From Lab to Life: Diastolic Blood Pressure Reactivity to Stress Predicts Ambulatory Blood Pressure

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This study examined whether blood pressure (BP) responses to psychological stress in a laboratory setting predict BP levels in daily life, measured by 24-hour ambulatory blood pressure monitoring (ABPM). Sixteen young adults completed both lab-based stress testing and ABPM. Results demonstrated that while systolic BP reactivity did not predict daytime or nighttime BP, greater diastolic BP reactivity was associated with higher daytime ambulatory diastolic BP. These findings suggest that stress-induced diastolic BP changes may help identify individuals at risk for elevated daytime BP, supporting the value of lab-based stress testing for early detection. However, the small sample size and limited assessment of daily factors highlight the need for further research.

Blood pressure (BP) is the force exerted by circulating blood against the walls of the arteries, the major blood vessels in the circulatory system. BP is measured in millimeters of mercury (mmHg) and recorded as systolic pressure, which is the pressure during heartbeats, over diastolic pressure, which is the pressure between beats. Maintaining BP within a normal range of 120/80 mmHg is crucial for overall health. Worldwide, elevated BP remains the single largest preventable risk factor for death, resulting in more than 9.4 million deaths per year (1). While BP is most commonly assessed through resting clinic measures, additional strategies such as laboratory-based psychological stress testing and 24-hour ambulatory blood pressure monitoring (ABPM) offer added diagnostic value. In laboratory stress testing, BP is measured during a resting baseline and again during challenging or frustrating tasks to capture BP reactivity, or the change in BP associated with psychological stress. ABPM involves measuring BP at regular intervals over 24 hours while the patient goes about their daily life and offers more reliable estimates of BP compared to one-time office assessments. Evaluating whether stress-induced BP reactivity predicts ambulatory BP levels may help determine the ecological validity of lab-based protocols and clarify whether these methods assess overlapping or distinct cardiovascular processes.

The current study investigated whether BP reactivity to laboratory stress predicted daytime and nighttime BP values obtained via ambulatory monitoring. Sixteen participants (mean age= 20.6 years, 75% women, 62.5% Non-Hispanic White, mean body mass index (BMI)= 23.9) completed the study. Participants underwent a standardized psychological stress protocol in a laboratory setting, with BP measured at baseline and again during two stress tasks. The average change in BP during the two stress tasks relative to baseline levels was calculated as an index of BP reactivity. Within two weeks following the laboratory session, participants completed 24 hours of ABPM, with BP measured every 30 minutes during the day, and every 60 minutes during the night.

On average, systolic BP increased by 9.93 (SD = 4.90) mmHg and diastolic BP increased by 10.53 (SD= 6.16) mmHg in response to the laboratory stress protocol. During ABPM, the average daytime systolic BP and diastolic BP were 117.75 (SD= 7.24) mmHg and 72.94 (SD= 4.86) mmHg, respectively, while the average nighttime systolic BP and diastolic BP were 107.06 (SD= 7.78) mmHg and 59.38 (SD= 4.62) mmHg, respectively. Linear regressions examined whether BP reactivity predicted ambulatory daytime and nighttime BP, adjusting for age, gender, BMI, and lab baseline BP. Systolic BP reactivity to laboratory stressors did not predict ambulatory systolic BP during the daytime or nighttime (wake: B = .72, p = .25; sleep: B = .53, p = .47). Greater diastolic BP reactivity to stress predicted higher daytime ambulatory diastolic BP (B = .54, p = .04) but not nighttime diastolic BP (B = -.06, p = .79).

These results demonstrate that stress-induced changes in diastolic BP may help identify individuals at risk for elevated daytime BP in everyday life, supporting the value of lab-based stress testing as a tool for early detection and intervention. On the other hand, the lack of association between systolic reactivity in the lab and ambulatory systolic BP may suggest that these measures capture distinct aspects of cardiovascular function. Limitations of this work include the small sample size, reliance on a single lab session to assess stress reactivity, and lack of assessment of physical activity or emotional state during ABPM. Future work should continue to investigate the link between laboratory and ambulatory BP in larger samples to clarify whether they capture overlapping or distinct physiological processes.

REFERENCE

1. Pena-Hernandez, C., Nugent, K., & Tuncel, M. (2020). Twenty-four-hour ambulatory blood pressure monitoring. *Journal of Primary Care & Community Health*, 11, 2150132720940519. https://doi.org/10.1177/2150132720940519

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