Beyond Status: Exploring the Psychological and Physiological Effects of Trait Dominance and Prestige

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Abstract

Social status is associated with benefits that include reduced stress and better health. The route by which social status is earned – i.e., the trait-like reliance on dominance versus prestige – may modulate known relationships. These personality traits might be related to stress and health outcomes, but few studies have explored the relationship based on the routes by which they are achieved. Dominant individuals are driven to seek power by being assertive, intimidating, and coercive. Because of the association of trait dominance with these relatively anti-social processes, it is expected that trait dominance is affiliated with more robust indicators of stress responses which include higher basal glucocorticoids, higher heart rate, higher sympathetic activity, and lower parasympathetic activity, all while correlated with reduced mental and physical health. Prestigious individuals try to earn respect and admiration from others through knowledge, a particular skill set, or success in life's endeavors. On the other hand, due to the association trait prestige individuals have, it is expected they are affiliated with attenuated stress responses which include lower basal glucocorticoids, lower heart rate, lower sympathetic activity, and higher parasympathetic activity, together with better mental and physical health. This research aims to fill the gaps on how one's status-relevant personality is associated with the autonomic nervous system, cardiovascular system, glucocorticoids, testosterone, and self-reported mental and physical health. The study contained 129 *(N=129)* college-aged students who were given surveys (Dominance and Prestige Scale (DPS), the Perceived Stress Scale (PSS), Lifestyle and Habits Questionnaire-Brief (LHQB), and a Positive and Negative Affect Schedule (PANAS)), and had physiology recorded at baseline, stressor, and recovery during a social-evaluated cold pressor task. Relevant biomarkers to stress and health were collected and assayed in saliva, including basal glucocorticoids (cortisol, cortisone, and corticosterone), and

testosterone; cardiovascular physiology measured during the stress task included heart rate, high-frequency heart rate variability (an index of parasympathetic functioning), and pre-ejection period (an index of sympathetic functioning). The study found that trait dominance was associated with worse overall health, substance abuse, poor nutritional care, low social integration, positive affect, and high-frequency heart rate variability; trait prestige was associated with better overall health, a higher sense of purpose, high social integration, and positive affect. This study puts forward information on the effects of social status necessary for understanding the link between status, health, and stress.

Introduction

Social status – defined as rank within one's group – has been extensively correlated to stress and health outcomes (Sapolsky, 2005; Knight, 2022). Higher social status is linked with social benefits, including a heightened sense of control that often leads to reduced stress, and reduced cortisol. Lower social status is linked to social detriments, which include a lowered sense of control that leads to an increase in stress, and increased levels of cortisol (Sapolsky, 2005; Sherman & Mehta, 2020). Environmental factors - like socioeconomic status - shape health outcomes. Higher socioeconomic status – a social status earned within society – is linked to better health outcomes and lower socioeconomic status is linked to worse health outcomes (Adler & Ostrove, 1999; Fournier, 2020).

Societal position and socioeconomic class can be earned through two distinctive routes: dominance and prestige (Cheng et al., 2013). Dominance is associated with seeking status by being assertive, intimidating, and coercive. Individuals who fall under this category use threats to induce fear in lower-ranking individuals (Cheng et al., 2014). These dominant individuals have heightened responses to threatening stimuli related to their social rank, which allows them to protect and maintain their power by immediately taking action (Mead & Maner, 2012; Case & Maner, 2014). However, this threat sensitivity may also be a key factor in early mortality, cancer, chronic heart disease, increased stress, and worse health outcomes (Miller et al., 1996; Adler & Ostrove, 1999; Knight, 2022). Therefore, it is expected that higher trait dominance – a personality style associated with relying on dominance tactics – will be associated with more robust stress responses and worse mental and physical health.

The prestige route to status is associated with trying to earn respect and admiration from others through knowledge, a particular skill set, or success in life's endeavors. Individuals relying on the prestige route achieve rank and influence with persuasion rather than forcing acquiescence (Cheng et al., 2014). These individuals gain rank by building their social relations instead of taking it by force (Cheng et al., 2010). Due to the low threat sensitivity that trait prestige individuals experience, their social integration and support could lead to reduced stress and better health outcomes (Miller et al., 1996; Adler & Ostrove, 1999; Cohen, 2004; Holt-Lunstad et al., 2017; Knight, 2022). Therefore, higher trait prestige is predicted to be associated with attenuated stress response and better physical and mental health.

Prior Work Linking Personality to Stress and Health

Prior work provides evidence of associations between personality, stress, and health outcomes. Research on the Big Five personality traits - extraversion, conscientiousness, agreeableness, neuroticism, and openness - indicates those with higher levels of extraversion, conscientiousness, and agreeableness are exposed to fewer events or situations that cause stress. In comparison, those with higher levels of neuroticism and openness are linked to more events or situations that cause stress (Schacter et al., 2011; Segerstrom & O'Connor, 2012; Cheng et al., 2013; Srivastava & Das, 2015; Leger et al., 2016; Saleh et al., 2017; Crosswell & Lockwood, 2020). Neuroticism and openness personality traits are very similar to how a trait-dominant individual might behave within a societal hierarchy to gain a better societal position; these traits are linked to more stressful situations affecting health, causing worse health outcomes.

Other prior work linking personality to health has focused on the so-called type A and D personalities. Type A personalities are those with aggressive, hostile, and competitive behaviors (Mcleod, 2023). Compared to other personality types, those with type A personality behaviors are more likely to be diagnosed with chronic heart disease and report larger amounts of stress (Friedman & Booth-Kewley, 1987; Clarke, 2023). Type D personality is classified as distressful, sad, and negative behaviors (Clarke, 2023). Type D personality behavior is negatively associated with mental health status and experience more anxiety and depression symptoms than those with other personality types (Mols & Denollet, 2010). Since trait dominance has personality traits from both types A and D, individuals with trait dominance may experience higher chances of chronic heart disease, higher levels of stress, and more mental health symptoms for anxiety and depression.

One prior report has linked self-reported dominance and prestige with health outcomes. Dominance is associated with perceived stress and worse mental and physical health. In contrast, prestige was not associated with perceived stress and was associated with better physical and mental health (Knight, 2022). However, the prior work did not examine the objective indices of stress and health, like physiological measures. The current study aims to fill in the gap of specific physiological measures that play a role in health and stress and replicate prior work that measured the self-reported health and stress of trait dominance and prestige individuals.

Measuring Stress and Health

Health is multidimensional, with countless factors playing a part in one's health and stress outcomes. To advance the prior work on dominance, prestige, stress, and health, the present work aims to replicate prior findings of associations with self-reported health and examine the extent to which these personality traits correlate with objective indices of stress and health.

Self-reported Stress and Health

Self-reports are regularly used as an index to measure physical and mental health and well-being. Self-reported data is useful, especially in younger populations, in the sense that it allows an individual to describe their own experiences, rather than being inferred by someone else. For example, self-reported perceived stress has been extensively linked to negative health outcomes, which include psychiatric disorders like depression and even poor quality of sleep (Slavish & Graham-Engeland, 2015; Thorsén et al., 2022). In addition, self-reported physical fitness is linked to objective cardiovascular health (Minder et al., 2014) and self-reported global health is linked with depressed moods among college-aged adults (Ortega et al., 2013; Ramón-Arbués et al., 2020). Within the confines of health and stress measures, it is predicted that trait-dominant individuals will have higher stress and poorer mental and physical health, and trait-prestige individuals will have lower stress and better mental and physical health.

Endocrine Measures of Stress and Health

Glucocorticoids are steroid hormones released from the hypothalamic-pituitary-adrenal (HPA) axis that are critical for responding to stress, mediating homeostasis, and suppressing immune responses (Whirledge & Cidlowski, 2010). A major hormone within the glucocorticoid class is cortisol, which is an index of stress responses. These responses have been linked to health conditions such as cardiovascular disease, diabetes/insulin resistance, cognitive decline, pain, depression, and post-traumatic stress disorder (PTSD) (Luecken & Gallo, 2008; Segerstrom & O'Connor, 2012).

Although not often studied in the context of stress and health, testosterone - an anabolic-androgenic steroid - plays a critical role in modulating physiological reactions to stressors, particularly in the context of status-relevant stressors, which play a role in health and stress (Kelly & Jones, 2013). Levels of this hormone vary between individuals, especially between sexes. On average, males typically have a circulating testosterone concentration that is approximately 13 nmol/L higher than females (Handelsman et al., 2018). Critically, testosterone is a biological determinant of status-seeking behaviors (Wingfield et al., 1990; Mazur & Booth, 1998; Booth et al., 2006) and has been linked to dominant behaviors, such as aggression and antisocial behaviors. However, testosterone has generally not been found to correlate with self-reported dominance or prestige because testosterone represents a more implicit index of status-seeking, and self-reported factors are more explicit (Knight et al., 2020). In several causal experiments that pharmacologically manipulated testosterone levels, testosterone has been shown to cause heightened cortisol responses to social-evaluative stress, particularly among those high in trait dominance (Knight et al., 2017), and to modulate women's cardiovascular responses to threatening stimuli (e.g., angry faces) (van Honk et al., 1999; Van Honk et al., 2001).

Cardiovascular Measurements of Autonomic Function

Cardiovascular physiology is another objective indicator of health and stress that can provide insights into the autonomic nervous system (ANS) functioning. The ANS includes the sympathetic and parasympathetic branches which help regulate system-wide homeostatic responses to internal and external stimuli, such as stress (Verberne & Owens, 1998; Pereira et al., 2017; Gibbons, 2019). The sympathetic nervous system (SNS) is responsible for the body's fight or flight response which is activated in dangerous or stressful situations. This response increases heart and respiration rates and lowers the digestion rate. The parasympathetic nervous system (PNS) is responsible for the body's rest and digestion response which is activated when the body is resting, feeding, or relaxed. This response decreases heart and respiration rates and increases digestion rate (Furness, 2009; Alshak & M Das, 2024). These responses can be measured by certain cardiovascular data, in particular, high-frequency heart rate variability (HF-HRV) and pre-ejection period (PEP), with HF-HRV being a good index of the PNS, and PEP being a good index of the SNS (Krohova et al., 2017; Cribbet et al., 2020). Due to how dominance and prestige may be linked to divergent responses to stressor stimuli, it is expected that trait-dominant individuals will have higher activation of their SNS, and therefore, faster PEP. It should also be noted that prestige trait individuals are expected to have higher PNS activation - higher HF-HRV - which is a great measure of the resilience an individual has to a stressor, leading to better health outcomes due to the adaptability of the individual and the low stimulation of their SNS when compared to trait dominant individuals.

Hypotheses

In summary, prior research points to status affecting different aspects of health and stress. This study examines whether high trait dominance is associated with higher glucocorticoids, higher heart rate, lower parasympathetic activity, higher sympathetic activity, and worse mental and physical health outcomes. In addition, the study examines the extent to which high trait prestige is associated with lower basal glucocorticoids, lower resting heart rate, higher parasympathetic activity, lower sympathetic activity, and better mental and physical health outcomes. Finally, this study examines trait prestige’s association with attenuated stress responses and trait dominance's association with heightened stress responses. Because prior work suggests that testosterone is unlikely to be associated with self-reported dominance (or prestige), this work explores relationships with testosterone without the expectation of a direct effect.

Methods

Participants

The convenience sample included 129 *(N=129)* undergraduate students enrolled (in General Psychology 'PSYC 1001') at the University of Colorado at Boulder. The final study included 59 males and 70 females. Racial/ethnic groups included were White (87%), Black (5%), Hispanic (3%), American Indian (1.5%), Asian/Pacific Islander (1.5%), and other (2%). The participants' ages ranged from 18-23 *(M = 18.9, SD = 1.1)*. The participants chose to partake in the study and achieved 2 credits via the Sona CU Psychology 1001 subject pool.

Protocols

The study's approach consisted of a cross-sectional design that examined the relationship of dominance and prestige with self-reported health and stress, basal glucocorticoids, testosterone, and cardiovascular indices of autonomic functioning.

Written informed consent was obtained from all participants, and the study was approved by the institutional review board (IRB) and conformed to the requirements for conducting human subject research. Upon arrival, participants were given a brief overview of the study, expected to pass exclusion criteria, and given a written consent form to fill out. Three electrocardiogram (ECG) and 8 impedance cardiography (NICO) sensors were placed in their specified positions on the participant. Following the setup, participants filled out the respective self-report questionnaires while baseline cardiovascular measurements were taken. After 5 minutes of cardiovascular recording was completed, a baseline saliva sample was collected. The physiology was recorded and stored via ACQknowledge (BioPac Systems) and the saliva samples were obtained via the passive drool method. All participants were then exposed to the social-evaluated cold pressor task (SECPT), a physical stressor (the participant submerged their hand in ice-cold water for as long as they chose to, up to 3 minutes) paired with social evaluation. Saliva was collected immediately after and again 20 minutes after the end of the SECPT. Cardiovascular physiology was recorded throughout the SECPT and during a 5-minute recovery period after the SECPT was ended. More questionnaires were filled out by the participants following the SECPT. After the study finished, forms and contact information were given to the participants, any questions a participant had were answered, and credit was given for the study.

Social-Evaluative Cold Pressor Task

This study used the SECPT to induce a stressed state in all participants (Schwabe et al., 2008; Vogel & Schwabe, 2018). Before a participant arrived, a large cooler with a water pump was filled with ice. Water was then added with enough volume to submerge a participant's hand fully. The pump was then turned on to circulate the water, and a thermometer was placed in the water to measure the temperature, aiming for between 0-3 degrees Celsius.

To begin the stressor, participants were instructed to sit by the cooler containing the ice water, where they received instructions for the task. The participants were also informed of the camera which was turned on to record the participants' reaction with the digital screen of the camera flipped towards the participant to heighten the sense of social evaluation. Research assistants were trained to take notes and not react while 'observing' participants.

