The Impact of Oral and Nasal Breathing on Visual Search Performance
A Pre-Registered Replication and Extension

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Research Question
Nasal breathing is linked to the entrainment of neural synchrony with oscillatory power of various frequency bands increasing during inhalation (Herrero et al., 2018). This synchrony dissipated during oral breathing (Zelano et al., 2016).

This nasal respiratory-driven synchrony has been suggested to aid cognitive functions including attention, information processing and memory (Zelano et al.; Arshamian et al., 2018).

Yoshimura et al. (2019) found oral breathing with reduced target discriminability led to increased reaction time (RT) intercepts compared to nasal breathing.

However, even their most difficult search condition produced flat RT*Set Size slopes suggesting a lack of sensitivity needed to detect potential slope effects.

We aim to replicate their findings in the RT intercepts and extend by altering the orientation discriminability ranging from easy (6°) to difficult (2°) to encourage slope effects and enhance the sensitivity.

Methods
Power analysis: n = 90 with a two-tailed alpha of .05 for the planned 1df contacts would be able to detect dz = .3 with 80% power.

Within-subjects single session 2x2x3x2 design: Oral Vs Nasal Breathing, Set Size (19 vs 37), Orientation (2°, 4°, 6°), Target Present Vs Absent.

Participants will use apparatus (Figure 1) to aid redirecting airflow to the oral or nasal pathway. The stimuli (Figure 2) consists of bars randomly orientated with half of the trials being of each set size (19 vs 37) and half consisting of a target bar which is tilted further to the left/right by 2°, 4°, 6°.

3x randomised blocks consisting of 144 experimental trials (36 trials x 2 target present/absent x 2 set sizes), leading to 576 trials per pathway and 1152 trials overall. Trials are separated by random intervals (700 -1100ms) of a fixation cross.

Planned Analysis

Replication of Y-intercept effect: Significant Pathway*Orientation interaction for the y-intercept on target-present trials for the 4° & 6° conditions. Oral breathing will have higher y-intercepts on target present trials compared with Nasal breathing in the 4° condition, but not the 6° condition.

Extension of Y-intercept effect: Oral breathing significantly higher y-intercepts (target present trials) compared with Nasal breathing in the 2° & 4° but not 6° condition.

Slopes Efficiency: Significant Pathway*Orientation interaction across both target-present & absent trials. Significantly lower search slopes for Nasal compared to Oral breathing in the 2° condition across target present & absent trials. No differences are expected in 4° & 6°.

References


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