

Three-dimensional ultrasound to evaluate muscle morphology and properties in children with cerebral palsy

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INTRODUCTION

- Cerebral palsy (CP) is the most common cause of childhood physical disability, associated with impaired muscle growth and abnormal architecture.
- Reliable, non-invasive assessment of muscle morphology is critical for monitoring disease progression and informing treatment.
- Three-dimensional ultrasound (3DUS) has emerged as a promising alternative to MRI, but reporting practices vary across studies.

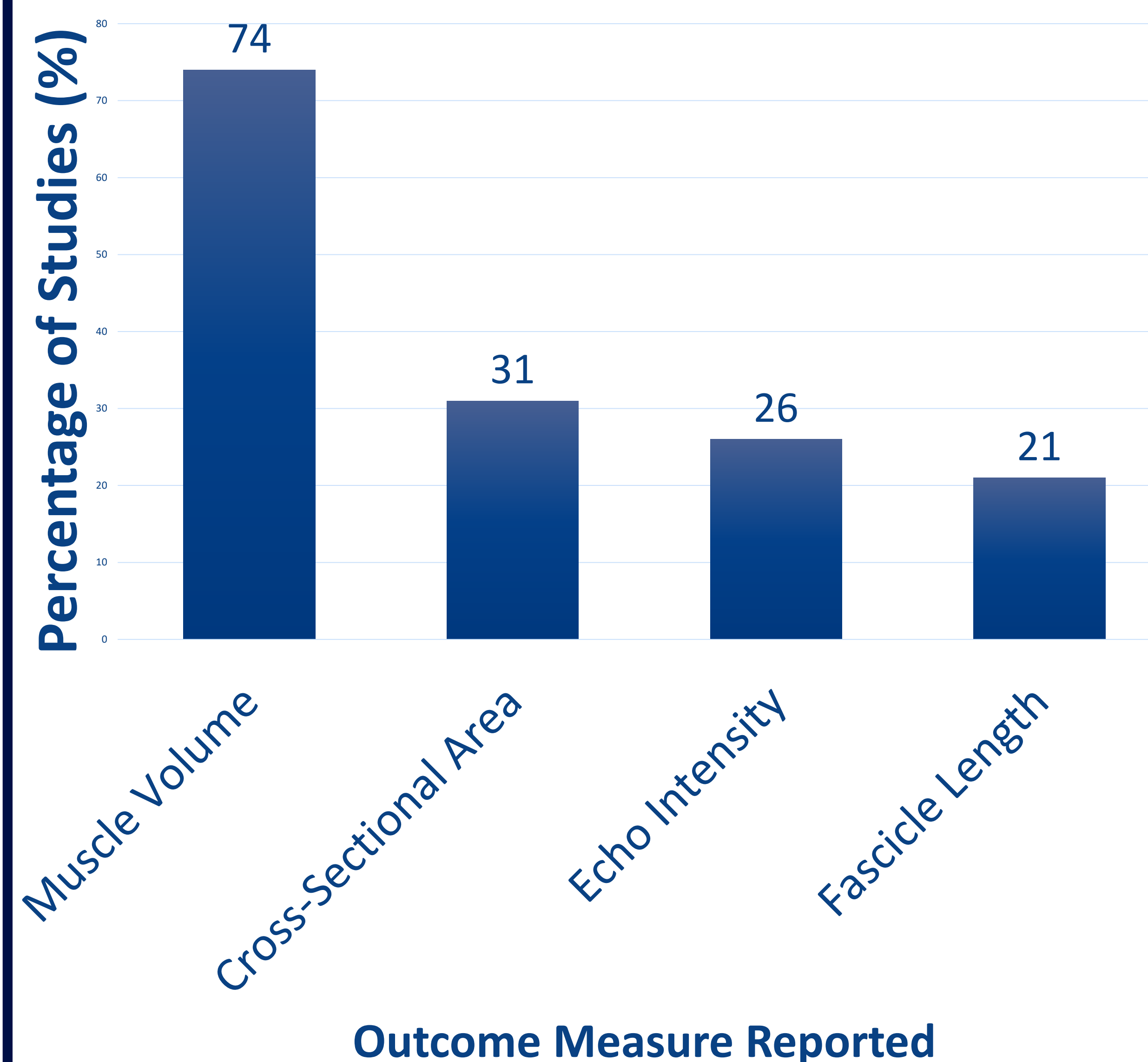
OBJECTIVE

- To systematically review studies applying 3DUS to evaluate skeletal muscle morphology in children with CP, with a focus on reported outcome parameters and measurement approaches

METHODS

- Medline, PubMed and Embase were searched, following PRISMA guidelines.
- Children and young adults (≤ 30 years) with CP.
- Registered PROSPERO protocol. Eligible English-language cohort studies and case series were included.
- Quality assessed using MINORS.

Frequency of Outcome Measures Reported in Included Studies



RESULTS

- A total of 39 studies were included in the review (n = 1,148 participants).
- The medial gastrocnemius was the most frequently studied.
- Mean muscle volume across the studies ranged from 6.8 to 134ml, while mean normalized volume ranged from 1.1 ml/kg to 2.3 ml/kg.
- Normalization methods varied, most commonly adjusting for body mass. .

CONCLUSION

- 3DUS is increasingly used to quantify skeletal muscle morphology in CP.
- Substantial heterogeneity in measurement techniques and normalization approaches limits comparability across studies.
- Standardization of 3DUS protocols and outcome reporting is essential to strengthen reproducibility, enable meta-analysis, and enhance clinical translation in the management of children with CP.