Before the stressor began, participants were read the following statement:

"We are now going to evaluate your pain tolerance. Please sit here. Before we begin, are you currently in any pain? This cooler is full of very cold water. We are going to ask you to submerge your hand up to your wrist for as long as you can stand. Avoid touching the sides or bottom of the cooler - let your hand rest in the water, open. After ten seconds, we will ask you to rate the intensity of the pain in your hand from 0 to 10, with 0 being no

pain at all and 10 being the worst pain imaginable using this scale. You are going to take your hand out of the water only when it feels too painful to keep going. This is up to you - you decide when it is too painful to keep going. After you take your hand out of the water, we will ask you the pain question again, this time about the intensity of the pain in your hand right before you took it out. We are also going to be using this camera to record and evaluate your response to pain. Keep your eyes on the camera throughout the evaluation. Trained researchers will watch and rate these videos, comparing your response to other participants' responses. Keep your eyes on the camera the entire time. Do not speak during the evaluation. Do not look at your hand or the researchers. You are now being recorded."

After all instructions were given, the participant was asked on a scale of 1-10 how much pain they were in (i.e., before submersion) and then allowed to start the task by fully submerging their hand in the cold water. After 10 seconds, the participant was asked the same pain question. The participant then kept their hand in the cold water until it was too unbearable or if they reached a 3-minute mark. After the participant withdrew their hand from the water they were asked the same pain question again.

Measures

Dominance and Prestige Scale (DPS)

A well-validated, self-reported scale was used to measure dominance and prestige (Cheng et al., 2010). The scale assessed how dominant or prestigious an individual is and consisted of 17 items. Responses to each item were rated by a 7-point Likert-type scale (1 = "Not at all," 4 = "Somewhat," and 7 = "Very much"). For example, one of the questions asked, "I try to control others rather than permit them to control me." The average response for the items were calculated to index levels of trait dominance and prestige. The scale had high internal reliability for both dominance *(a= 0.78)* and prestige *(a= 0.74)*.

Lifestyle and Habits Questionnaire-Brief (LHQB)

To measure self-reported health in a young adult population, the LHQB was used. The scale was validated to measure health-relevant lifestyles, behaviors, and attitudes of university-aged individuals (Dinzeo et al., 2014). The self-reported scale was used as a continuous variable. The questionnaire assessed lifestyle behaviors/attitudes and consisted of 42 items across 8 subscales. Responses to each item were rated by a 5-point Likert-type scale (1 = "Strongly disagree," 2 = "Disagree," 3 = "Neutral," 4 = "Agree," 5 = "Strongly agree,"). The questions were worded such that higher scores indicated better health outcomes, such as better social connections, lower substance use, etc. Each set of questions was categorized into physical health (6 items), psychological health (7 items), substance use (8 items), nutrition (4 items), environmental concerns (5 items), social concerns (5 items), accident prevention/safety (4 items), and a sense of purpose (3 items). For example, one of the statements in the psychological health subscale was, "I get at least 7-8 hours of sleep at night and wake up feeling rested and refreshed." The total score per category was calculated by adding up the scores in each category and dividing them by the number of items per category. The scale for physical health had high internal reliability *(a = 0.89)*; the scale for psychological health had high internal reliability *(a = 0.71)*; the scale for substance use had high internal reliability *(a = 0.84)*; the scale for nutrition had questionable internal reliability *(a = 0.6)*; the scale for environmental concerns had high internal reliability *(a = 0.72)*; the scale for social integration had low internal reliability *(a = 0.57)*; the scale for accident prevention/safety had low internal reliability *(a = 0.55)*; the scale for sense of purpose had high internal reliability *(a = 0.7)*; the overall LHQB scale had low internal reliability *(a = 0.43)*. Principle analyses focus on the overall scores to align with prior work (Knight, 2022).

The Perceived Stress Scale (PSS)

The PSS was utilized to gauge participants' self-reported stress levels (Cohen et al., 1983). The scale assessed how stressed participants perceived themselves in the past week and consisted of 10 items. Responses to each item were rated by a 5-point Likert-type scale (0 = “Never,” 1 = “Almost never,” 2 = “Sometimes,” 3 = “Fairly often,” and 4 = “Very often”), with scores ranging between 0-13 to be considered as low stress, 14-26 to be considered as moderate stress, and 27-40 to be considered as high stress (however, the scale was used as a continuous variable). For example, one of the questions asked was, “In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?” The total score per participant was calculated by scoring and reverse scoring questions and then adding the scores together. The scale had high internal reliability *(a = 0.81).*

Positive and Negative Affect Scale (PANAS)

Watson and colleagues (1988) developed and validated a self-reported scale to measure the mood and emotion of an individual, used to answer the research questions posed in this paper (continuous variable). The scale assessed how positively or negatively an individual feels regarding emotion and mood, and the scale consisted of 20 items. Responses to each item were rated by a 5-point Likert-type scale (1 = “Very slightly or not at all,” 2 = “A little,” 3 = “Moderately,” 4 = “Quite a bit,” 5 = “Extremely,”). Both positive (e.g., “Enthusiastic”) and negative affect (e.g., “irritable”) were evenly distributed across all items. Scores can range from 1-5 with lower scores in each category representing lower effect and higher scores representing higher effect. The total score per category was calculated by adding the scores on respective items per category, producing a "positive" and "negative" score. The scale for positive pre-PANAS had a high internal reliability *(a = 0.86)*; the scale for negative pre-PANAS had a high internal reliability *(a = 0.88)*; the scale for positive post-PANAS had a high internal reliability *(a = 0.90)*; the scale for negative post-PANAS had a high internal reliability *(a = 0.88)*.

Salivary Biomarkers

Saliva samples were assayed for basal glucocorticoids (i.e. cortisol, cortisone, and corticosterone) and testosterone, as well as several other hormones not analyzed in the present report (i.e., DHEAS, estradiol, progesterone). The passive drool method was used to obtain 3 separate 3.5 mL samples of saliva into 15 mL conical tubes at baseline, immediately after the stressor, and after 20 minutes of recovery. Frozen samples were thawed, centrifuged for 15 minutes at 3000 RPM to remove solid particulate, and aliquoted into 300 µL samples. These samples were sent for liquid chromatography-tandem mass spectroscopy (LC/MC) assay using previously published methods (Gao et al., 2016). Testosterone values were normalized (z-scored) within sex to remove the large differences in testosterone levels between men and women.

Cardiovascular Biomarkers of Autonomic Function

Heart rate (HR) is medically necessary when examining an individual's health and is a predictor of stroke, coronary artery disease, death, and an abundance of noncardiovascular diseases (D. Zhang et al., 2016). Heart rate variability (HRV) is the beat-to-beat variation in heart rate which, when measured in a high-frequency domain (i.e., between 0.15 and 0.40 Hz), is thought to represent PNS control of cardiovascular activity. Some factors that can affect HF-HRV are body mass index (BMI), sex, mood, and alcohol/smoking behaviors (Sahdra et al., 2015; Curtis et al., 2020; Orini et al., 2023). PEP is also a good measure because it is modulated by mental and physical stress and is an index of beta-adrenergic sympathetic control (Bethesda, 2012; Forouzanfar et al., 2019; Pilz et al., 2023).

Cardiovascular physiology was obtained through ECG (electrocardiogram) and NICO (non-invasive impedance cardiography) sensors through the BioPac MP160 system and recorded on ACQKnowledge. Data were visually checked for quality on ACQKnowledge by a trained research assistant. ACQKnowledge's PEP analysis function was used to locate the ECG and ICG (impedance cardiograph) complex boundaries (i.e., R-spikes, B-point, etc.). Complex boundaries were extracted from the three epochs (baseline, stress, recovery) and analyzed in R. The RHRV package (Rodríguez-Liñares et al., 2011) was used to calculate normalized HF-HRV, with the waveform ranging from 0.15-0.40 Hz. PEP was calculated as the time from QRS onset to the B-point (i.e., ventricular depolarization to Semilunar valves opening), using the Lozano and colleagues (2007) method to estimate the B-point.

Analysis

Data were analyzed by using linear regression models which examined the relationship between dominance/prestige and a given self-reported health or stress outcome. Similarly, biomarkers were examined for baseline correlations with dominance and prestige. Changes in biomarkers and affect due to stress were examined using linear regression with the dependent variable being a change score calculated by subtracting pre-stress (baseline) values from a post-stress measure (i.e., affect: measured immediately after the stressor; hormones: measured 20 minutes after the stressor) or from values recorded during the stressor (i.e., cardiovascular indices). Results report relationships via a regression coefficient, 95% confidence interval, degrees of freedom, t-test value, and p-value.

Results

Self-Reported Health, Stress, and Affect

LHQB

Trait dominance was associated with worse self-reported health overall (*B*= -0.057, *95% CI*= [-0.114, -0.000], *t(*109*)*= -1.971, *p*= 0.051), whereas trait prestige was associated with better self-report health overall *(B*= 0.098, *95% CI*= [0.020, 0.176], *t(*109*)*= 2.448, *p*= 0.016).

Within the subscales of the LHQB, trait dominance was associated with increased substance use (*B*= -0.233, *95% CI*= [-0.390, -0.076], *t(*109*)*= -2.907, *p*= 0.004), poor nutrition *(B*= -0.161, *95% CI*= [-0.282, -0.040], *t(*109*)*= -2.605, *p*= 0.010), and worse social integration *(B*= -0.116, *95% CI*= [-0.200, -0.033], *t(*109*)*= -2.742, *p*= 0.007). Trait dominance was not associated with physical health (*B*= 0.143, *95% CI*= [-0.030, 0.317], *t(*109*)*= 1.619, *p*= 0.188), psychological health (*B*= 0.055, *95% CI*= [-0.052, 0.162], *t(*109*)*= 1.014, *p*= 0.313*)*, environmental concerns (*B*= 0.005, *95% CI*= [-0.111, 0.122], *t(*109*)*= 0.091, *p*= 0.928), accident prevention/safety (*B*= -0.104, *95% CI*= [-0.210, 0.002], *t(*109*)*= -1.919, *p*= 0.058), and sense of purpose (*B*= -0.047, *95% CI*= [-0.191, 0.097], *t(*109*)*= -0.642, *p*= 0.522).

Trait prestige was associated with social integration (*B*= 0.141, *95% CI*= [0.026, 0.255], *t(*109*)*= 2.402, *p*= 0.018) and a stronger sense of purpose (*B*= 0.237, *95% CI*= [0.039, 0.435], *t(*109*)*= 2.345, *p*= 0.021). Trait prestige was not associated with physical health (*B*= 0.187, *95% CI*= [-0.030, 0.317], *t(*109*)*= 1.619, *p*= 0.127), psychological health *(B*= 0.133, *95% CI*= [-0.014, 0.280], *t(*109*)*= 1.772, *p*= 0.079), substance use *(B*= -0.056, *95% CI*= [-0.273, 0.160], *t(*109*)*= -0.509, *p*= 0.612), nutrition (*B*= 0.146, *95% CI*= [-0.021, 0.312], *t(*109*)*= 1.711, *p*= 0.090), environmental concerns (*B*= -0.008, *95% CI*= [-0.168, 0.152], *t(*109*)*= -0.094, *p*=

0.925), and accident prevention/safety (*B*= 0.003, *95% CI*= [-0.143, 0.149], *t*(109)= 0.046, *p*= 0.964).

PSS

Unlike prior work (Knight et al., 2022), trait dominance and prestige were not associated with perceived stress (Dominance: *B*= 0.037, *95% CI*= [0.039, 0.435], *t*(109)= 2.345, *p*= 0.501; Prestige: *B*= -0.030, *95% CI*= [-0.177, 0.118], *t*(109)= -0.392, *p*= 0.696).

PANAS

Trait dominance was associated with heightened positive affect-pre (*B*= 0.138, *95% CI*= [0.017, 0.259], *t*(108)= 2.231, *p*= 0.028) and positive affect-post (*B*= 0.199, *95% CI*= [0.056, 0.343], *t*(108)= 2.725, *p*= 0.007). Trait dominance was not associated with negative affect-pre (*B*= -0.012, *95% CI*= [-0.129, 0.105], *t*(108)= -0.200, *p*= 0.842) or negative affect-post (*B*= 0.053, *95% CI*= [-0.057, 0.163], *t*(108)= 0.948, *p*= 0.345).

Trait prestige was associated with heightened positive affect-pre (*B*= 0.310, *95% CI*= [0.143, 0.477], *t*(108)= 3.644, *p*= <0.001) and positive affect-post (*B*= 0.376, *95% CI*= [0.179, 0.574], *t*(108)= 3.741, *p*= <0.001). Trait prestige was not associated with negative affect-pre (*B*= -0.015, *95% CI*= [-0.176, 0.146], *t*(108)= -0.186, *p*= 0.853) and negative affect-post (*B*= 0.017, *95% CI*= [-0.134, 0.168], *t*(108)= 0.218, *p*= 0.828).

Hormones

Basal Glucocorticoids

Trait dominance was not associated with basal glucocorticoids (e.g. cortisol, cortisone, corticosterone) (*B*= *-0.016*, *95% CI*= [-0.161, 0.129], *t*(108)= -0.215, *p*= 0.830) and cortisol specifically (*B*= -0.025, *95% CI*= [-0.577, 0.526], *t*(108)= -0.089, *p*= 0.929). Trait prestige was not associated with basal glucocorticoids (*B*= 0.037, *95% CI*= [-0.164, 0.237], *t(*108*)*= 0.358, *p*= 0.721) nor cortisol specifically (*B*= -0.043, *95% CI*= [-0.149, 0.718], *t(*108*)*= -0.110, *p*= 0.913).

