

Impact of custom-contoured wheelchair seating on scoliosis progression for children with neurologic and neuromuscular disorders

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Summary: This study explores the clinical effectiveness of custom-contoured seating (CCS) for wheelchair users with neurologic and neuromuscular disorders (NMDs).

Category - Audit/Research

Aims and Objectives

The first aim of this project was to gain further understanding of the clinical effectiveness of CCS for persons with neurologic and NMDs from existing published literature.

The second aim of this project was to explore the relationship between CCS and scoliosis progression for children with neurologic and NMDs.

The objective of the study was to synthesise information from the existing literature, inform current practice, and identify knowledge gaps for further experimental investigation.

Background, Technique, Standards, Clinical Detail, Results and Testing

To date, CCS has received little attention in the research literature. Despite its widespread use, the clinical effectiveness of CCS for individuals with neuromuscular disorders remains unclear. This study set out to gain a better understanding of its clinical effectiveness and to investigate its comparative impact versus alternative seating on progression of scoliosis deformity.

Firstly, a scoping review was conducted exploring the efficacy of CCS for:

- (1) posture and musculoskeletal deformity,
- (2) quantitative measures of body structure and functions including cardiopulmonary and upper limb function, motor control and tissue integrity, and
- (3) qualitative perceptions, opinions and quality of life indicators including comfort and satisfaction.

A total of 17 studies met the inclusion criteria. This review highlighted the lack of literature exploring the impact of CCS on cardiopulmonary function, pressure injury management, and upper limb function; although, there was no indication that risk is increased compared to alternative seating and it performed well in terms of perceived user satisfaction, comfort, and function. The findings also demonstrated immediate benefits to postural alignment, although, the longitudinal effect on progression of musculoskeletal deformity compared to alternative seating was more ambiguous.

Secondly, a longitudinal, retrospective cohort study was conducted for a convenience sample of 75 paediatric wheelchair users with neurologic and neuromuscular disorders (NMDs) prescribed CCS or modular wheelchair seating (MWS) by the South Wales Posture and Mobility Service. Of the 75 participants enrolled, 51% had cerebral palsy. Fifty were issued CCS and 25 were issued MWS. In the study, a generalised least squares (GLS) model was used to estimate the comparative impact of each seating system on Cobb angle over time and to determine predictors for scoliosis progression. The GLS model demonstrated

that seat type ($\chi^2 = 52.5$, $P < .0001$), time since intervention ($\chi^2 = 122$, $P < .0001$), and baseline scoliosis ($\chi^2 = 41.6$, $P < .0001$) were predictive of scoliosis progression. Condition was not a strong predictor ($\chi^2 = 9.96$, $P = .0069$), and sex ($\chi^2 = 5.67$, $P = .13$) and age at intervention ($\chi^2 = 4.47$, $P = .35$) were not predictive. The findings showed paediatric wheelchair users with neurologic and neuromuscular disorders prescribed CCS showed greater mitigation of scoliosis progression over time compared to those issued MWS, although, scoliosis deteriorated regardless of intervention.

Discussion

This study has provided the first comprehensive assessment of the clinical effectiveness of CCS and has provided a deeper insight into its comparative impact on scoliosis progression for children with neurologic and NMDs. It is anticipated that this information can be used to develop seating guidelines and assist clinicians in prescribing targeted seating interventions. Overall, this study strengthens the idea that CCS is beneficial in mitigating scoliosis progression and improving postural alignment, and it is clinically effective at improving comfort and user satisfaction.

References

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