THE RELATIONSHIP BETWEEN SEGMENTAL FAT-FREE MASS AND PACER PERFORMANCE IN YOUTH SOCCER PLAYERS

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Abstract

INTRODUCTION: Fat-free mass (FFM) is an important body composition metric related to performance of many sports. However, most studies have primarily focused on the relationship between total body FFM and performance in adult athletes. There is a paucity of research examining the relationship between segmental FFM and performance in youth athletes.

PURPOSE: The purpose of this study was to examine the association between the FFM of various body segments (arms, legs, and trunk), as well as total FFM, and the Pacer test performance in youth soccer players.

METHODS: Young male soccer players (n=20, age=13.7±0.8 years, height=167.0±7.9 cm, weight= 56.2±8.4 kg, and FM=11.1±2.9 kg) participated in this study. Dual-energy x-ray absorptiometry was used to measure total (FFM_{total}) and segmental FFM. The segments recorded were the FFM of the upper limbs (FFM_{arms}), lower limbs (FFM_{legs}) and trunk (FFM_{trunk}). The Pacer test was completed on an outdoor soccer field and required participants to shuttle-run back and forth between two markers placed 20m apart. The test was terminated when the participant could no longer maintain the required pace, set by audible cues from a smartphone application, as determined by failure to reach the 20m mark on two consecutive instances. Pacer performance was recorded as the total distance completed (m) for each subject. Bivariate correlations between the FFM metrics and the Pacer were assessed using Pearson's correlation coefficient (r). For all correlation procedures the strength of each r value will be qualitatively described as follows: 0-0.30, small; 0.30-0.50, moderate; 0.50-0.70, large; and 0.70-1.00, very large.

RESULTS: The mean±standard deviation for the Pacer test was 74.5±14.4 m, for FFM_{total} was 46.0±6.9 kg, FFM_{arms} was 12.2±2.6 kg, FFM_{legs} was 37.1±5.8 kg, and FFM_{trunk} was 44.2±6.8 kg. Moderate positive correlations were observed between FFM_{total} (r=0.66, p=0.001), FFM_{arms} (r=0.63, p=0.003), FFM_{legs} (r=0.58, p=0.007) and pacer performance, whereas a large correlation was observed for FFM_{trunk} (r=0.71, p <0.001). Stepwise regression analysis showed that only FFM_{trunk} was independently associated with Pacer performance (R^2=0.51, p<0.001). No other FFM metric significantly contributed to the model and hence, were excluded.

CONCLUSION: The results of this study showed that segmental FFM metrics were associated with the Pacer test performance. However, FFM_{trunk} yielded the strongest correlation with the Pacer test, accounting for 51% of the observed variance in Pacer test performance. Therefore, in relation to soccer performance, total and segmental FFM metrics appear to be important, especially in the region of the trunk.

PRACTICAL APPLICATIONS: Strength and conditioning professionals are encouraged to evaluate segmental FFM as a part of their performance testing battery, as well as optimize training protocols for developing FFM of the truncal region.

Purpose

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Methods

- Young male soccer players (n=20, age=13.7±0.8 years, height=167.0±7.9 cm, weight= 56.2±8.4 kg, and FM=11.1±2.9 kg) participated in this study.
- Dual-energy x-ray absorptiometry was used to measure total (FFM_{total}) and segmental FFM. The segments recorded were the FFM of the upper limbs (FFM_{arms}), lower limbs (FFM_{legs}) and trunk (FFM_{trunk}).
- The Pacer test was completed on an outdoor soccer field and required participants to shuttle-run back and forth between two markers placed 20m apart. Pacer performance was recorded as the total distance completed (m) for each subject.

Results

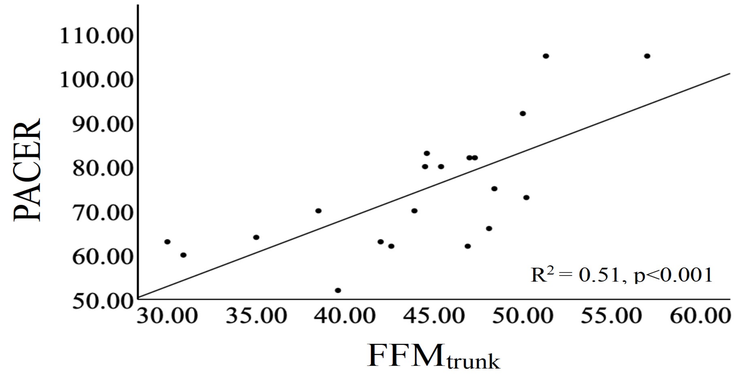
Table 1. Means, Standard deviations, and correlations of FFM and Pacer performance

	M±SD	r	*p*
Pacer	74.5±14.4 m	-	-
FFM_{total}	46.0±6.9 kg	0.66	0.001
FFM_{arms}	12.2±2.6 kg	0.63	0.003
FFM_{legs}	37.1±5.8 kg	0.58	0.007
FFM_{trunk}	44.2±6.8 kg	0.71	<0.001

Moderate positive correlations were observed between FFM_{total}, FFM_{arms}, FFM_{legs} and pacer performance, whereas a large correlation was observed for FFM_{trunk}.

Results

Figure 1. Regression analysis between FFM_{trunk} and Pacer Performance



- Stepwise regression analysis showed that only FFM_{trunk} was independently associated with Pacer performance (R^2=0.51, p<0.001).

Conclusion

- The results of this study showed that segmental FFM metrics were associated with the Pacer test performance..
- FFM_{trunk} yielded the strongest correlation with the Pacer test, accounting for 51% of the observed variance in Pacer test performance.
- Therefore, in relation to soccer performance, total and segmental FFM metrics appear to be important, especially in the region of the trunk.

Practical Application

- Strength and conditioning professionals are encouraged to evaluate segmental FFM as a part of their performance testing battery, as well as optimize training protocols for developing FFM of the truncal region.