

Intra- and Inter-rater Reliability of Biceps Thickness Assessment by Ultrasound in Elderly

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Aim

We aimed to assess intra-rater reliability (intra-RR) and inter-rater reliability (inter-RR) of biceps muscle size (thickness) by ultrasound in elderly.

Conclusion

Procedural reliability of biceps muscle size assessed by BodyMetrix™ in elderly is moderate to good, and measurement reliability is good to excellent.

Additional training in performing ultrasound measurements may further improve measurement reliability.

Background

Ultrasound has been reported as a valid and reliable tool to assess muscle size in older adults.¹ Most studies are performed in larger muscles, e.g. quadriceps muscles, mostly by an B-mode device. Only few studies assessed both procedural and measurement reliability, and/or both intra- and inter-RR.

However, little is known about reliability of assessing small muscles, e.g. biceps, by BodyMetrix™, an A-mode device.

Results

For procedural intra-RR, ICC was 0.630. For inter-RR of image 1 (R1) vs. image 2 (R2), ICC was 0.622. For inter-RR of image 2 (R2) vs. image 3 (R1), ICC was 0.534.

For measurement reliability, ICCs for intra-RR of R1 and R2 were 0.865 and 0.766, respectively. ICCs for inter-RR of R1 vs. R2, R2 vs. R3, and R1 vs. R3 were 0.865, 0.800, and 0.815, respectively.

All ICCs were statistically significant ($p \leq 0.001$).

Methods.

- Thirty elderly (81.9±6.3 years; 80% women; BMI 26.7±5.3 kg/m²) living in a Portuguese nursing home/ residence were included.
- To assess *procedural* intra-RR and inter-RR, ultrasound measurements were performed by 2 raters (R1, R2; both beginners level) by BodyMetrix™ BX2000, on the biceps of the right arm. R1 repeated the ultrasound measurement once.
- To assess *measurement* intra-RR and inter-RR, images were analysed by 3 raters: R1, R2, and R3 (experienced level).
- Agreement was analysed by intraclass correlation coefficient (ICC). ICC values of 0.50 to 0.75 were considered moderate to good, and ICC of 0.75 to 1.00 as good to excellent. Statistical significance was set at $p < 0.05$.

Table 1. Analysis of Measurement and Procedural Reliability

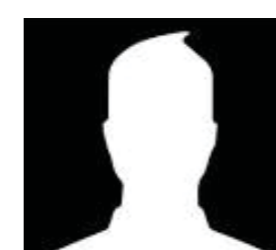
Measurement Reliability	Inter-Rater	Pair 1	Image 1 analysed by R1 in moment 1 vs. Image 1 analysed by R2 in moment 1
		Pair 2	Image 1 analysed by R1 in moment 1 vs. Image 1 analysed by R3
Pair 3	Image 1 analysed by R2 in moment 1 vs. Image 1 analysed by R3		
Intra-Rater	Pair 4	Image 1 analysed by R1 in moment 1 vs. Image 1 analysed by R1 in moment 2	
	Pair 5	Image 1 analysed by R2 in moment 1 vs. Image 1 analysed by R2 in moment 2	
Procedural Reliability	Inter-Rater	Pair 6	Image 1 analysed by R1 in moment 1 vs. Image 2 analysed by R2
		Pair 7	Image 3 analysed by R1 vs. Image 2 analysed by R2
	Intra-Rater	Pair 8	Image 1 analysed by R1 in moment 1 vs. Image 3 analysed by R1

Table 2. Analysis of Agreement

Measurement Reliability	Inter-Rater	Pair 1	ICC value
		Pair 2	0.865
Procedural Reliability	Inter-Rater	Pair 3	0.815
		Pair 4	0.800
	Intra-Rater	Pair 5	0.865
Procedural Reliability	Inter-Rater	Pair 6	0.766
		Pair 7	0.622
	Intra-Rater	Pair 8	0.534
			0.630

References

1. Nijholt W, Scafoglieri A, Jager-Wittenaar H, Hobbelen JSM, van der Schans CP. The reliability and validity of ultrasound to quantify muscles in older adults: a systematic review. *Journal of Cachexia, Sarcopenia and Muscle* 2017 [Epub ahead of print];



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