

Testing the Effects of Friendship Quality on Hormonal Synchrony in Cortisol and Progesterone

Social bonds, specifically friendships, are typically associated with stress reduction and protection against disease and psychopathology, particularly for girls and women¹. One exception to this pattern is an aspect of a high-quality friendship, co-rumination, which is associated with increased friendship quality in females, but also increased anxiety and depressive symptoms over time². The hypothalamic–pituitary–adrenal axis is reactive to co-rumination, resulting in higher levels of cortisol³. Since there is a mismatch between adaptive (i.e., stress reduction) and maladaptive (i.e., co-rumination) outcomes of friendship, understanding biological mechanisms of co-rumination and friendship quality will tease apart the positive and negative aspects of close friendships.

Two hormones known to be involved in the stress response and affiliative behaviors are cortisol and progesterone. Cortisol has been widely studied as a marker in the stress response, but it has not been examined in the context of hormonal synchrony between friends. Progesterone, on the other hand, has received less attention in humans, but recent work suggests it may help to encourage affiliation during stress⁴. The goal of the proposed study is to examine if higher levels of hormonal synchronization in cortisol and progesterone between friends is associated with friendship quality and co-rumination.

Aims: The following aims will be examined to add to the existing literature as well as advance our knowledge of biosocial mechanisms associated with close friendships:

Aim #1: To examine if hormonal (i.e., cortisol and progesterone) synchrony of close friends is associated with friendship quality.

Aim #2: To examine if hormonal synchrony of close friends is related to co-rumination.

Aim #3: To examine how the interplay of co-rumination, hormonal synchrony and friendship quality affects internalizing symptoms (i.e., depression and anxiety).

Methodologies: To test this, we will recruit close friend dyads from Oklahoma State University (OSU). To control for time of day, the study will be conducted after 11am. To control for the reaction of the stress response to novel environments, the study will take place during two sessions. Day one of the study will consist of each member of the dyad answering questionnaires about internalizing symptoms and their friendship (i.e., friendship quality, co-rumination) for the close friend who is participating with them. This will allow us to cross-validate the quality of the friendship.

In day two of the study each member of the dyad will complete a medication and general health screening questionnaire. Then the dyad will talk to each other for 10 minutes about their favorite TV show as a warm-up task after which the first saliva sample will be collected. The first saliva sample (Time 1) will serve as a baseline for the dyad's cortisol and progesterone synchrony. Then, one participant (i.e., Friend One) will be randomly assigned to do the control task and the other participant (i.e., Friend Two) will be assigned to the stress task.

For the control task, Friend One will be asked to plan and diagram an amusement park for 15 minutes. For the stressor task, Friend Two will be led to a different room and will perform a modified version of the Trier Social Stress Task (TSST) and be randomly assigned to one of three experimental conditions: Positive, negative, or neutral feedback. They will be asked to give a 5 minute speech about their strengths and weaknesses with an additional 5 minute question and answer period. The second saliva sample (Time 2) will be taken immediately after the task. The purpose of the second saliva sample is to examine the cortisol and progesterone responses

individually to the tasks. This methodology was modeled after an assessment of mother-infant physiological attunement⁵ in which the infant's responses were coordinated with their mothers, despite not having been exposed directly to the stressor.

The dyad will reunite and complete a questionnaire without being allowed to talk. The purpose of this second questionnaire period is to serve as a 20 minute delay to collect cortisol and progesterone levels closer to their likely peak (Time 3). The questionnaire is selected on the basis that it is not socially stressful, therefore any change in hormone levels can be attributed to the stress task (i.e., Friend Two) and mirroring of reactivity (i.e., Friend One). In addition to salivary cortisol and progesterone, blood pressure will be collected for an autonomic nervous system representation of the stress response. The participants will then be debriefed about the true nature of the study.

Expected results: I expect to find that the dyads that have higher levels of hormonal synchrony will have higher levels friendship quality, in that they will report higher levels of friendship satisfaction. The dyads that have higher levels of hormonal synchrony will also have higher levels of co-rumination. I expect to find that dyads that have higher levels of friendship quality and hormonal synchronization with lower levels of co-rumination will have lower levels of internalizing symptoms. These results will lay the foundation to understanding the complex interplay between stress and affiliative responses, friendship quality, co-rumination, and internalizing symptoms.

Significance: The proposed study will advance the scientific community by implementing relational interventions (i.e., decreasing the maladaptive traits of friendship) that would serve to increase protective factors against disease promoting biological cascades. Additionally the proposed study will use a variety of methodologies (i.e., self-reports, blood pressure, and assays of cortisol and progesterone). While the majority of psychological research relies heavily on the self-report method, understanding the hormonal mechanisms that underpin our social relationships allow us to better predict individual health outcomes arising from relationship quality.

Intellectual Merit: This project provides a comprehensive and interdisciplinary perspective to the study of complex biosocial mechanisms associated with stress-related disorders. These methodologies provide a novel approach to test formerly separate models of social support and underlying biological mechanisms.

Broader Impacts: I will present my findings at conferences (i.e., Human Behavior and Evolution Society) and publish in peer-reviewed journals (i.e., *Hormones and Behavior*) to promote interest in the psychobiology of friendships and its protective role against disease promoting biological cascades. I will mentor undergraduates in my lab and expand their methodological skill set. Additionally, these findings will be disseminated to the community at departmental colloquiums, science café at OSU, and talks at Stillwater High School, where health-promoting relationship behaviors will be presented. This study will help to clarify the role of an important, and understudied relationship.

References:

¹. Taylor, S. E. (2006). *Current directions in psychological science*, 15(6), 273-277. ². Rose, A. J. (2002). *Child development*, 73(6), 1830-184. ³. Byrd-Craven, J., Geary, D.C., Rose, A.J., & Ponzi, D. (2010). *Hormones & Behavior*, 53, 489-492. ⁴ Wirth, M. M., & Schultheiss, O. C. (2006). *Hormones and Behavior*, 50(5), 786-795. ⁶ Waters, S. F., West, T. V., & Mendes, W. B. (2014). *Psychological science*, 25(4), 934-942.