Testosterone

Trait dominance was not associated with testosterone (*B*= -0.013, *95% CI*= [-0.206, 0.181], *t(*108*)*= -0.129, *p*= 0.898). Trait prestige was not associated with testosterone (*B*= 0.186, *95% CI*= [-0.082, 0.453], *t(*108*)*= 1.362, *p*= 0.176)

Dry Biomarker

Cardiovascular Physiology

Trait dominance was associated with high-frequency heart rate variability (*B*= -10.718, *95% CI*= [-20.386, -1.051], *t(*87*)*= -2.173, *p*= 0.032). Trait dominance was not associated with heart rate (*B*= 0.882, *95% CI*= [-1.77, 3.533], *t(*87*)*= 0.652, *p*= 0.516), heart rate variability (*B*= -173.495, *95% CI*= [-530.086, 183.097], *t(*82*)*= -0.954, *p*= 0.343), and pre-ejection period (*B*= -1.382, *95% CI*= [-3.211, 0.446], *t(*84*)*= -1.482, *p*= 0.142).

Trait prestige was not associated with heart rate (*B*= -0.926, *95% CI*= [-4.738, 2.886], *t(*87*)*= -0.476, *p*= 0.635), heart rate variability (*B*= 115.474, *95% CI*= [-392.231, 623.180], *t(*82*)*= 0.446, *p*= 0.657), high-frequency heart rate variability (*B*= 8.310, *95% CI*= [-5.592, 22.211], *t(*87*)*= 1.172, *p*= 0.245), and pre-ejection period (*B*= -0.786, *95% CI*= [-3.438, 1.865], *t(*84*)*= -0.581, *p*= 0.563).

Discussion

The study explored how distinctive routes that lead to social status - dominance and prestige - were associated with health and stress. Previous work points to how rank within our social hierarchies interacts with one's health and stress (Luecken & Gallo, 2008; Whirledge & Cidlowski, 2010; Segerstrom & O'Connor, 2012; Cheng et al., 2013; Saleh et al., 2017; Crosswell & Lockwood, 2020; Knight, 2022). The current results showed that beneficial health outcomes lean towards prestige, rather than dominance. In particular, prestige had better overall self-reported health, which included increased social integration, higher sense of purpose, and positive affect. On the other hand, dominance had overall worse self-reported health, including higher substance abuse, poor nutritional intake, and poor social integration.

However, this investigation did not find any significant results pointing to self-reported stress. Prior work found that self-reported stress was associated with dominant and prestige traits, and portions of that prior work were conducted during the timeframe of the pandemic (Knight, 2022). It is still unclear if trait dominance or prestige is linked to stress. Stress can be linked to multiple factors in one's life, and big events like the pandemic could have caused a spike in high self-reported stress. It is also possible that where and when the study is conducted could impact study results, with speculation of different environmental factors, like the pandemic - seen in prior work (Knight, 2022) - affecting health and stress, in comparison to the current study, with stress, in particular, being affected.

Basal glucocorticoids and testosterone were also found to not have any association with dominance and prestige. Though the study didn't find any relation to these steroid hormones, it is worth noting that testosterone is theorized to drive social status-earning behaviors, health, and stress (Wingfield et al., 1990; Mazur & Booth, 1998; Booth et al., 2006; Whirledge & Cidlowski, 2010; Kelly & Jones, 2013). Despite this prior theorization, a growing body of evidence suggests that testosterone acts as an implicit motivator of status-seeking behavior and does not align with more explicit measures like self-reported trait dominance. The lack of an association with cortisol may also not be surprising, given that prior work has shown that it is the interactive effects of testosterone and trait dominance that cause heightened cortisol responses to social stress (Knight et al., 2017). This prior work also did not find evidence that trait prestige and testosterone interacted to predict stress responses. Future work should investigate higher-order interactions with dominance and prestige and examine not only their structure, but also reshape the framework for larger multi-level group interactions between dominance, prestige, and testosterone which may help examine the cortisol stress response in those individuals (Battiston et al., 2021; Gibbs et al., 2022; Y. Zhang et al., 2023).

Future exploration into the autonomic nervous system function should be examined further for differences between trait-dominant and prestige individuals, especially for HF-HRV and PEP due to both being good indexes of the PNS and SNS respectively (Krohova et al., 2017; Cribbet et al., 2020). Over time and across repeated stressors, over-exposure to sympathetic activation can lead to cardiovascular health problems like left ventricle diastolic dysfunction (Grassi et al., 2009). Further exploration may point in the direction of a specific trait - dominance or prestige - which gives insight into potentially reducing SNS activation, and lowering cardiovascular health problems.

Limitations and Future Direction

A few factors restricted the study, notably the limited diversity of the participants and a somewhat constrained investigation of stress responses. There were also only 129 participants, which is relatively small for self-report studies, but of moderate size for biopsychosocial stress research. 87% of the participants were white and all the participants were also college-aged students (18-23 years), who were enrolled in ‘General Psychology’ at the University of Colorado at Boulder. Future work should unpack the degree to which demographic differences may alter these relationships. Diving deeper into the exploration of different age groups, incomes, ethnicities, educations, occupations, genders, and sexes should all be examined more thoroughly due to different hierarchical styles to earn social status via dominant and prestigious behaviors. These behaviors are ultimately based on how individuals navigate through these distinguished groups in which they originated from, and the experiences they have faced in their environments to earn this said social status. Investigation of these different groups will be key in determining the effects that social hierarchies have on health, stress, and socioeconomic status.

The study was also constrained somewhat by a limited view of stress responses, though even the combination of cortisol and autonomic data is somewhat novel. Saliva samples are being assayed for inflammatory markers currently, which could provide insights into immune activity. Future work could also consider investigating more self-reported responses to the stressor and more behavioral markers. Other possible measures that future studies could examine would be electrodermal measures like skin conductance level (SCL) and skin conductance responses (SCRs) as well as respiratory reactivity which includes tidal volume (Vt) and inspiratory time (Ti) for ANS function, VO_2 max could also be examined for further measurement of cardiovascular health (Bye et al., 2013; Behnke et al., 2022).

The current study examined college-aged students in a very healthy environment. Although the reported effects may be seen in any demographic, older populations may be worth exploring. The reason behind examining older populations is due to their higher risk of health complications. Seeing if there is a link between dominant or prestige traits in an older adult population may help give insight into the prevention of certain health complications seen in older populations with declining health.

Although the study did not receive inflammatory cytokines data, it should not be dismissed for future studies, especially when using a stressor like the SECPT. Proinflammatory cytokines are involved in the up-regulation of inflammatory response reactions due to a stressor on the body, primarily seen in Interleukin-1-beta ((IL)-1β), Interleukin-6 ((IL)-6), Interleukin-8 ((IL)-8), and tumor necrosis factor-alpha ((TNF)-*a*)). (IL)-1β are released into the body during cell inflammation, infection, injury, and invasion. (IL)-6 contributes to neuropathic pain behavior after peripheral nerve injury and is critical in the neuronal reaction to nerve injuries. (IL)-8 is a chemotactic factor that is one of the major mediators of the inflammatory response of infection or tissue injury, that plays a key role in attracting T lymphocytes (T-cells), neutrophils, and basophils (J.-M. Zhang & An, 2007; Canil, 2008). TNF-*a* is responsible for a wide range of signaling events within cells, which leads to apoptosis or necrosis, and plays a key role in some pain modules. (TNF)-*a* plays a significant role in the development, progression, persistence, and resolution of autoimmune diseases, and is an important factor in infection and cancer resistance, as well as both inflammatory and neuropathic hyperalgesia. Some notable autoimmune diseases that have an overabundance of (TNF)-*a* are rheumatoid arthritis, psoriatic arthritis, ankylosing spondylitis, psoriasis, ulcerative colitis, Crohn’s disease, noninfectious uveitis (J.-M. Zhang & An, 2007; Chadwick et al., 2008; Jang et al., 2021). For future studies, (IL)-1β,6,8, and (TNF)-*a* should be examined due to their modulation in health responses, and those responses may differ between dominant and prestige trait individuals.

Conclusion

The results of the study give more insight into the effects trait dominance and prestige have on health and stress. Trait dominance and prestige are two routes by which individuals earn social status (Cheng et al., 2013; Fournier, 2020) and have previously been linked with stress and health (Cohen, 2004; Sapolsky, 2005; Holt-Lunstad et al., 2017; Sherman & Mehta, 2020; Knight, 2022). Trait dominance was associated with worse overall health, substance abuse, poor nutritional care, low social integration, positive affect, and high-frequency heart rate variability. Trait dominance was not associated with perceived stress as seen in previous works. On the other hand, trait prestige was associated with better overall health, a higher sense of purpose, high social integration, and positive affect. Therefore, this work puts forward information on the effects of social status necessary for understanding the link between status, health, and stress. Future studies should focus on finding correlations to how specific traits - particularly dominance and prestige - affect certain health and stress factors found in college-aged students. This data can help open new findings regarding specific health outcomes and how one may be able to avoid negative health consequences in different demographics.

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Table

Table 1: Mean, Standard Deviation, and Change

#	VARS	Mean	SD	Table_out
1	DOM	2.977822581	0.9487701	2.98 (0.95)
2	PRES	5.122759857	0.7119263	5.12 (0.71)
3	LHQB_Phys	3.533602151	0.9075936	3.53 (0.91)
4	LHQB_Psych	3.494239631	0.5718347	3.49 (0.57)
5	LHQB_S11bUse	3.711693548	0.8393852	3.71 (0.84)
6	LHQB_ utr	2.70766129	0.6623758	2.71 (0.66)
7	LHQB_Enviro	3.564516129	0.631966	3.56 (0.63)
8	LHQB_Social	4.230645161	0.4582003	4.23 (0.46)
9	LHQB_AccPrev	3.933467742	0.5586614	3.93 (0.56)
11)	LHQB_SPurp	3.994623656	0.7507706	3.99 (0.75)
11	PSS	2.723255814	0.5469034	2.72 (0.55)
12	PositiveAff_pre	2.825735563	0.6832858	2.83 (0.68)
13	NegativeAff_pre	1.588368056	0.5831466	1.59 (0.58)
14	PositiveAff_post	2.622583559	0.8134793	2.62 (0.81)
15	NegativeAff_post	1.46504065	0.5527551	1.47 (0.55)
16	cortisol_)	5.497148221	2.9911524	5.5 (2.99)
17	dCORT	2.365261468	5.4229658	2.37 (5.42)
18	testosterone 1 zws	-0.005312836	0.9938369	-0.0 I (0.99)
19	dT	0.010670898	1.0042074	O.oJ (l)
21)	HR out Base	83.98143747	12.6221022	83.98 (12.62)
21	dHR	2.582124533	12.1389646	2.58 (12.14)
22	HF HRV out Base	796.5117514	923.8826549	796.51 (923.88)
23	dHRV	404.0041016	1538.322408	404 (1538.32)
24	HFHR.Vnu Base	0.354286227	0.1294964	0.35 (0.13)
25	dRMSSD	-3.896742047	62.1047758	-3.9 (62.1)
26	PEP Base	129.9730801	11.8733898	129.97 (11.87)
27	dPEP	-0.997085536	7.9650368	-1 (7.97)

