rehabilitation centres using purposive sampling. Ocular mobility was assessed clinically through evaluation of fixation, smooth pursuit, saccadic eye movements, and gaze stability. Gravitational insecurity was evaluated using standardised sensory processing and observational assessment tools. Statistical analysis was performed using descriptive statistics

and Pearson's correlation coefficient. A p-value <0.05 was considered statistically significant.

Results: Among the 70 participants, 42 (60%) children demonstrated moderate-to-severe ocular mobility impairment, while 46 (65.7%) showed features of gravitational insecurity. The mean ocular mobility score was 18.42 ± 4.16 , whereas the mean gravitational insecurity score was 27.35 ± 5.28 . A significant positive correlation was observed between ocular mobility impairment and gravitational insecurity ($r=0.68$, $p<0.001$). Children with impaired smooth pursuit and gaze stabilisation exhibited significantly higher gravitational insecurity scores compared to children with relatively preserved ocular motor control (31.12 ± 4.21 vs 22.48 ± 3.96 , $p<0.001$). Increased movement-related anxiety and vestibular sensitivity were also commonly observed in children with greater ocular motor dysfunction.

Conclusion: The present study demonstrated a significant association between ocular mobility impairment and gravitational insecurity in children with Down syndrome. Children with poorer ocular motor control exhibited greater movement-related fear and vestibular sensitivity.

Keywords: Down syndrome, Gravitational insecurity, Ocular mobility, Paediatric physiotherapy, Sensory integration, Vestibular dysfunction.

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