



# 1.5 Age and Sex Differences in the Association of Brachial and Central Blood Pressure Variability with Arterial Stiffness

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## ABSTRACT

**Background:** Both blood pressure variability (BPV) and arterial stiffness (AS) are significantly influenced by age and sex. However, whether the association between BPV and AS differs with age and sex remains unclear. We examined age and sex differences in the association between brachial and central BPV and AS in a cohort of healthy individuals, covering a wide age-span.

**Methods:** 24-hour brachial and central blood pressures (Mobil-O-Graph) and aortic pulse wave velocity (aPWV) (SphygmoCor) were measured in 957 healthy individuals (age range: 18–88 yrs; mean age: 46 ± 18 yrs; 45% males). BPV was calculated as standard deviations of 24-hour (time-weighted, 24wSD), daytime (dSD) and night-time systolic blood pressures. Correlation analyses were performed, separately, in groups stratified by age (≤40, 41–60, and >60 yrs) and sex.

**Results:** aPWV significantly correlated to brachial and central 24wSD and dSD ( $p \leq 0.02$  for all) in both males and females, but females showed significantly stronger correlations of aPWV to brachial 24wSD (correlation coefficient [ $r$ ]: 0.31 vs. 0.11,  $p = 0.001$ ) and dSD ( $r$ : 0.32 vs. 0.12,  $p = 0.001$ ) and to central 24wSD ( $r$ : 0.34 vs. 0.20,  $p = 0.02$ ) and dSD ( $r$ : 0.34 vs. 0.21,  $p = 0.03$ ), compared to males (Table 1). After stratification by age and sex, in both males and females, significant correlations between aPWV and BPV indices were observed in middle-aged and older adults, but not in younger adults (Tables 2 and 3).

**Conclusion:** Correlation between BPV and AS differs with age and sex. BPV relates to AS in middle-aged and older adults and more strongly relates to AS in females.

**Table 1** | Correlation between SBP variability and aortic pulse wave velocity in males and females

SBP variability	Males (n = 431)		Females (n = 526)		p*
	r	p	r	p	
<b>Brachial</b>					
24 h time-weighted SD	0.11	<b>0.02</b>	0.31	<b>&lt;0.0001</b>	<b>0.001</b>
Day SD	0.12	<b>0.01</b>	0.32	<b>&lt;0.0001</b>	<b>0.001</b>
Night SD	0.01	0.81	0.16	<b>0.0002</b>	<b>0.02</b>
<b>Central</b>					
24 h time-weighted SD	0.20	<b>&lt;0.0001</b>	0.34	<b>&lt;0.0001</b>	<b>0.02</b>
Day SD	0.21	<b>&lt;0.0001</b>	0.34	<b>&lt;0.0001</b>	<b>0.03</b>
Night SD	0.08	0.08	0.18	<b>&lt;0.0001</b>	0.12

\*p-value derived from Z-test; SD, standard deviation; r, correlation coefficient.

**Table 2** | Correlation between SBP variability and aortic pulse wave velocity in younger, middle-aged and older males

SBP variability	Younger adults Age ≤ 40 yrs N = 208		Middle-aged adults 40 < Age ≤ 60 N = 104		Older adults Age > 60 yrs N = 119	
	r	p	r	p	r	p
<b>Brachial</b>						
24 h time-weighted SD	0.06	0.42	0.20	<b>0.04</b>	0.23	<b>0.01</b>
Day SD	0.09	0.17	0.20	<b>0.04</b>	0.22	<b>0.01</b>
Night SD	-0.04	0.58	0.20	<b>0.04</b>	0.08	0.38
<b>Central</b>						
24 h time-weighted SD	0.12	0.09	0.26	<b>0.008</b>	0.23	<b>0.01</b>
Day SD	0.15	<b>0.03</b>	0.27	<b>0.006</b>	0.26	<b>0.005</b>
Night SD	0.01	0.93	0.20	<b>0.04</b>	0.08	0.41

SD, standard deviation; r, correlation coefficient.

**Table 3** | Correlation between SBP variability and aortic pulse wave velocity in younger, middle-aged and older females

SBP variability	Younger adults Age ≤ 40 yrs N = 214		Middle-aged adults 40 < Age ≤ 60 N = 157		Older adults Age > 60 yrs N = 155	
	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>
<b>Brachial</b>						
24 h time-weighted SD	0.08	0.26	0.12	0.14	0.25	<b>0.002</b>
Day SD	0.12	0.09	0.14	0.08	0.21	<b>0.008</b>
Night SD	0.03	0.62	0.07	0.37	0.22	<b>0.006</b>
<b>Central</b>						
24 h time-weighted SD	0.11	0.12	0.20	<b>0.01</b>	0.24	<b>0.003</b>
Day SD	0.13	<b>0.05</b>	0.20	<b>0.01</b>	0.19	<b>0.02</b>
Night SD	0.07	0.31	0.10	0.22	0.21	<b>0.008</b>

SD, standard deviation; *r*, correlation coefficient.

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