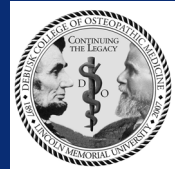


Correlation of Perceived Stress and Physical Activity Levels on Central vs Brachial Blood Pressures



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Abstract

Background: The Sphygmocor® XCEL device can be used to obtain central pressure non-invasively, providing a more accurate measurement for evaluation of cardiovascular risk than peripheral pressures, given its proximity to the aorta.

Objectives: To compare the brachial and central pressures in a young adult population and to determine whether or not there is a statistically significant difference between perceived stress and physical activity level and the two types of pressures.

Methods: Fifty adults free from cardiovascular disease and between ages 18-30 were recruited. After a 10-minute rest period, brachial blood pressure was obtained using an electronic blood pressure cuff, while central pressure was measured using the Sphygmocor® XCEL device. A survey on perceived stress and physical activity level was administered following both measurements.

Results: Central systolic blood pressure was significantly lower than brachial systolic blood pressure. There was no significant correlation between brachial or central aortic systolic pressure when considering perceived stress or physical activity level.

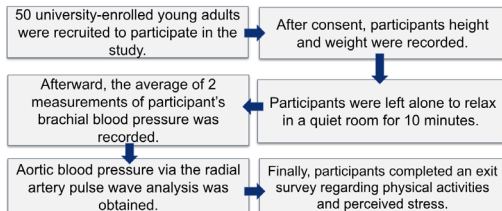
Introduction

Overview: High blood pressure is a leading risk factor for disability and death worldwide due to the risk of developing cardiovascular disease (CVD).¹ To this day, the most routine method of obtaining blood pressure from an individual is utilizing the peripheral blood pressure cuff and stethoscope on the brachial artery. However, recent studies have shown brachial blood pressure to be more variable, and thus, less accurate compared to central aortic blood pressure, which is a better indication of CVD risk.^{2,3}

Importance: Compared to brachial pressure, central aortic pressure is superior due to the vicinity of other important organs, including the kidneys, lungs, etc.⁴ The pressure exerted on these organs is of higher clinical significance than brachial pressure. Thus, central systolic pressure has been found to be the most consistent predictor of cardiovascular mortality deeming it a more accurate marker for measurement of blood pressure.⁵

Study Goals: Examining the relationship between central aortic blood pressure and variability of pressure measures with perceived stress and physical activity may lead to new insights into how these lifestyle factors impact blood pressure at different anatomical locations.

Methods



Results

Perceived Stress vs. Brachial and Central Aortic Systolic Pressure

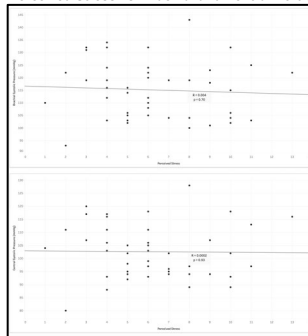


Figure 4. A correlation analysis between perceived stress versus systolic brachial and central aortic blood pressures.

Participants perceived stress scores were compared to their systolic brachial and aortic blood pressures. The coefficient of determination (R^2) for both systolic and diastolic pressures were 0.004 and 0.0002, respectively, indicating a weak correlation, in this scenario, a weak negative correlation. Furthermore, a p-value of 0.70 for brachial systolic and a p-value of 0.93 for central systolic does not indicate statistical significance.

Godin Leisure Time Exercise Score vs. Brachial and Central Aortic Systolic Pressure

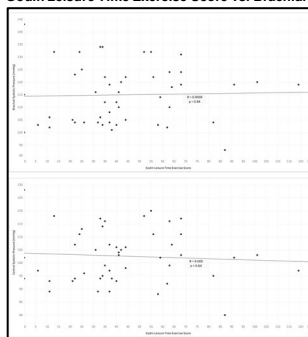


Figure 5. A correlation analysis between Godin Leisure Time Exercise Score versus the brachial and central systolic blood pressures.

Participants' Godin Leisure Time Exercise scores were compared to their systolic brachial and aortic blood pressures. The coefficient of determination (R^2) for both systolic brachial and central pressures were 0.0009 and 0.005, respectively, indicating a weak correlation, in this scenario, a weak positive correlation for brachial and a weak negative correlation for central aortic. Furthermore, p-values of 0.84 and 0.64 lack statistical significance, respectively.

Discussion

Discussion: This study aimed to examine the relationships between central aortic systolic blood pressure and brachial systolic blood pressure with perceived stress and self-reported physical activity level. In our study, the systolic blood pressure decreased significantly from brachial to central aortic measurement for all participants regardless of their stages of hypertension. This is in concurrence with other studies that show that central aortic systolic pressure is lower than brachial systolic pressure due to the decrease in elasticity of our arteries and an increase in resistance as one travels to the periphery. This "amplification phenomenon" occurs because as an artery's distance from the heart increases, the stiffness also increases. This explains the increase in systolic pressure as the pressure wave moves from the central arteries, which are more elastic, to the brachial artery, which is stiffer and not as elastic.⁶ The diastolic pressure changes between brachial and central aortic measurements did not show a statistically significant drop or rise. Studies have shown that moderate-intensity aerobic exercise increases the bioavailability of nitric oxide, a vasodilator, which improves endothelial function. Therefore, regular aerobic exercise participation correlates with lower and healthier blood pressure.⁸ Additionally, stress physiologically affects our blood pressure due to its stimulation of the sympathetic nervous system, which releases catecholamines to increase heart rate, cardiac output, and blood pressure. Chronic stress can lead to sustained high blood pressure, and these individuals are at risk for hypertension.⁷ In our study, there was no statistically significant correlation found between perceived stress level and systolic brachial or central pressures. Additionally, no statistically significant correlation existed between reported physical activity level and systolic brachial or central pressures.

Limitations: Due to the study of enrollment being voluntary, there was a limit in the number of participants and an unequal ratio of male to female participants. Most participants were from the Debusk College of Osteopathic Medicine program. The inability to control which day/week the participants came in would have affected their perceived stress level when taking the survey due to varying proximities to an exam date. The weight scale used for our baseline measurements was a spring scale, therefore there may have been some instrumental error due to the needle being set less than the 0 point for several participants, and thus may have caused inaccurate measurements.

Future studies: The limited number of participants may have impeded us from finding a statistically significant relationship, and therefore, future studies should include a larger set of students for further analysis.

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