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Muscular Strength is Inversely Associated with Central Hemodynamic Load in Young Women

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Muscular strength is important for overall fitness. Strength is also associated with cardiovascular health; individuals with higher strength have a lower risk of developing hypertension. Muscular strength has been shown to be inversely associated with aortic stiffness, a precursor of hypertension. **PURPOSE:** Determine the relationship between muscular strength, aortic stiffness, and central hemodynamic load in young women. **METHODS:** Forty-two healthy young women (age 24 ± 6 years, body fat 23.1 ± 8.3 %) underwent muscular strength and vascular testing. Muscular strength was evaluated using a five-repetition maximum bench press and expressed relative to body weight. An aortic blood pressure waveform was derived from the brachial artery via an oscillometric cuff and used to estimate aortic pulse wave velocity (PWV). From this waveform, we also derived measures of central hemodynamic load: augmentation index (AIx@75, at heart rate of 75 bpm), forward wave pressure (Pf) and reflected wave pressure (Pb). Body composition was evaluated using air displacement plethysmography. **RESULTS:** As seen in Table 1, there was a negative correlation between relative strength and Pf ($p < 0.05$) and Pb ($p < 0.05$). Correlations remained after adjusting for age and mean arterial pressure (Pf, $r = -0.28$, $p < 0.05$; Pb, $r = -0.31$, $p < 0.05$) but were lost after further adjusting for body fat (Pf, $r = -0.22$, $p > 0.05$; Pb, $r = -0.19$, $p < 0.05$). There were no associations between relative strength and aortic PWV or AIx@75 ($p > 0.05$). **CONCLUSIONS:** Women who have higher relative strength have lower forward and reflected wave pressure suggesting lower central hemodynamic load. Favorable associations may be partially mediated by stronger women having lower body fat.

Table 1. Correlation matrix between strength and central hemodynamics.

	Age	Body Fat	MAP	AIx @75	Relative Strength	PWV	Pf
Body Fat	-0.08						
MAP	0.05	-0.02					
AIx@75	0.12	0.11	0.23				
Relative Strength	0.14	-0.50**	-0.10	0.03			
PWV	0.68**	0.05	0.52**	0.23	-0.14		
Pf	-0.07	0.19	0.01	-0.01	-0.29*	0.41**	
Pb	0.22	0.27*	0.14	0.42**	-0.28*	0.62**	0.57**

MAP, mean arterial pressure; AIx@75, augmentation index at 75 beats per minute; PWV, pulse wave velocity; Pf, forward wave pressure; Pb, reflected wave pressure.

** . Correlation is significant at the 0.01 level (1-tailed).

* . Correlation is significant at the 0.05 level (1-tailed).