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Inter- and Intra-rater Reliability of B-mode Ultrasound to Assess Body Fat Percentage

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Body fat percentage (%BF) assessment is used to evaluate overall health, nutritional status, and body composition changes over time. The most accurate assessment tools (i.e. DEXA and MRI scans) are not widely accessible due to high costs, while less-expensive field measures (i.e. skinfold calipers) have limited reliability. Ultrasound (US) is proposed as a relatively inexpensive, portable tool for %BF assessment, as results are shown to correlate with those from validated laboratory methods. However, technician skill-level and amount of previous experience using US may impact reliability of this tool. **PURPOSE:** To assess inter- and intra-rater reliability between experienced (ET) and novice technicians (NT) using brightness mode (B-mode) US to assess %BF. **METHODS:** Two technicians, one ET and one NT, scanned participants ($n=17$; $M_{age}=27.6\pm 7.9$ yr; $M_{height}=171.1\pm 7.6$ cm; $M_{weight}=71.7\pm 12.0$ kg; $M_{BMI}=24.4\pm 3.2$ kg/m²) in triplicate at seven pre-determined skinfold sites using B-mode US. Jackson-Pollock skinfold equations were used to estimate %BF. Reliability was assessed by intraclass correlation coefficients (ICC) and 95% confidence intervals (CI). **RESULTS:** The ICC for %BF via US was 0.983 (CI 0.946-0.994) and $R^2=0.94$, indicating a high level of agreement between ET and NT. There was better agreement among female (ICC= 0.992; CI: 0.963-0.998) compared to male participants (ICC= 0.867; CI 0.430-0.970) across both technicians. Inter-rater reliability was also high at each measurement site, with the exception of subscapular (ICC=0.858; CI 0.491-0.953) and chest (ICC=0.807; CI 0.437-0.932). Intra-rater reliability was high for both ET (ICC= 0.997; CI 0.992-0.999; $R^2=0.977-0.982$) and NT (ICC= 0.998; CI 0.996-0.999; $R^2=0.990-0.998$). Technicians had high intra-rater reliability at individual sites for both sexes. **CONCLUSION:** B-mode ultrasound is a reliable %BF assessment tool regardless of technician experience level, indicated by the high inter- and intra-rater reliability found in this study. However, additional training- even for experienced technicians- may be necessary when imaging males. Future studies should investigate the validity of US to determine potential use and replacement of common laboratory and field techniques used to assess %BF.