Developing new equations to predict body composition from bio-impedance and skinfold thickness in children with severe cerebral palsy and intellectual disability

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Methods
We included 61 children with severe CP and ID (Figure 1). In all children skinfold measurements and BIA were performed. Percentage of body fat using skinfolds and TBW using BIA, calculated by currently available equations, were compared with similar outcomes, determined by the reference standard: the doubly labeled water (DLW) method. The relationship between outcomes was evaluated using intraclass correlation coefficients (ICC) and agreement was evaluated using Bland and Altman’s agreement analysis (mean ± 2 SD). Group-specific regression equations for interpretation of skinfold thickness and BIA outcome were developed using multivariate analyses based on the outcome of the DLW method.

Results
In 54 children two skinfolds recordings could be obtained, and in 49 children all four skinfolds. Percentage of body fat was underestimated when using the equations by Slaughter, Gurka and Durnin (Figure 2). The new equation, based on the sum of four skinfold measurements, did not improve explained variance compared with the established equations (ICC=0.62, SEE=7.5%, Figure 3). TBW was overestimated by the Pencharz equation (Figure 2). The newly developed equation included tibia length as an alternative for standing height. This new equation improved explained variance (ICC=0.96, SEE=1.7 kg, Figure 4).

Conclusion
BIA is a more accurate method of measuring body composition than measuring skinfolds in children with severe CP and ID.

Future research should focus on establishing normative values for body composition in these children.

Summary
Current prediction equations for skinfold measurements underestimate %BF; a new equation based upon our sample did not improve predictability to an acceptable level.

The current prediction equation for BIA overestimated TBW; our new equation improved predictability and contains tibia length instead of standing height for easier application in practice (Figure 5).