

Novel muscle measurement methods to improve muscle health assessment throughout the aging process

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Background

- Sarcopenia is a risk factor for falls and fractures.¹
- Sarcopenia is diagnosed using muscle function tests and dual-energy X-Ray absorptiometry (DXA) measured appendicular lean mass (ALM) adjusted for height (ALM/ht²) or body mass index (ALM/BMI).^{2,3}
- Muscle quality may better correlate with muscle function tests compared to muscle mass which can vary with aging and fluid shifts.⁴
- The method of combining DXA and bioimpedance spectroscopy (BIS) proxies muscle quality.

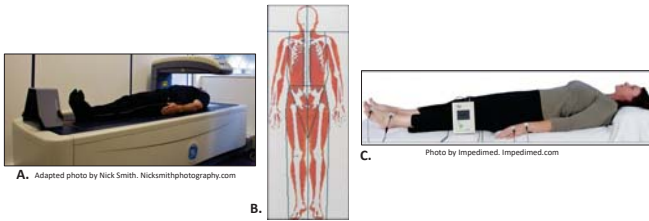


Figure 1. (A) DXA device, (B) DXA output. (C) Impedimed BIS SFB7 device.

Methods

- MIDUS Refresher participants completed DXA and BIS⁵
- Measures
 - DXA:
 - Appendicular Lean Mass- ALM, ALM/ht², ALM/BMI
 - BIS:
 - Extracellular and Intracellular Fluid- ECF and ICF
 - ECF to ICF ratio- E/I
- Muscle Function:
 - Hand-grip strength
 - Jump power
- Created our new variable- ALM/(E/I)
- Spearman's rank correlation for bivariate correlations

Results

Table 1. Ranked correlations of sarcopenia diagnoses with muscle function among age categories. *p<0.05; **p<0.001; † one participant did not complete BIS.

| | Hand-grip Strength | | Jump Power | |
|------------------------------|--------------------|----------------|------------|----------------|
| | ρ | R ² | ρ | R ² |
| Under 40 (n=68) | | | | |
| ALM/(E/I) | 0.25* | (0.06) | 0.82** | (0.67) |
| ALM/BMI | 0.51** | (0.26) | 0.61** | (0.38) |
| ALM/ht ² | -0.15 | (0.02) | 0.46** | (0.32) |
| 40 to under 50 (n=62) | | | | |
| ALM/(E/I) | 0.58** | (0.34) | 0.81** | (0.66) |
| ALM/BMI | 0.57** | (0.32) | 0.62** | (0.39) |
| ALM/ht ² | 0.36* | (0.13) | 0.56** | (0.30) |
| 50 to under 60 (n=70) | | | | |
| ALM/(E/I) | 0.58** | (0.33) | 0.87** | (0.75) |
| ALM/BMI | 0.58** | (0.33) | 0.70** | (0.49) |
| ALM/ht ² | 0.2 | (0.04) | 0.55** | (0.21) |
| 60 and older (n=67†) | | | | |
| ALM/(E/I) | 0.65** | (0.42) | 0.81** | (0.66) |
| ALM/BMI | 0.66** | (0.43) | 0.76** | (0.58) |
| ALM/ht ² | 0.22* | (0.05) | 0.34** | (0.11) |

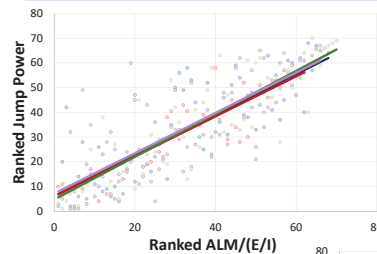


Figure 2. The association between jump power and ALM/(E/I) among age groups.

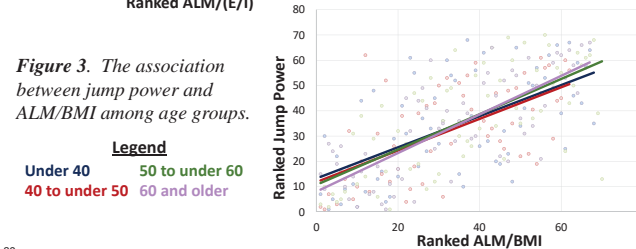


Figure 3. The association between jump power and ALM/BMI among age groups.

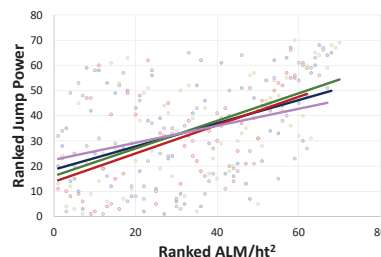


Figure 4. The association between jump power and ALM/ht² among age groups.

Conclusions

- ALM/(E/I) consistently accounts for the highest variation in jump power among all age categories.
- ALM/(E/I) is strongly and consistently associated with jump power among all age categories.
- ALM/BMI varies from moderately to strongly associated with jump power among all age categories.
- ALM/ht² varies from weakly to moderately associated with jump power among all age categories.
- Hand-Grip Strength is associated with ALM/(E/I) and ALM/BMI more frequently than ALM/ht².

Future Directions

- Examine the sarcopenia diagnoses and age categories by race/ethnicity and body mass index
- Compare the abilities of the sarcopenia diagnoses to predict falls and fractures.
- Compare the abilities of the sarcopenia diagnoses to predict other health outcomes.

References

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