Figures

Figure 1: LHQB: Physical Health Subscale

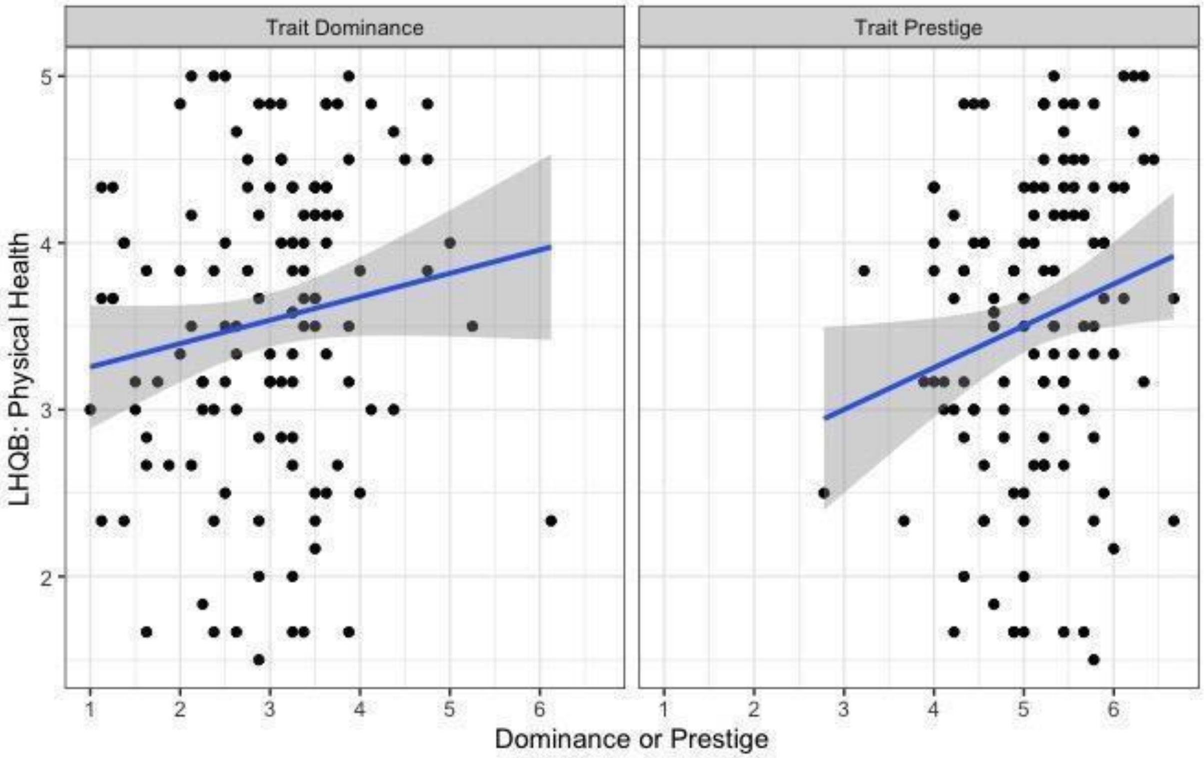

Figure 2: LHQB: Psychological Health Subscale

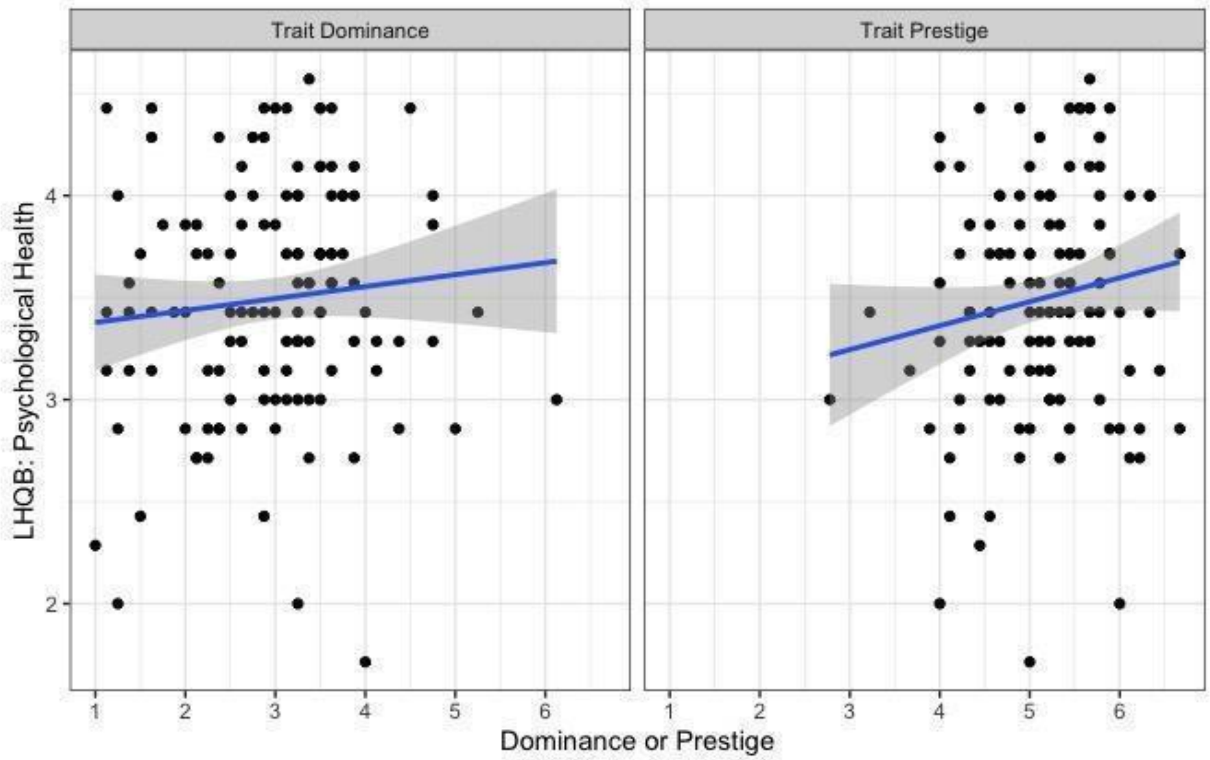

Figure 3: LHQB: Substance Use Subscale

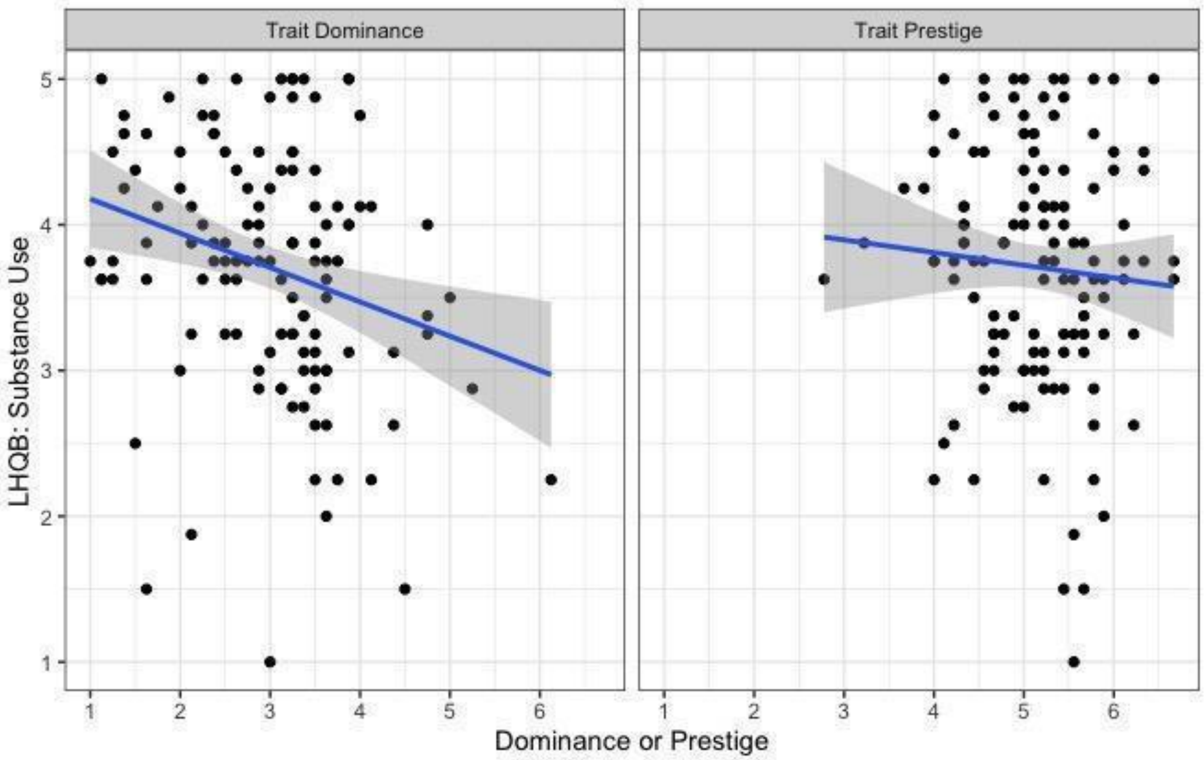

Figure 4: LHQB: Nutrition Subscale

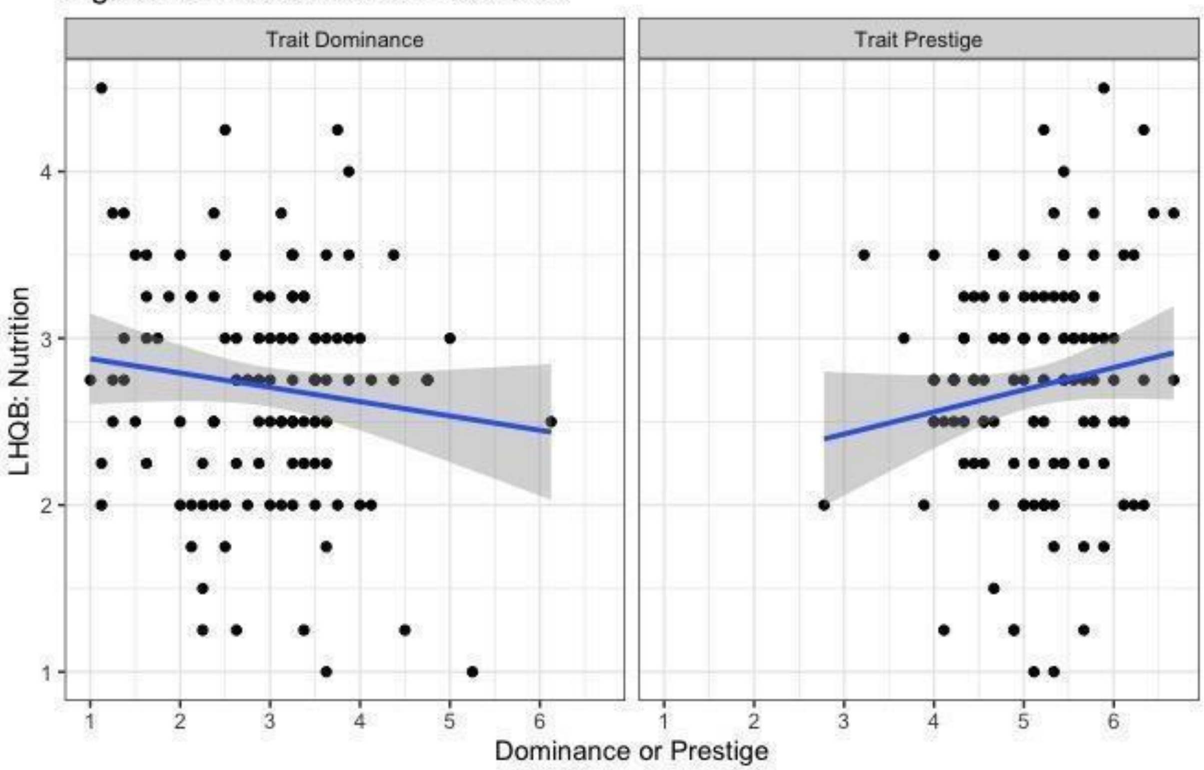

Figure 5: LHQB: Environment Subscale

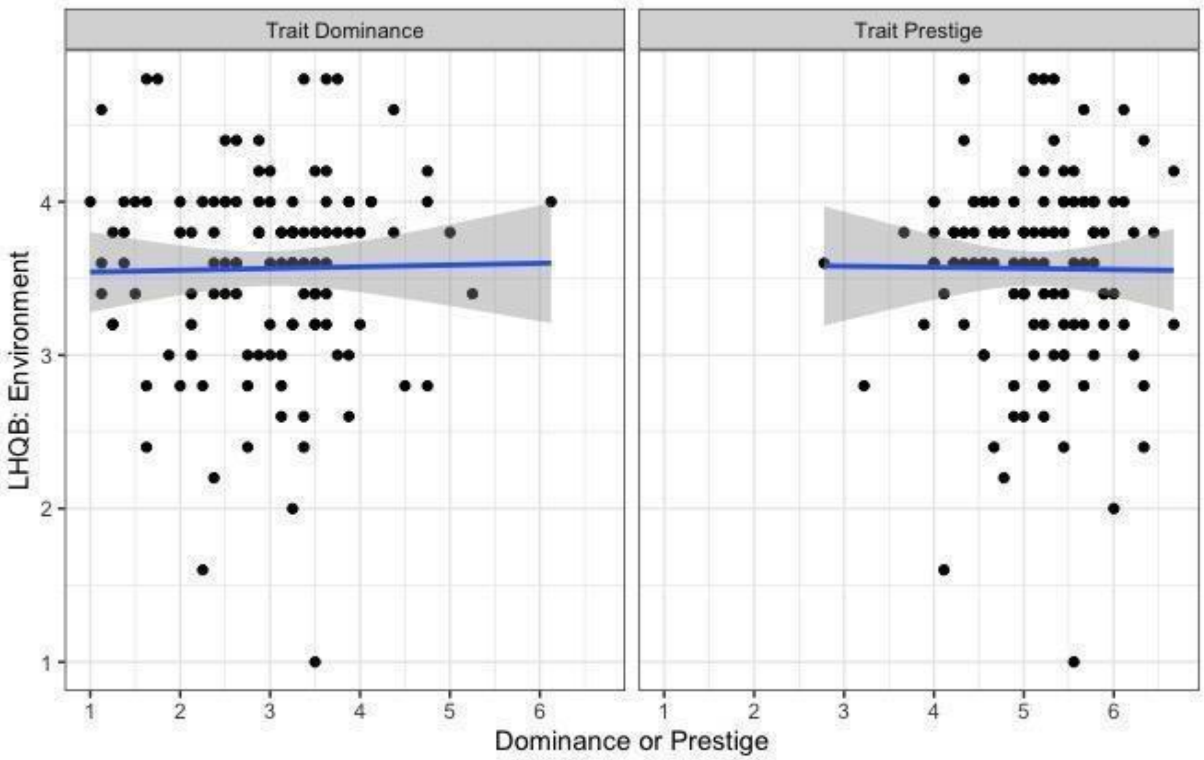

