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# Science 411

*4 fundamentals, 1 big takeaway, and 1 practical application*

## Citation

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**Benefits from one session of deep and slow breathing on vagal tone and anxiety in young and older adults**

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## 4 FUNDAMENTALS

### 1. Essential Background Material

*This study examined the effects of one 5-minute slow breathing session (6 breaths/min) on anxiety and heart rate variability (HRV) in young and older adults.*

Anxiety is widespread. It contributes to poor mental health and is associated with increased all-cause mortality. Moreover, anxiety might pose a more significant threat as we get older because our bodies might lose the resiliency to adapt to it. Thus, we must develop effective treatments for anxiety, especially in the older adult population.

It is established that slow deep breathing (usually around 6 breaths/min) can reduce anxiety and increase HRV, a physiological measure of resiliency. However, it's unclear if these same effects will hold true in an older population (surprisingly, no one has tested this explicitly).

**Thus, the goal of this paper was to use slow breathing in younger and older adults and measure how it impacted psychological anxiety (via a questionnaire) and physiological anxiety (using HRV).**



## 2. What Did this Research Do?

They recruited 25 younger adults with a mean age of ~20 years old and 22 older adults with a mean age of ~66 years old (a sample of at least 20 was needed to determine significance).

This paper was part of a more extensive study, so there seemed to be many tasks going on. However, for this paper, here are the three main components:

1. Take a state anxiety questionnaire (pre-test period)
2. Slow deep breathing session (5 min)
3. Retake state anxiety questionnaire (post-test period)

**The slow breathing exercise consisted of a 4-second inhale, and a 6-second exhale (6 breaths per minute).** Because they were focused on anxiety, they specifically used a longer exhale to maximize relaxation and promote a shift into a parasympathetic dominant state.

The questionnaire used was called Spielberger's State Anxiety Inventory, which consisted of 20 questions assessing anxiety.

HRV was measured continuously throughout the protocol. They measured differences between the "pre-test period" and "post-test period" to determine the significance of the breathing protocol. They focused on high frequency power (HF-HRV) and RMSSD (see sidebar).

## 3. What Were the Major Findings?

State anxiety was significantly lower after slow breathing in both the younger and older adults.

HF-HRV power increased (meaning physiological anxiety decreased) and was negatively correlated with perceived anxiety. **Thus, the greater the increase in HF-HRV, the lower the participant's subjective anxiety.**

Somewhat surprisingly, **HF-HRV increased more in older adults than younger ones.** This was surprising because the authors hypothesized the younger adults would have greater autonomic flexibility and would therefore be able to increase HRV more robustly.

**NOTE:** They make a strong argument that HF-HRV is a good measure of vagal tone when using breathing with slow, extended exhalation. I've read other studies saying HF-HRV is not a measure of vagal tone, so there doesn't seem to be agreement on what these HRV frequency-domain measurements really mean. In any case, this was published in Nature, and it's almost certain a reviewer brought it up. So, I am going to accept their justification for calling HF-HRV "vagal tone" since they're the experts getting published in Nature, not me.



## 4. Why Do These Results Matter?

These results provide three significant outcomes.

First, they show that older adults' vagal tone is persevered (perhaps even strengthened). **This suggests that deep breathing exercises might be particularly helpful in this population (but really for everyone) to improve aging and reduce anxiety.**

Second, they show that HF-HRV is negatively associated with perceived anxiety. Thus, measuring the HF-HRV of yourself or your clients might be a reliable way to assess physiological anxiety.

Third, HF-HRV is potentially a good indicator of vagal tone and overall physiological resiliency. The different HRV metrics still confuse me, and I'm not entirely sold on their arguments (see above sidebar). But, they make a good case for using HF-HRV in the paper. So, it seems like one that's worth measuring if you have the equipment.

## 1 BIG TAKEAWAY

Slow breathing at 6 breaths per minute (4-sec in/6-sec out) reduces subjective and physiological anxiety. **This holds true in younger and older adults and could be a valuable practice for promoting healthy aging.**

## 1 PRACTICAL APPLICATION

Perform slow breathing with a slightly longer exhalation (4/6, 5/7, etc.) anytime you experience anxiety to help with symptoms. Moreover, use this practice regularly to improve vagal tone, enhance physiological resiliency, and promote healthy aging.