

Measurement properties of assessment methods to estimate nutritional status in ALS

A systematic review

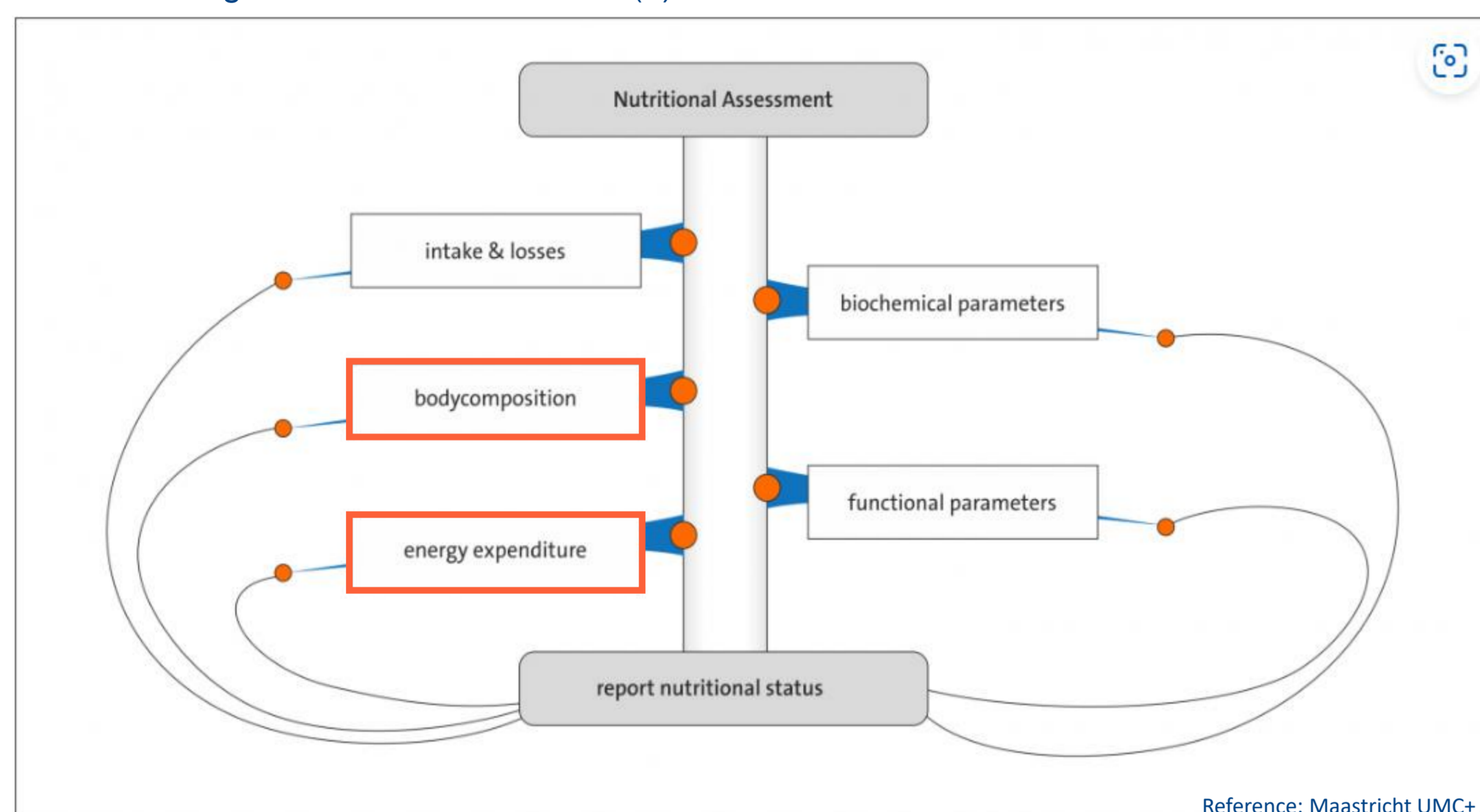
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Background

- People with ALS are at high risk of malnutrition, therefore it is essential to monitor nutritional status through nutritional assessment (1)



- Commonly used equations to estimate body composition or energy expenditure may not be accurate in people with ALS
- Understanding the measurement properties (validity, reliability, responsiveness) of these equation-based tools is essential for clinical use

Aim: To evaluate measurement properties of equation-based tools for estimating body composition and energy expenditure in ALS

Methods

- Electronic databases EMBASE, MEDLINE, CINAHL and Cochrane were systematically searched from inception until July 1st, 2024.
- Eligibility criteria:
 - Observational studies in all languages
 - Reporting on people diagnosed with ALS, PMA or PLS, aged over 18 years old
 - Examining at least one measurement property (reliability, validity or responsiveness) of an outcome measurement instrument for estimating body composition or energy expenditure
- Methodological quality was assessed using the COSMIN risk of bias checklist.
- Measurement property results were rated as sufficient (+), indeterminate (?) or insufficient (-) based on COSMIN criteria for good measurement properties.
- Results were qualitatively summarised.