Figure 6: LHQB: Social Integration Subscale

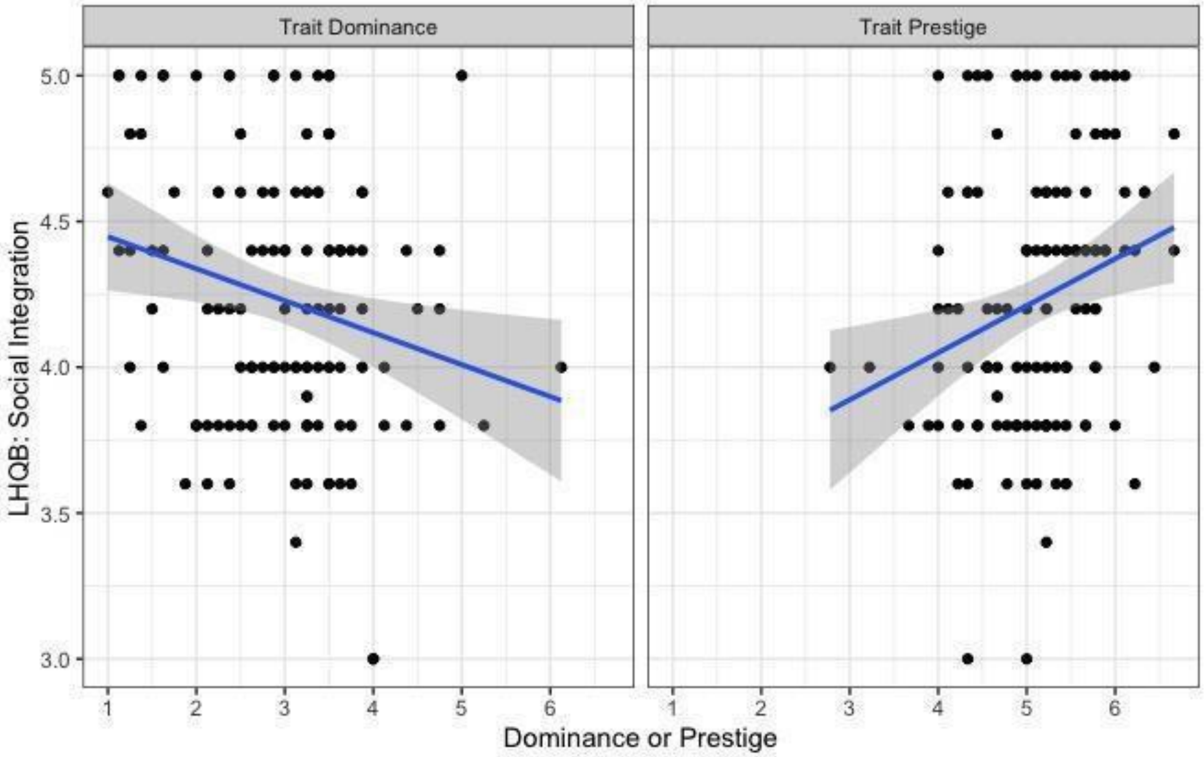

Figure 7: LHQB: Accident Prevention/Safety Subscale

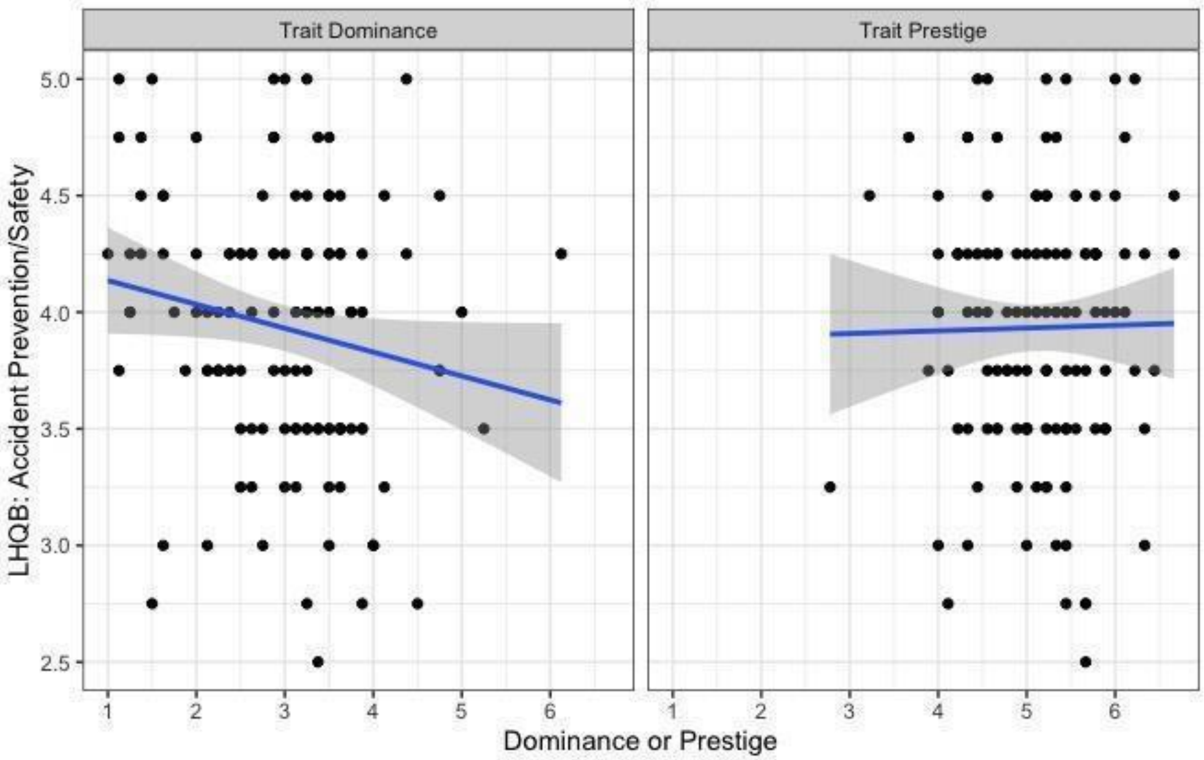

Figure 8: LHQB: Sense of Purpose Subscale

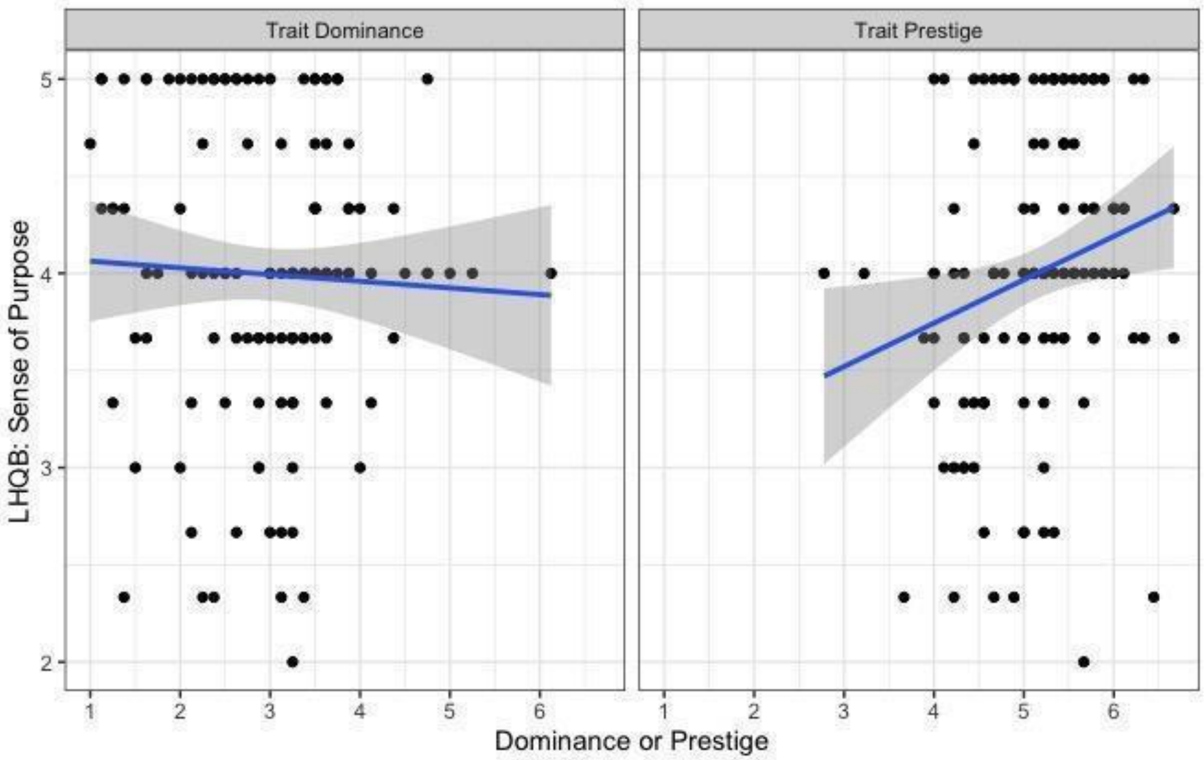

Figure 9: PSS: Precieved Stress Scale

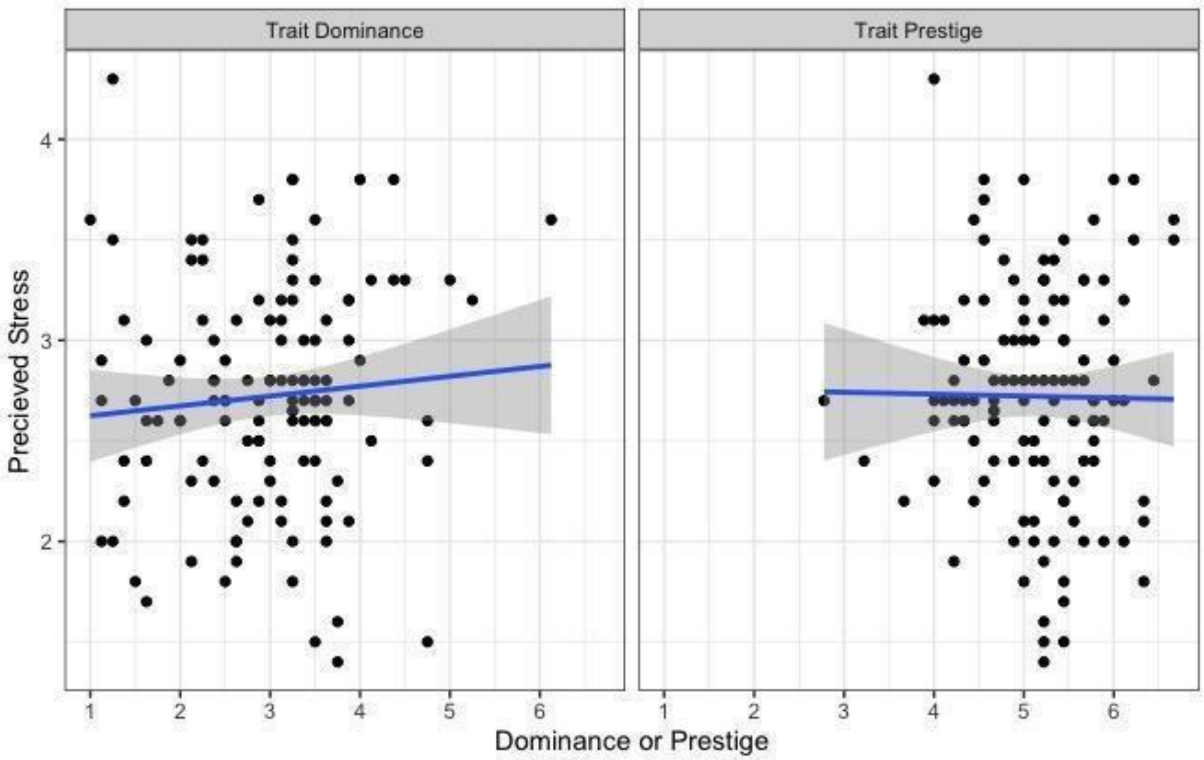

Figure 10: PANAS: Positive Affect-Pre

