Body Composition Negatively Influences Running Velocity in Male University Soccer Players

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ABSTRACT

The physiological demands of competition in male collegiate soccer require elevated and sustained musculoskeletal performance. As such, strength and conditioning coaches frequently prescribe exercise programs designed to develop both strength and muscular hypertrophy. However, the interplay between muscular hypertrophy and its influence on running velocity remains a point of contention within the sport of soccer. **PURPOSE:** This study examined the association between indices of anthropometry and running velocity in male university soccer players. **METHODS**: Twenty (n = 20) healthy male university soccer players with a (mean ± SD) height of, 179.4 ± 6.7cm, a weight of 79.0 ± 8.0 kg, a BMI of 24.6 ± 2.6, a body fat % of 14.4 ± 6.2, and fat free mass of 67.6 ± 5.9 kg participated in this study. Anthropometry and running speed were assessed over two-time periods separated by 60-days. On each testing session, anthropometry was examined using air displacement plethysmography (BodPod, COSMED, Chicago, IL). Participants wore a Lycra cap and removed all clothing and jewelry except underclothing prior to each assessment in accordance with the manufacturer's guidelines. Fat free mass (FFM) was estimated utilizing the Siri Equation for percent body fat (BF %) estimation, based on the two-compartment model. Running velocity was examined over a 30m distance and was recorded using a photocell timing gate (Brower Timing Systems, IRD-T175). Each sprint assessment was conducted in a controlled environment with a standardized running surface and ambient temperature. Participants completed two trials with their fastest time being used for analysis. A Pearson correlation coefficient (r) with its corresponding 95% CI was used to examine the association between 30m sprint time and each index of anthropometry. Significance was declared using a probability of $p < 0.05$. **RESULTS:** Significant (95% CI) inverse associations were observed between 30m running velocity and body fat % [r = - 0.52 (- 0.72 : - 0.24) p = 0.0002], BMI [r = - 0.37 (- 0.62 : - 0.05) p = 0.007], and body weight [r = - 0.41 (-0.64 : - 0.11) p = 0.009]. FFM displayed an insignificant association with running velocity [r = 0.04, p = 0.81]. CONCLUSION: Indices of anthropometry can significantly impact running velocity in male university soccer players. Both body weight and body fat % are inversely associated to running speed over a 30m distance. **PRACTICAL APPLICATIONS:** There remains a balance between increasing the number of contractile units, as represented through FFM, and overcoming inertia when running. Strength and conditioning coaches should consider prescribing exercise programs designed to enhance neural adaptation, that prevent changes to body weight and FFM when enhancing running velocity in male university soccer players.

INTRODUCTION

Male university soccer players are required to perform elevated and sustained levels of musculoskeletal performance throughout competition[1]. We have previously demonstrated that 30m running velocity is significantly associated with hamstrings symmetry and not peak musculoskeletal force production in male university soccer players[2]. This suggests, that additionally factors beyond muscular force production, and potentially muscular hypertrophy, may influence running speed. This study sought to examine the association between indices of anthropometry and running velocity in male university soccer players.

METHODOLOGY

Twenty (n = 20) male university soccer players participated in this study. Anthropometry and running speed were assessed over two-time periods separated by 60-days. On each testing session, anthropometry was examined using air displacement plethysmography. Running velocity was examined over a 30m distance. Participants completed two trials with their fastest time being used for analysis. A Pearson correlation coefficient (r) with its corresponding 95% CI was used to examine the association between sprint time and each index of anthropometry. Significance was declared using a probability of $p < 0.05$

RESULTS

Table 1. Participant Characteristics.

Height	Weight	BMI	Body Fat	Fat Free Mass	30m Running Velocity
cm	kg	kg/m^2	%	kg	m/s
78.3 ± 6.1	179.5 ± 6.4	24.4 ± 2.3	14.2 ± 6.2	67.3 ±5.4	7.01 ± 0.36

Values displayed as a mean (±SD). n = 20

Table 2. Correlation Matrix.

	Weight	Height	BMI	Body Fat	Fat Free Mass	30m Running Velocity
	kg	cm	kg/m^2	%	kg	m/s
Weight (kg)	-					
Height (cm)	0.19	-				
BMI kg/m^2	0.68	-0.58	-			
Body Fat (%)	0.49	-0.45	0.77	-		
Fat Free Mass (kg)	0.48	0.66	-0.12	-0.42	-	
30m Running Velocity (m/s)	-0.41*	0.02	-0.37*	-0.52**	0.03	-

Values displayed as a Pearson correlation coefficent (r). ** $p < 0.001$ * $p < 0.05$

CONCLUSION

This study revealed significant inverse associations between 30m running velocity and both body mass and body composition. We failed to observe a positive effect between FFM and improved running speed. Our observations further support recent inquiry displaying negative associations between body composition and running speed in male collegiate soccer players[3]. There remains a balance between increasing the number of contractile units, as represented through FFM, and overcoming inertia when running. Strength and conditioning coaches should consider prescribing exercise programs designed to enhance neural adaptation, that prevent changes to body weight and FFM when enhancing running velocity in male university soccer players

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