

Effect of respiratory modulation on relationship between heart rate variability and motion sickness

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This study investigates the interplay among heart rate variability (HRV), respiration, and the severity of motion sickness (MS) in a realistic passive driving task. Although HRV is a commonly used metric in physiological research or even believed to be a direct measure of sympathovagal activities, the results of MS-affected HRV remain mixed across studies. The goal of this study is to find the source of these contradicting results of HRV associated with MS. Experimental results of this study showed that the group trend of the low-frequency (LF) component and the LF/HF ratio increased and high-frequency (HF) component decreased significantly as self-reported MS level increased ($p < 0.001$), consistent with a perception-driven autonomic response of the cardiovascular system. However, in one of the subjects, the relationship was reversed when individuals intentionally adjust themselves (deep breathing) to relieve the discomfort of MS during the experiments. It appears that the correlations between HRV and MS level were higher when individuals made fewer adjustments (the number of deep breathing) during the passive driving experiments.