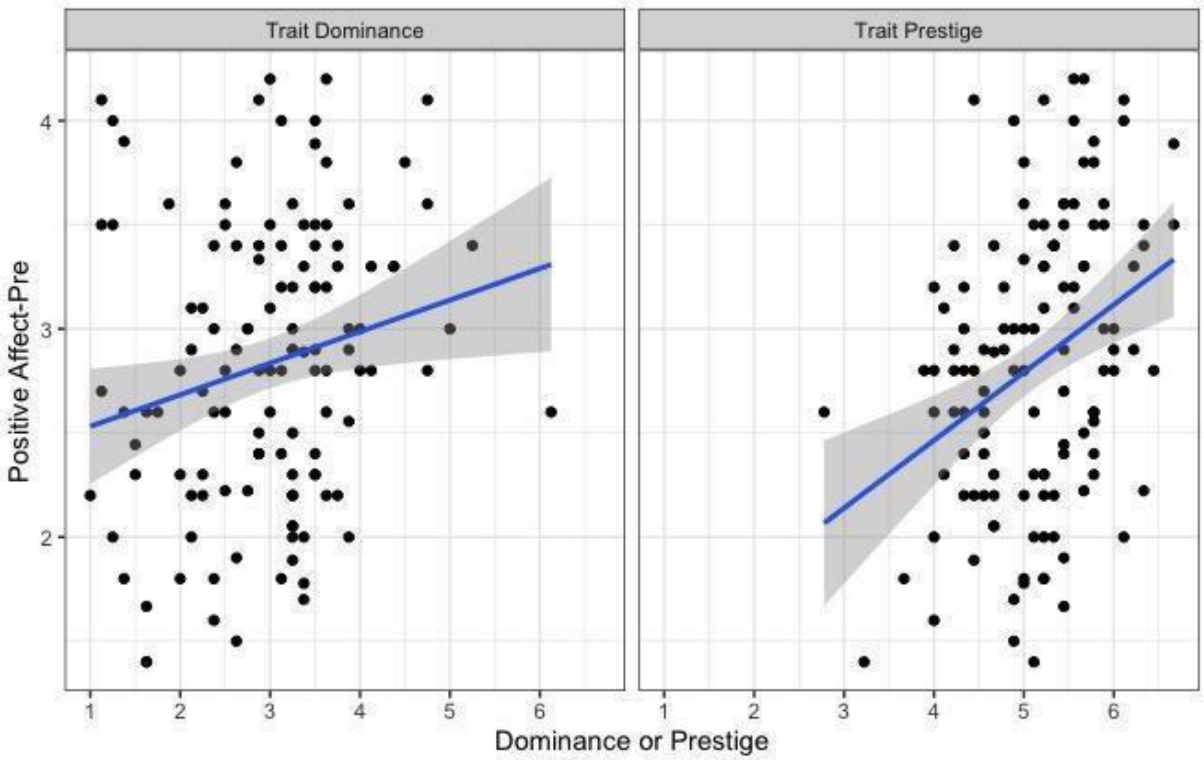

Figure 11: PANAS: Positive Affect-Post

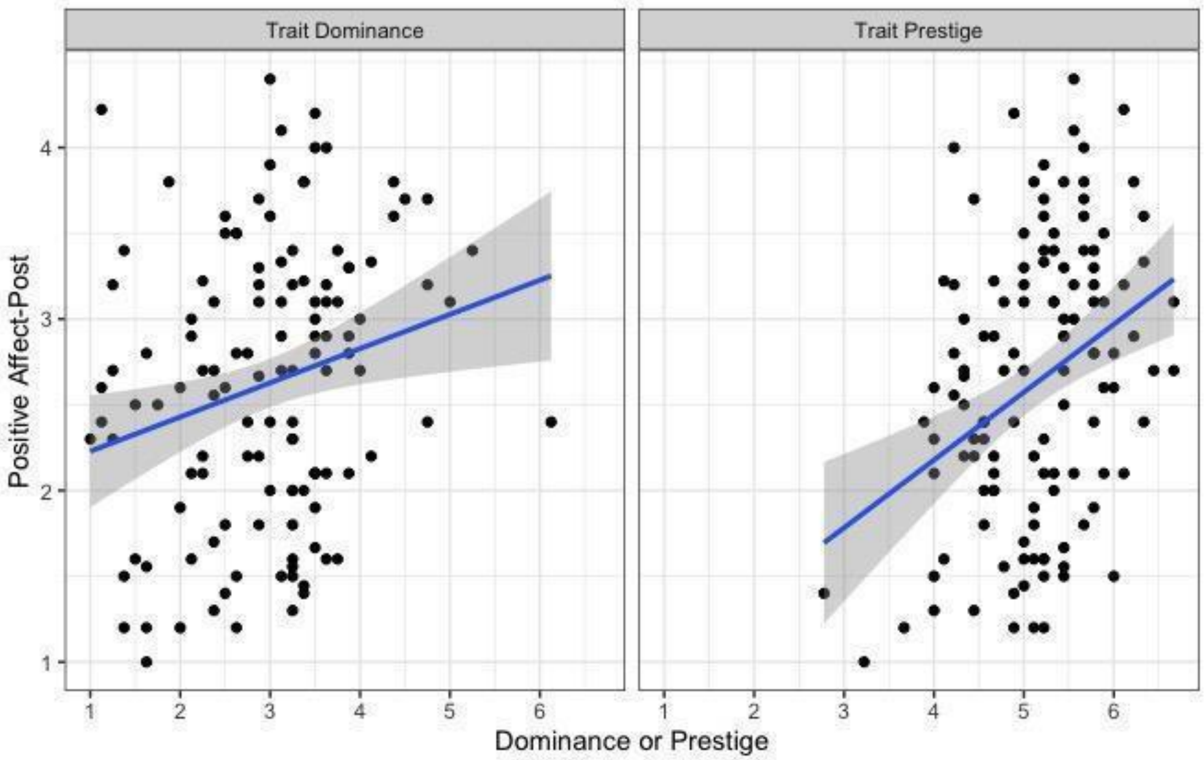

Figure 12: PANAS: Negative Affect-Pre

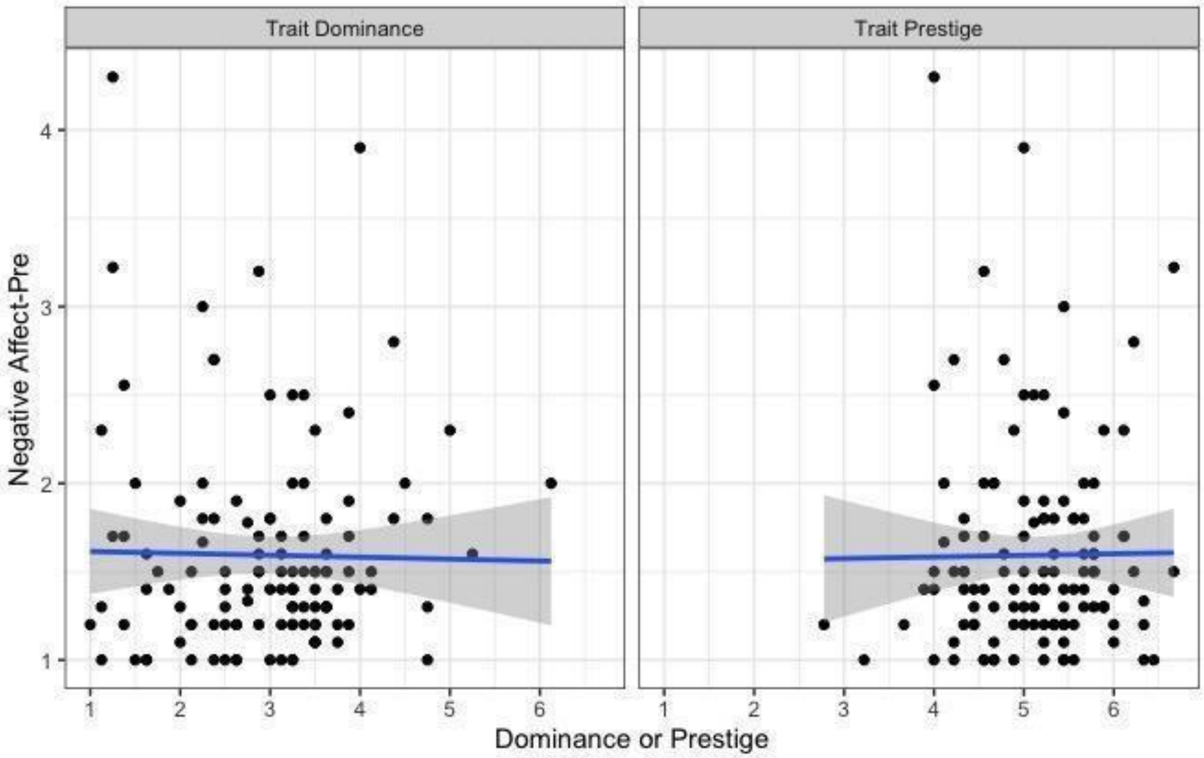

Figure 13: PANAS: Negative Affect-Post

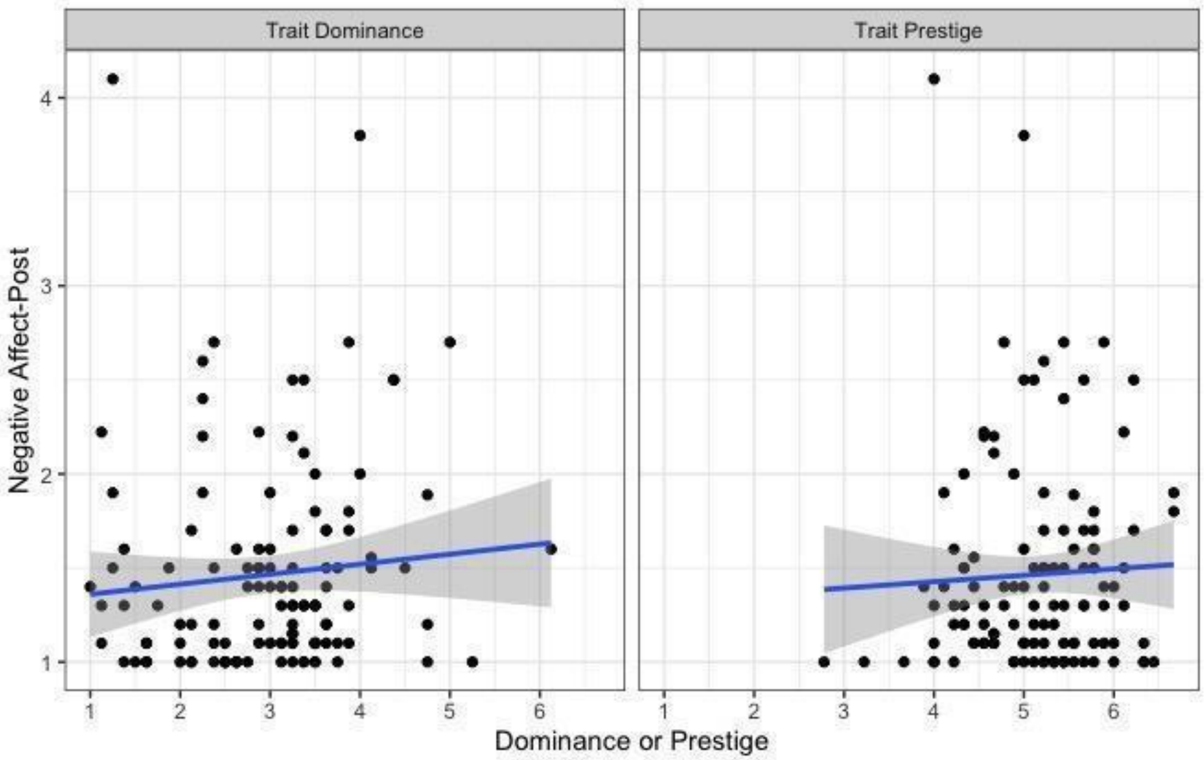

Figure 14: Hormone: Baseline Cortisol

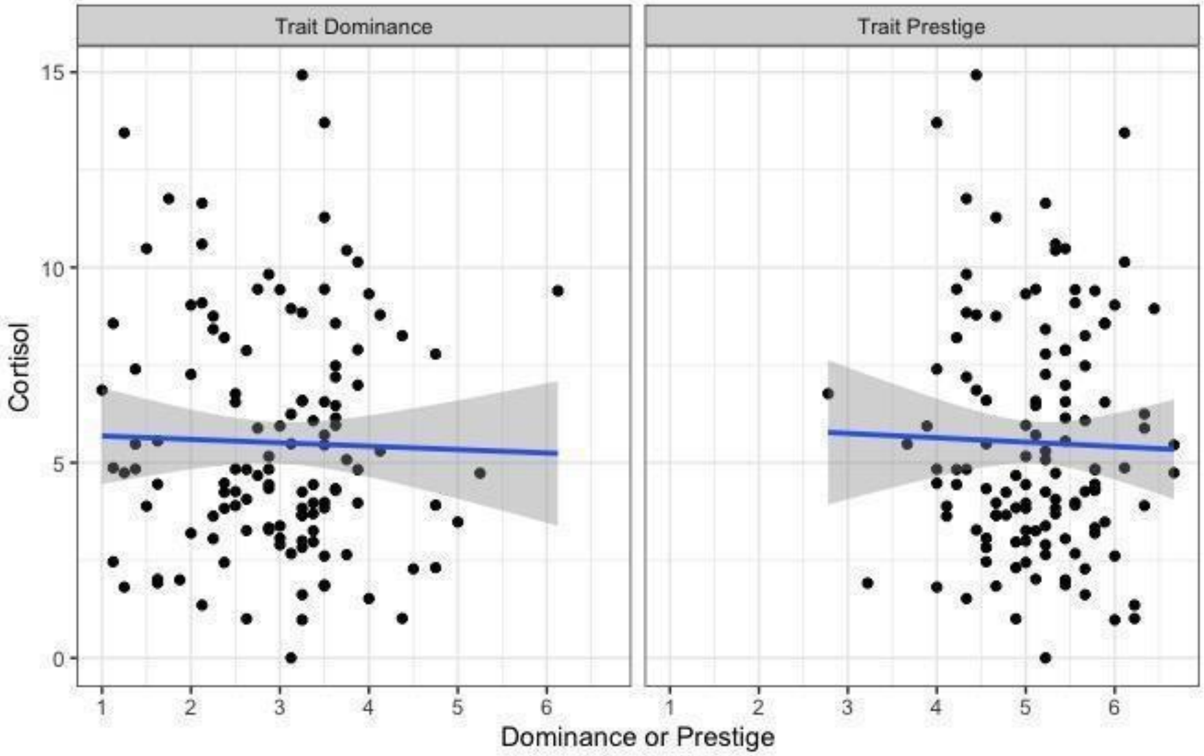

Figure 15: Hormone: Cortisol Change

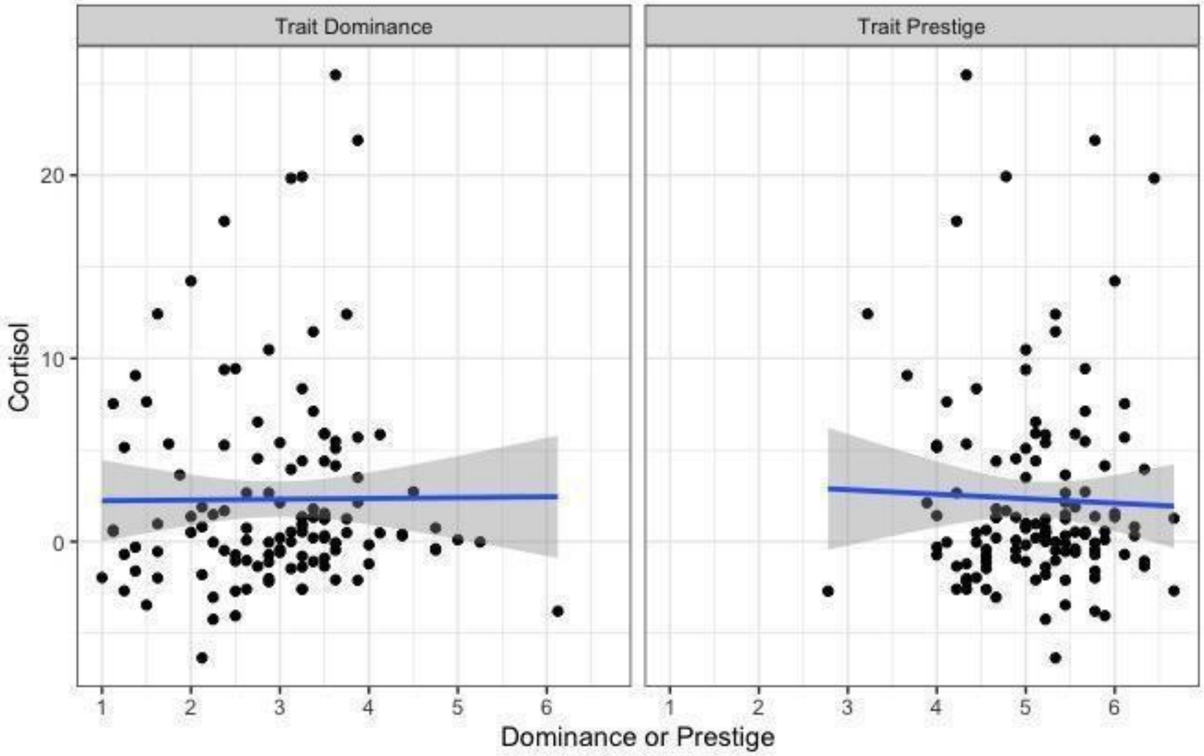

