



## Comparison of body composition assessment tools in infancy

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The prevalence of childhood obesity is increasing globally<sup>(1)</sup>. While BMI is commonly used to define obesity, it is unable to differentiate between fat and muscle mass, leading to calls to measure body composition specifically<sup>(2)</sup>. While several tools are available to assess body composition in infancy, it is unclear if they are directly comparable. Among a subset of healthy infants born to mothers participating in a randomised controlled trial of a preconception and antenatal nutritional supplement<sup>(3)</sup>, measurements were made at ages 6 weeks (n = 58) and 6 months (n = 70) using air displacement plethysmography (ADP), whole-body dual-energy X-ray absorptiometry (DXA), and bioelectrical impedance spectroscopy (BIS). Estimates of percentage fat mass (%FM) were compared using Cohen's kappa statistic ( $\kappa$ ) and Bland-Altman analysis<sup>(4,5)</sup>. There was none to weak agreement when comparing tertiles of %FM ( $\kappa = 0.15-0.59$ ). When comparing absolute values, the bias (i.e., mean difference) was smallest when comparing BIS to ADP at 6 weeks (+1.7%). A similar bias was observed at 6 months when comparing DXA to ADP (+1.8%). However, when comparing BIA to DXA at both ages, biases were much larger (+7.6% and +4.7% at 6 weeks and 6 months, respectively). Furthermore, there was wide interindividual variance (limits of agreement [LOA] i.e.,  $\pm 1.96$  SD) for each comparison. At 6 weeks, LOA ranged from  $\pm 4.8$  to  $\pm 6.5\%$  for BIA vs. DXA and BIA vs. ADP, respectively. At 6 months, LOA were even wider, ranging from  $\pm 7.3$  to  $\pm 8.1\%$  (DXA vs. ADP and BIA vs. DXA, respectively). Proportional biases were apparent when comparing BIS to the other tools at both ages, with BIS generally overestimating %FM more among infants with low adiposity. In addition to differences according to tool type, within-tool factors impacted body composition estimation. For ADP measurements, the choice of FFM density reference (Fomon vs. Butte) had minimal impact; however, choice of DXA software version (GE Lunar enCORE basic vs. enhanced) and BIS analysis approach (empirical equation vs. mixture theory prediction) led to very different estimates of body composition. In conclusion, when comparing body composition assessment tools in infancy, there was limited agreement between three commonly used tools. Therefore, researchers and clinicians must be cautious when conducting longitudinal analyses or when comparing findings across studies, as estimates are not comparable across tools.

**Keywords:** air displacement plethysmography, bioelectrical impedance, body composition, dual-energy X-ray absorptiometry

### Ethics Declaration

Yes

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