

The Effects of Advancing Gestation on Maternal Autonomic Response

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Background: Maternal autonomic adaptation is essential in facilitating the physiological changes that pregnancy necessitates. Insufficient adaptation is linked to complications such as hypertensive diseases of pregnancy. Consequently, tracking autonomic modulation throughout pregnancy could allow for the early detection of emerging deteriorations in maternal health. Autonomic modulation can be longitudinally monitored by assessing heart rate variability (HRV). Yet, changes in maternal HRV corresponding to normally progressing pregnancy remain poorly understood. Current literature focuses on standard HRV features that inform on the activity of the two autonomic branches, often showing conflicting results. Investigating further characteristics of autonomic regulation, such as the responsivity of HR to stimuli, may offer clarity on autonomic changes during normal pregnancy. Subsequently, we investigate whether the increasing stress of advancing gestation alters the maternal autonomic response.

Methods: Multiple ECG measurements (≈ 45 minutes) were obtained longitudinally from 33 healthy pregnant women (range 14-41 weeks of gestation). Maternal autonomic response was assessed with phase rectified signal averaging (PRSA), which graphically shows the rate and magnitude of HR responsivity. Deceleration capacity (DC), which quantifies the response observed in PRSA, was calculated correspondingly. Results were grouped into three gestational age ranges (i.e. under 23 weeks (GA_1), 23 to 32 weeks (GA_2), and over 32 weeks (GA_3)). The Wilcoxon signed-ranks test and Cohen's U_1 were implemented to determine significance and effect sizes, respectively.

Results: The mean and standard deviation of the DC were 11.82 ± 5.12 (GA_1); 9.93 ± 4.31 (GA_2), and 9.01 ± 3.88 (GA_3). Changes between groups were significant (GA_1 to GA_2 : $p < 0.001$; GA_2 to GA_3 : $p = 0.03$; GA_1 to GA_3 : $p < 0.001$), yet the effect sizes were small ($U_1 = 0.05, 0.02$ and 0.03 , respectively).

Conclusion: Autonomic responsiveness dampens under the increasing stress of advancing gestation. This dampening, albeit significant, is not comparable to decreases in DC observed in diseased states.