

## Individual Differences in Cognitive-Emotional Appraisal & Physiological Reactivity to Stress

**KEYWORDS:** *personality; cognitive appraisal; emotion; stress reactivity; ecological momentary assessment*

**INTRODUCTION:** Everyone experiences stressful life events, but the *magnitude* of stress experienced in response to the same stressor can vary considerably between two people. For example, certain people tend to express more heightened negative emotion in response to life events and therefore perceive their lives as more stressful.<sup>1</sup> Personality factors such as increased neuroticism, behavioral inhibition, and negative attributional style are also implicated in this greater stress reactivity<sup>1,2</sup>. I propose that these **individual differences** in response to stressors are strongly influenced by **personality**, and lead to variation in **cognitive-emotional appraisal and processing** of the stressful life event. In turn, this cognitive-emotional appraisal contributes to varying physiological reactivity, as measured by immune, cardiovascular, and endocrine response (See *Figure 1*).

Cognitive appraisal involves the **perceived severity** and **perceived controllability** of the stressor, as well as the magnitude and frequency of persistent, maladaptive, negative thoughts

leading up to and following the stressor (**worry/rumination**). Emotional reactivity involves the presence of **positive or negative affect** in response to the stressor (See *Figure 1*). A better understanding of how subjective cognitive-emotional reactions to stress relate to individual variation in **physiological reactivity** is needed to better understand key individual differences between people.

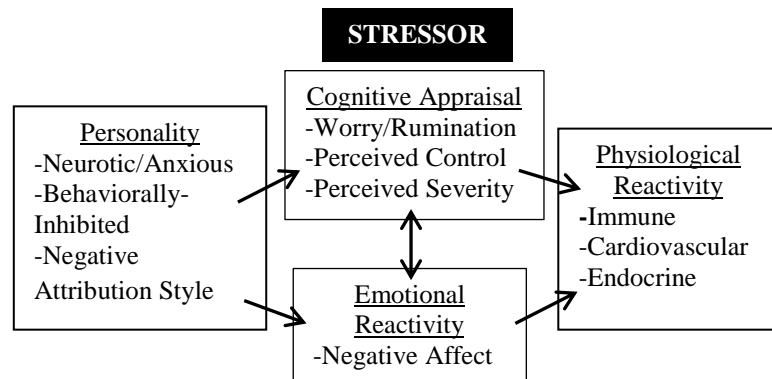
It is well established that stress relates to immunological dysregulation (e.g. slowed wound healing and increased viral susceptibility).<sup>3</sup> Yet the interplay between *individual differences* in stress reactivity and immune system reactivity has seldom been investigated, particularly with regard to how such changes play out in real time, real-life human contexts.<sup>2</sup> One reason for this lack of understanding is that studies of immune reactivity have largely been limited to short-term laboratory studies that use blood draws for serum/plasma-based biomarkers. With less invasive **salivary biomarker techniques** that are currently in development, more **ecologically-valid studies** of individual differences in stress reactivity could be conducted.

**RESEACH AIM 1:** To investigate how individual differences in personality relate to differences in physiological reactivity, specifically markers of immune system function.

**RESEARCH AIM 2:** To examine how cognitive appraisal of a stressor and emotional reactivity to a stressor mediate the relationship between personality and physiological reactivity.

**RESEARCH AIM 3:** To determine how relationships between personality, cognitive appraisal, emotional reactivity, and physiological reactivity play out over time in an ecological context.

**METHODS:** I have already independently conducted an extensive literature review to elucidate the connection between salivary and blood measures of inflammation and plan to publish a review article on this work. Along with Penn State investigators who are spear-heading further



*Figure 1.* Proposed model of personality, cognitive appraisal, emotional reactivity, and physiological reactivity in response to stress

investigation of salivary immune diagnostics, I hope to incorporate salivary measures of immune reactivity into novel methodological approaches to studying individual variation in the stress response. My research program during my graduate training will culminate in my implementation of three original studies described below.

**STUDY 1 (S1):** I will begin by using an existing data set to examine connections between individual differences and immune responses to stress. My advisor is PI on a longitudinal investigation of the degree to which inflammation mediates connections between stress and cognitive aging among diverse adults. I will be able to use those data to explore new dimensions of how personality (e.g. behavioral inhibition, negative attribution style) is related to cognitive-emotional responses to stress and, consequently, to physiological reactivity over a 4-year period.

**STUDY 2 (S2):** To experimentally model the relationship between personality and immune function, I will expose participants to an acute social lab stressor in order to measure individual differences in stress reactivity through endocrine, immune, and cardiovascular measures and through self-reported assessments of cognitive-emotional state. Specifically, immune function will be measured through circulating inflammatory markers obtained via saliva and blood.

**STUDY 3 (S3):** The data from S1 and S2 will be used to inform a larger naturalistic study which will utilize ecological momentary assessment (EMA), a method whereby participants report what they are feeling and/or how they are behaving in real-time in natural settings. In collaboration with Penn State's Dynamic Real-Time Ecological Ambulatory Methodologies (DREAM) initiative – a unique program designed to popularize and educate researchers on EMA methods – participants will be given smart phones which will prompt them to fill out assessments of cognitive-emotional states and to give saliva samples at specific time points. State-of-the-art hierarchical linear modeling and structural equation modeling will be utilized for mediation analyses in S1 and S2, as well as to examine between-subject and within-subject variation, including how multiple daily assessments change over time in S3.

**INTELLECTUAL MERIT and BROADER IMPACTS:** With the levels of stress that many in our society are facing, it is imperative to better understand the mechanisms by which some people become more susceptible to the physiological consequences of stress. My program of research has potential implications for improving **quality of life, coping strategies, interpersonal relationships, and productivity** in the workforce, as well as fostering **self-actualization** through stress reduction. These three studies will advance the field of psychoneuroimmunology by examining the **underutilized combination of less-invasive salivary inflammatory biomarkers with respect to individual differences**. The additional assessment of this concept through EMA will allow for greater external validity of results and help popularize more ecologically-valid studies. Pre-existing partnerships with a number faculty who already investigate individual differences in the stress response makes me well-poised to implement the tri-part research initiative I am proposing. In conjunction with the DREAM initiative and Penn State's Centers for Healthy Aging and "De-Stress Zone" (a biofeedback facility), I also plan to design and hold **workshops for education on ecological measurement of stress and stress self-management to implement with diverse populations**. With all of the opportunities for research and outreach available at Penn State, my current position places me in an ideal situation to begin explaining the individual variation that is often overlooked in physiological psychology studies.

**REFERENCES:** [1] Suls, J., Green, P., & Hillis, S. (1998). Emotional reactivity to everyday problems, affective inertia, and neuroticism. *Pers & Soc Psych Bltn.* 24: 127-136. [2] Segerstrom, S.C. (2000). Personality and the immune system: Models, methods, and mechanisms. *Annals of Behav Med.* 3:180-190. [3] Contrada, R., & Baum, A. (Eds.). (2010). *The handbook of stress science: Bio., psych., & health*. New York, NY: Springer Publishing Co.