Figure 16: Hormone: Baseline Testosterone

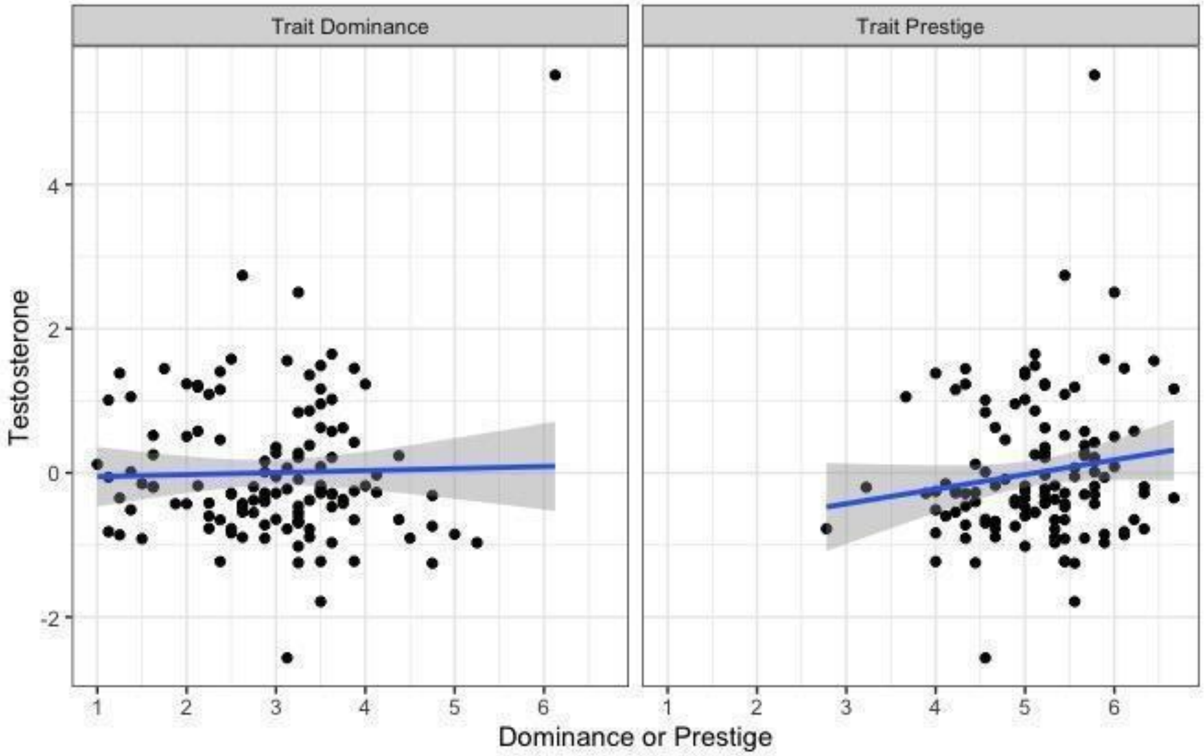

Figure 17: Hormone: Testosterone Change

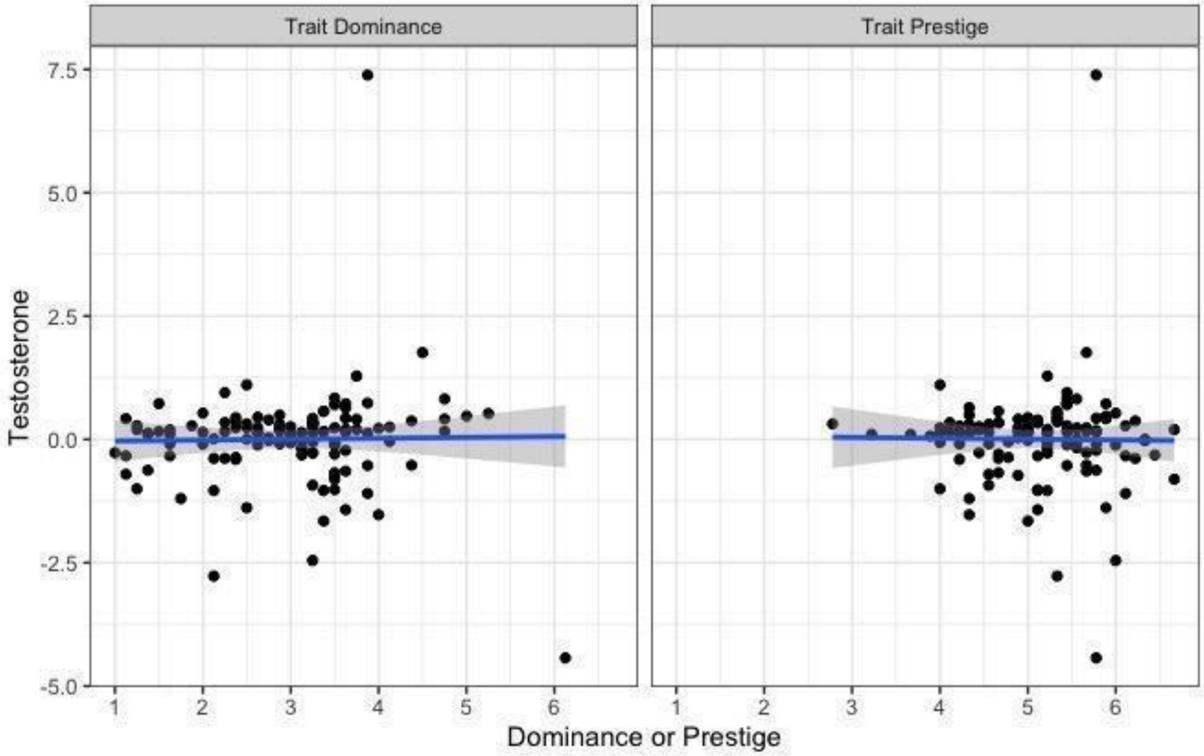

Figure 18: Baseline Heart Rate

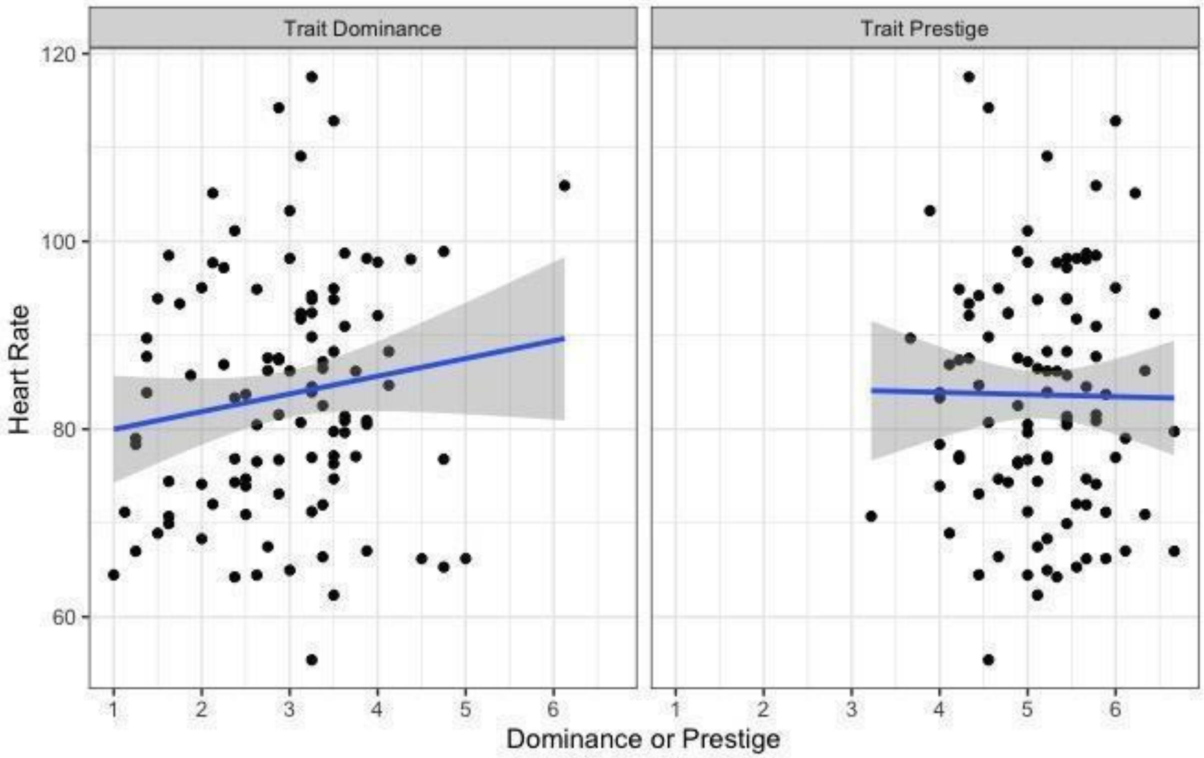

Figure 19: Heart Rate Change

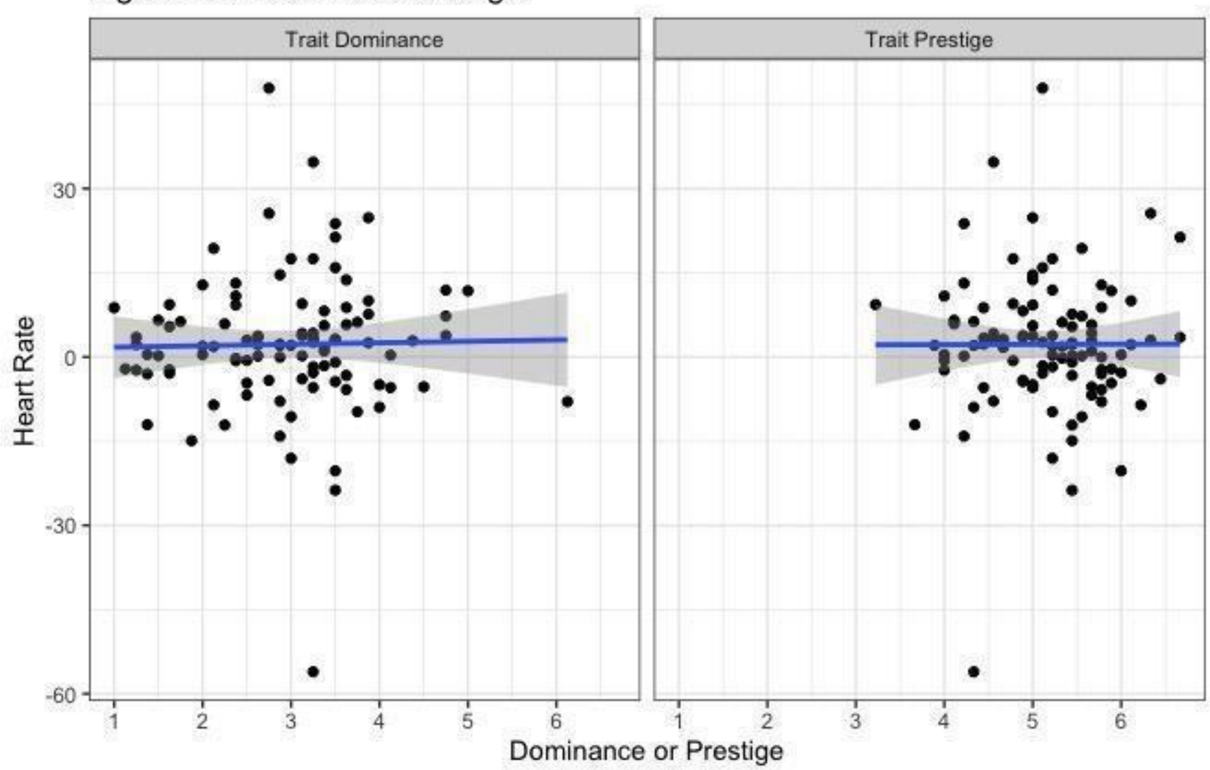

Figure 20: Baseline Heart Rate Variability

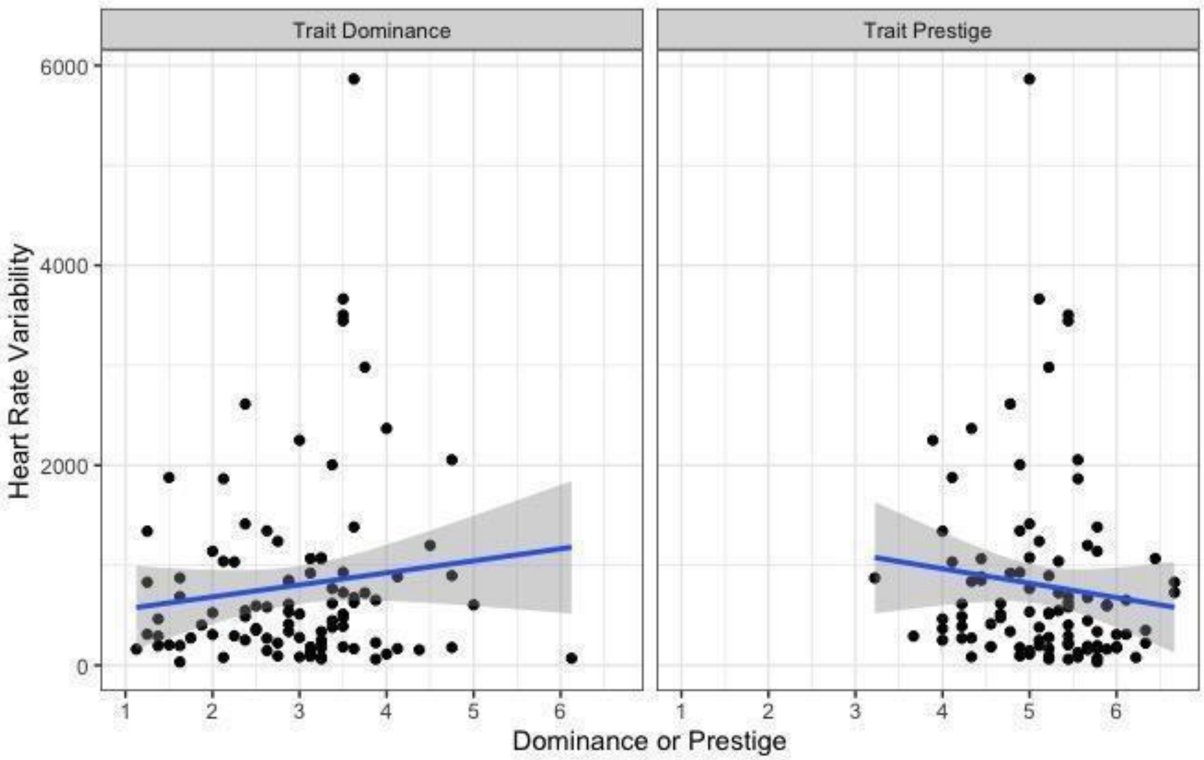

