

**Heart coherence intervention among highly anxious individuals:  
Effects on interoception and anxiety**

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**Introduction:** Trait anxiety is a stable facet of personality, which has been associated with (1) reduced autonomic flexibility and (2) increased interoception. Indeed anxious individuals show a predominance of sympathetic activation and attention to their body sensations, this vigilance towards the body is likely reinforcing their anxiety. Interoceptive accuracy, typically assessed by heartbeat counting tasks, is also increased in anxiety. At present, many mobile apps of cardiac coherence through rhythmic breathing to reduce anxiety by strengthening the parasympathetic system are available to the general public. In this pilot study, we investigated the impact of a weeklong breathing program via the Respi-Relax+ app on anxiety and interoception.

**Method:** 24 participants (mean age: 22.75,  $\sigma = 1.42$ , 18 females, 8 males), including 8 non-anxious control subjects (control group), 8 anxious control subjects (anxious control group) and 8 experimental anxious subjects (experimental group) took part in the study. The three groups were matched for age and gender. For one week, the experimental group received daily rhythmic breathing training. While the two control groups had to reflect on moral dilemmas and submit their answers in writing. To assess anxiety and interoceptive features prior and post-intervention, participants completed State-Trait Anxiety Inventory (STAI-Y), the interoceptive accuracy (IAS) and attention scales (IATS) and performed the heartbeat counting task followed by a self-appraisal of the accuracy of their response (confidence judgment). We hypothesised that breathing training should reduce anxiety levels, eventually resulting in a decrease in interoceptive components, with therefore a positive impact on the inflated attention towards body sensations.

**Results:** Firstly, the relationship between increased interoception and anxiety was confirmed. Indeed, anxiety scores on the STAI-Y were positively correlated with scores on the heartbeat counting task ( $r_s=0.416$ ;  $p=.043$ ) and the IATS ( $r_s=0.563$ ;  $p=.004$ ). But the confidence judgment for the heartbeat counting task is negatively related to anxiety ( $r_s=-0.7$ ;  $p<.001$ ). Secondly, anxiety and attention to body sensation significantly decreased in the anxiety group that received breathing training compared to the anxiety control group ( $U=11.50$ ;  $p=.03$ ,  $U=9.50$ ;  $p=.015$ ).

**Conclusions:** On the one hand, our results confirmed that interoceptive accuracy and attention to body sensations are increased in anxiety. But self-confidence in interoceptive abilities is diminished in anxiety, which may be explained by a more general lack of self-confidence characteristic of the anxious personality. On the other hand, a one-week cardiac coherence intervention reduces anxiety and attention to body sensations. Given these initial encouraging results, breath training mobile apps are promising possible treatments for anxiety and associated interoceptive dysfunctions.