

# THE CLINICAL VALUE OF SALIVARY CORTISOL AS A BIOMARKER OF STRESS IN VOICE RESEARCH

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**Background:** In some individuals, psychological stress may play a role in the development and/or maintenance of voice disorders such as muscle tension dysphonia. The psychobiological framework of stress and voice (Dietrich & Verdolini Abbott, 2008; revised in Helou, 2014) outlined stress-related psychobiological responses and how they might be linked with laryngeal function. Most voice research to date captured stress by assessing trait stress reactivity and/or state negative emotions. In contrast, little research measured cortisol, a key biomarker of the stress response, to assess whether a biological stress response in fact occurred besides cardiovascular arousal and perceived distress. The purpose of this research was to evaluate whether the inclusion of cortisol as a measure in voice studies provided clinically meaningful data that helped to understand the relationship between stress and vocal dysfunction. The hypothesis was that cortisol reactivity correlated positively with laryngeal airway resistance ( $R_{law}$ ) during voicing via a subset of personality traits. Such a relationship with  $R_{law}$  was expected to be smaller for trait stress reactivity alone or perceived fear.

**Method:** The author completed two studies with vocally healthy females, which included the collection of salivary cortisol. The studies investigated the effect of stress on (a) the central control of voice using fMRI ( $n = 13$ ), and (b) voicing efficiency using aerodynamic testing ( $n = 36$ ). Both studies used a social-evaluative stress protocol and included voicing efficiency measures. Personality was assessed with the NEO-PI-R or MPQ—BF and the Rosenberg self-esteem scale, and perceived fear was assessed with the PANAS-X.

**Results:** Across both studies, stress responders, as identified by stressor-induced cortisol increase, scored higher on trait Neuroticism/Negative Emotionality (Stress Reaction), and lower on Extraversion/Positive Emotionality (Social Potency) and self-esteem. Preliminary findings indicated a moderate negative correlation between salivary cortisol (area under the curve with respect to increase) and  $R_{law}$  during stressor exposure. This correlation with  $R_{law}$  was smaller for trait Stress Reaction. In contrast, the correlation between  $R_{law}$  and perceived fear scores was positive.

**Discussion:** The preliminary findings contradicted the general notion that a stress response is linked with increased  $R_{law}$  during voicing. Instead a strong biological stress response appeared to be linked with down-regulated laryngeal behavior. The advantage of cortisol is that a researcher does not have to rely on self-report of personality or emotional state to infer stress reactivity. More importantly, using cortisol one can differentiate between stress and fear responses. Future research will refine personality profiles of stress responders that reliably correlate with laryngeal function. The long-term goal is to improve screening methods for occupational voice users at risk for stress-related vocal dysfunction.