

Respiratory and cardiac activity associated with conscious tactile perception

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Introduction

Cardiac activity has been shown to interact with conscious tactile perception: detecting near-threshold tactile stimuli was more likely during diastole and heart slowing was greater for detected compared to undetected stimuli (Motyka et al., 2019, Al et al., 2020).

Main research questions:

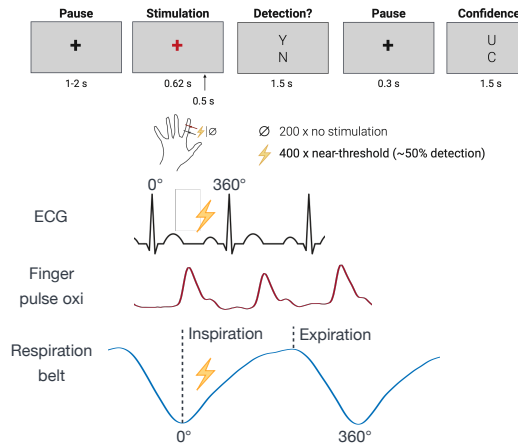
1. Does the interaction of cardiac activity and conscious tactile perception depend on decision confidence?
2. How is the relationship between decreased tactile detection and the kinetics of the pulse wave in the finger?
3. Does conscious tactile perception vary across the respiratory cycle?



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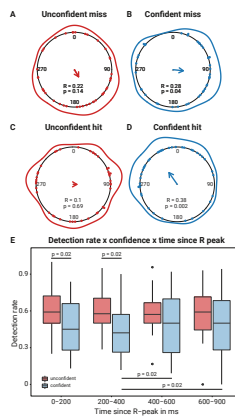
Methods



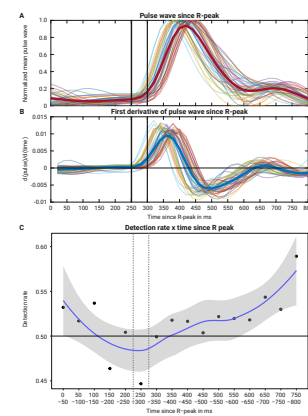
Forty-one healthy participants had to report conscious perception of weak electrical pulses applied to the left index finger (yes/no) and confidence about their yes/no-decision (unconfident/confident) while electrocardiography (ECG), respiration activity (chest circumference), and finger pulse oximetry were acquired.

Results

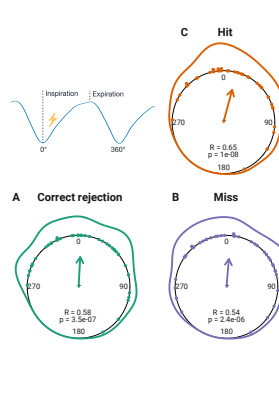
Cardiac cycle x confidence



Finger pulse wave relative to cardiac cycle



Tactile detection relative to respiration



Discussion

Main research questions:

1. Does the interaction of cardiac activity and conscious tactile perception depend on decision confidence?
 -> Yes, further evidence for higher cognitive processes (e.g., interoceptive predictive coding).
2. How is the relationship between decreased tactile detection and the kinetics of the pulse wave in the finger?
 -> Tactile detection lowest at pulse wave onset (250-300 ms) indicates that cardiac cycle effect does not correspond to maximal peripheral cardiac changes.
3. Does conscious tactile perception vary across the respiratory cycle?
 -> Locking to inspiration onset tunes sensory system for incoming system and hence conscious tactile perception.