Results

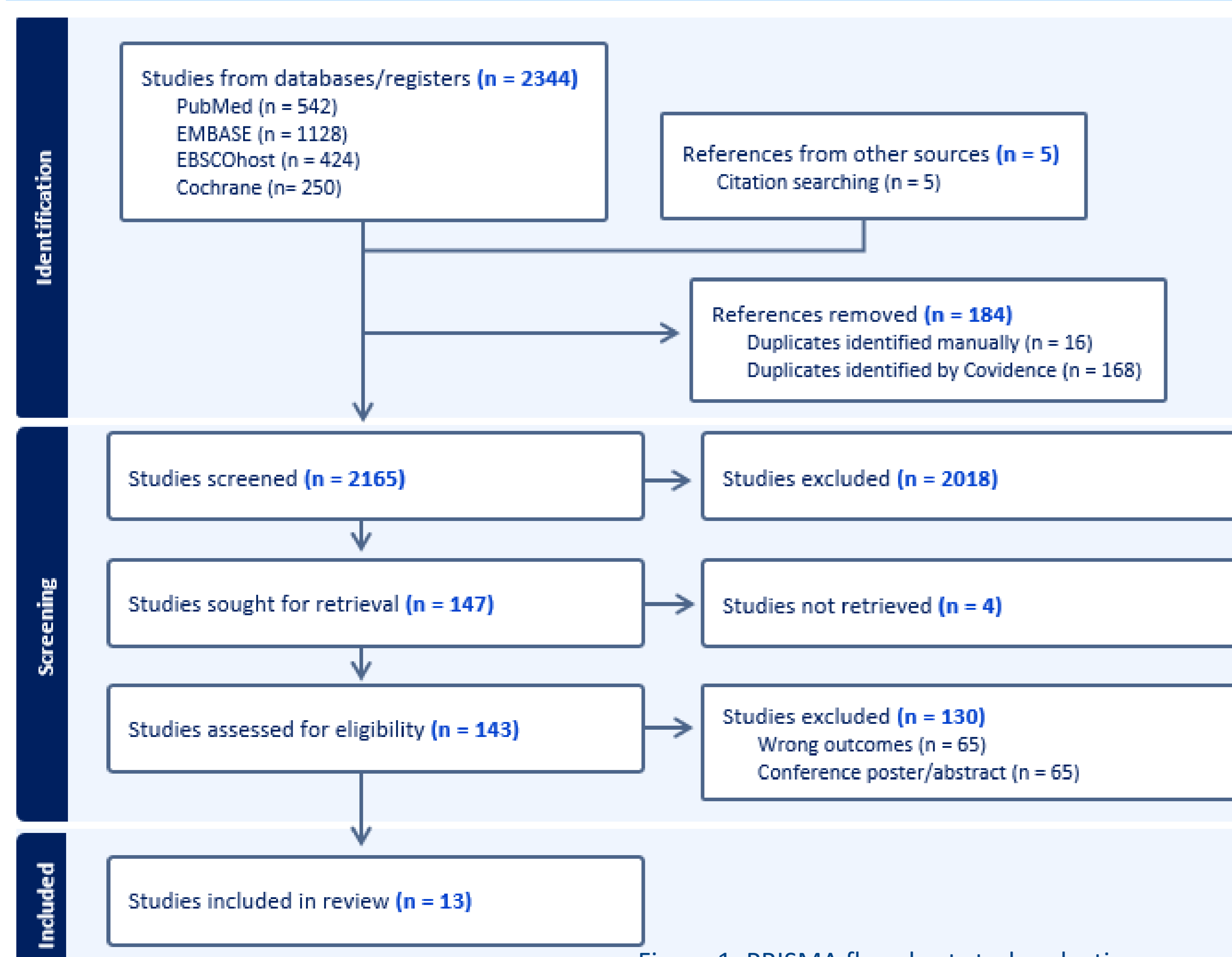


Figure 1: PRISMA flowchart study selection process

Results

- 13 studies were included
 - 5 evaluated equations to estimate **body composition** with Bioelectrical Impedance Analysis (BIA) or anthropometry
 - 8 assessed equations to estimate **energy expenditure**

Study characteristics

- Sample size ranged from 16 to 364
- 1315 participants in total, including 1186 people with ALS
- All observational, in 6 different countries

Body composition

Criterion validity

- A total of 9 different BIA equations and 10 anthropometric equations were evaluated for criterion validity against Dual-Energy X-ray Absorptiometry (DEXA) or Air Displacement Plethysmography
- all BIA and anthropometric equations overestimated FFM compared to the gold standard, except for the Segal equation in the study by Nau et al., which showed underestimation.
- No equation was rated as sufficient for criterion validity across studies.

Measurement error

The only study that investigated measurement error showed a repeatability coefficient of $0.59 \pm 0.11\%$ for DEXA and $0.48 \pm 0.28\%$ for BIA, indicating low variability between repeated measures.

Responsiveness

The only study that investigated responsiveness showed that changes in FFM measured with DEXA between T1 and T2 showed a strong and significant correlation with changes in FFM measured with the Desport equation ($R=0.70$, $p=0.04$; concordance $R=0.75$, 95% CI: 0.46–0.90), indicating good responsiveness.

Energy expenditure

Criterion validity

- A total of 22 different equations were evaluated for criterion validity against Indirect Calorimetry or Doubly Labeled Water
- No equation was rated as sufficient for criterion validity across studies.
 - The Harris and Benedict equation overestimated energy expenditure in studies of Ellis et al. and Roscoe et al. (MD: 32.93, 13.38 respectively) and underestimated energy expenditure in the studies of Jesus et al., Kurihara et al., Sherman et al., and Shimizu et al. (MD: -158.4; -144, -42.8; -244 respectively).
 - The Mifflin equation underestimated energy expenditure in both studies (MD: -57.88 and -231.5)
 - The Shimizu equation slightly underestimated energy expenditure in the study of Shimizu et al. (MD: -4.08) and overestimated energy expenditure in the study of Kurihara et al. (MD: 33).

Evidence for reliability and responsiveness was lacking for estimating energy expenditure

Conclusion

Equations to estimate body composition and energy expenditure should be used with caution, as no equation could be recommended for use in ALS. ALS-specific equations require further validation.

References

1. Muscaritoli, Maurizio et al. Nutritional and metabolic support in patients with amyotrophic lateral sclerosis. Nutrition. vol. 28,10(2012):959-66



Contact