Figure 21: Heart Rate Variability Change

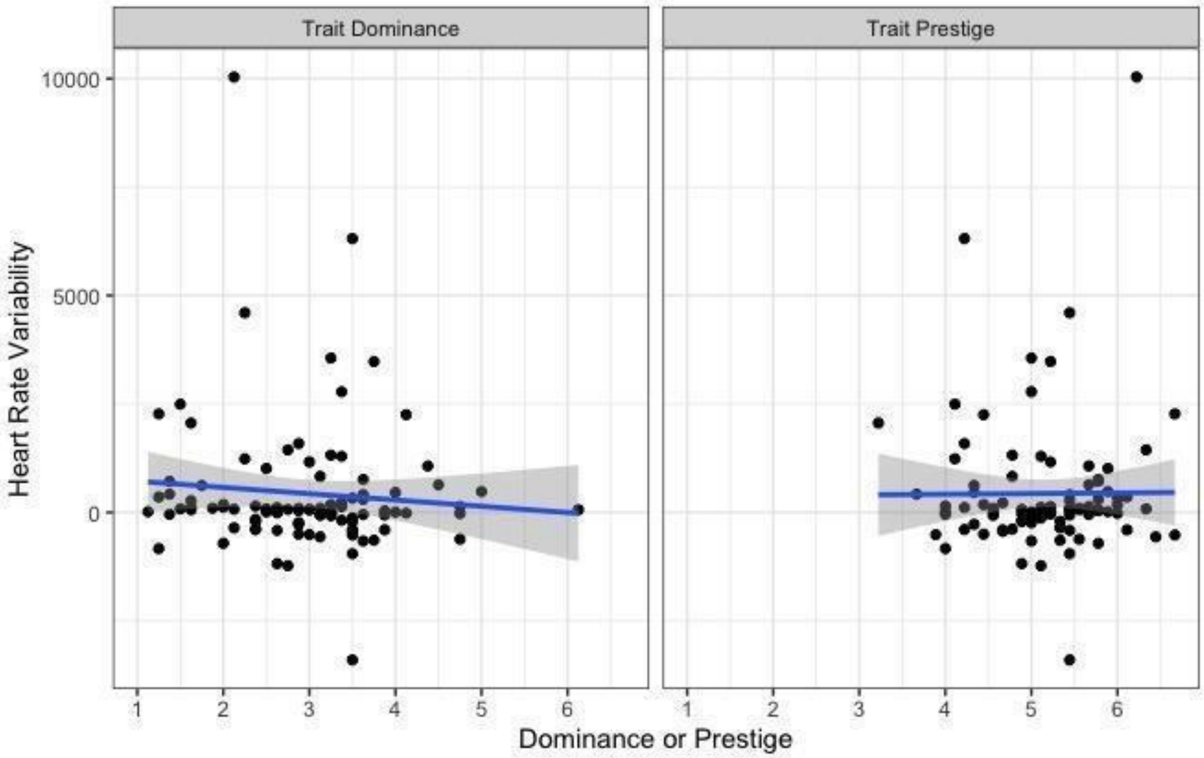

Figure 22: Baseline High-Frequency Heart Rate Variability

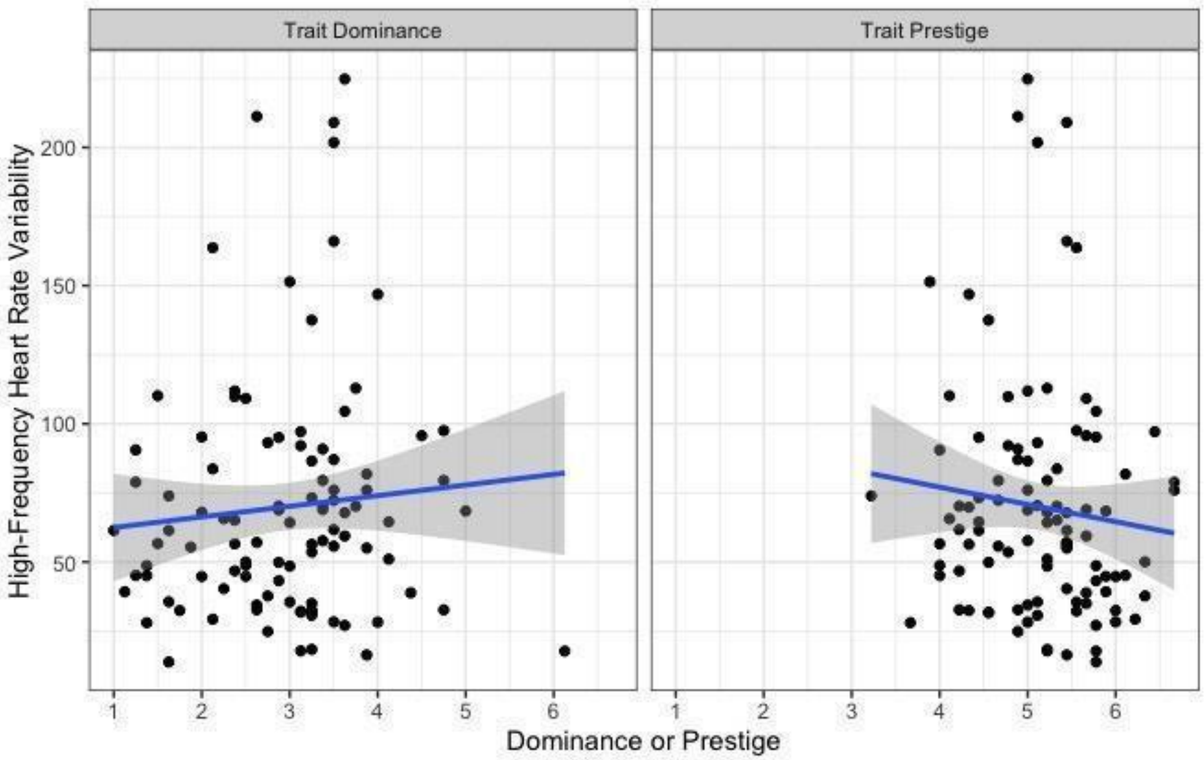

Figure 23: High-Frequency Heart Rate Variability Change

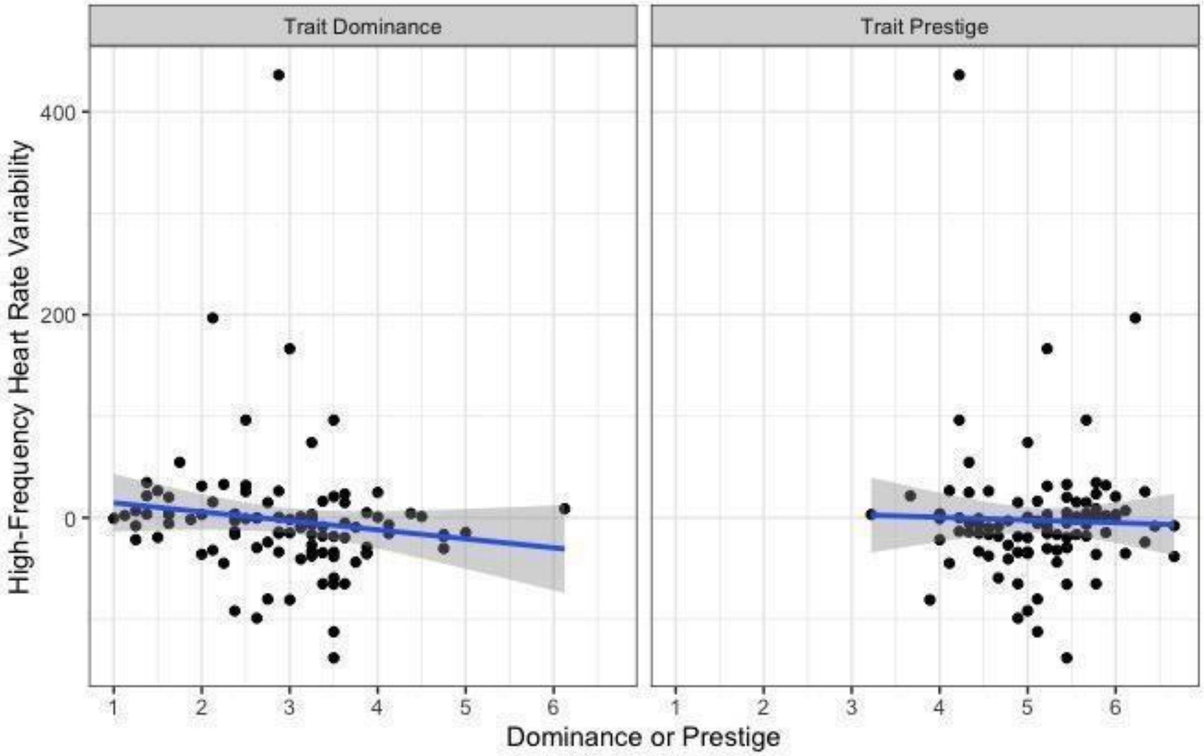

Figure 24: Baseline Pre-Ejection Period

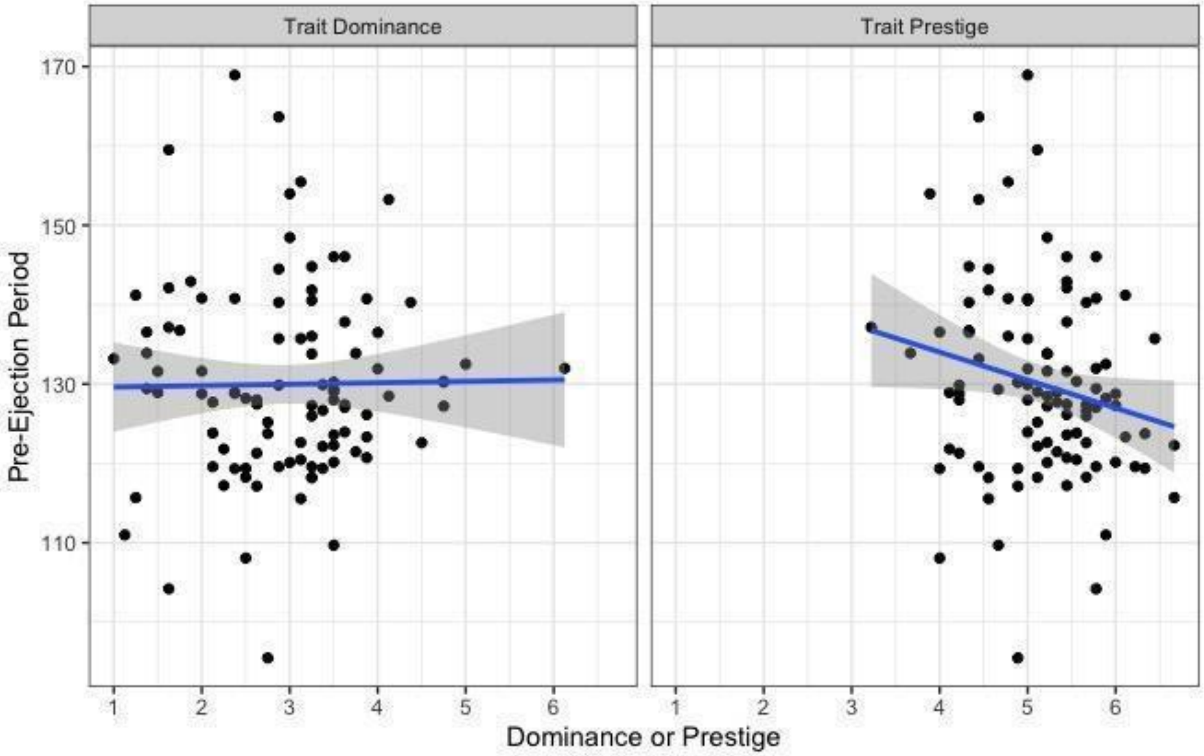

Figure 25: Pre-Ejection Period Change