THE EFFECTS OF SOCIAL HIERARCHIES AND PERCEIVED POPULARITY ON STRESS LEVELS

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CHAPTER I

INTRODUCTION

All social systems contain some form of social hierarchy (Hawley, 1999). These are often characterized by wealth, power, status, employment, abilities, popularity, or many other qualities. One component involved in hierarchies is social stress. This stress is usually caused by striving for status and the struggle for acquiring resources (Sapolsky, 2004). Social stress impacts quality of life as well as overall health. Prior research has shown that many factors are associated with social stress, such as personality characteristics and stability of the hierarchies (Sapolsky, 2004). Other factors include the timing and duration of social stress as well as the saliency of the stress to the individuals (Flinn, 2006). Overall, the consensus from the research is that there is a relationship between social hierarchies and stress, but these studies have produced mixed results. Some studies have shown dominant individuals have a stronger physiological response to hierarchical systems while others show that it is subordinate individuals have a stronger response (Davis, Donzella, Krueger, & Gunnar, 1999; Ostner, Heistermann, & Schülke, 2008; Poisbleau, Fritz, Guillon, & Chastel, 2005). Further complicating this picture is

that it is not clear whether this strong response is due to stress or arousal (Ellis, Essex, & Boyce, 2005; Sapolsky, 2004). Most studies in this area have primarily focused on adults, mostly men, and young children. However, adolescence is a time of intense focus on social hierarchies, and has been largely neglected. The current study will attempt to fill this age gap in the literature. For the purpose of the current research, stress will be operationally defined by self-report measures and hormonal output (cortisol). This study will add to the literature by helping to clarify the mixed results through the use of two different measurement types and assessing these responses in two different scenarios.

CHAPTER II

REVIEW OF LITERATURE

Stress

Stress is defined by a disruption in homeostasis (Ellis, et al., 2005). The idea of homeostasis is that various physiological components such as blood pressure, heart rate and temperature are at their optimal or base level. Sapolsky (2004) defines a stressor as "any physical or psychological factor that perturbs or threatens to perturb homeostasis, and stress is the state of homeostasis imbalance."

Because homeostasis becomes imbalanced by stressors, all mammals have a stress response system that helps to regulate the body in accordance with the amount of stress experienced. Much of the stress response takes place in the hypothalamic-pituitary-adrenal (HPA) axis, though the autonomic nervous system is involved as well. This system controls the body's daily circadian rhythm and activation results in the release of cortisol (West, Sweeting, Young, & Kelly, 2010). The stress response systems send norepinephrine from the nerve endings throughout the body. This happens within

seconds of a stressor taking place. Within minutes, glucocorticoids are secreted from the adrenal glands. Additionally, there is release of pituitary hormone. In combination, these responses cause a shift in alertness and preparedness. This involves increasing heart rate, blood pressure, metabolic mobilization of cellular nutrients, and redirection of energy source (Ellis, et al., 2005).

In order to measure the reactivity of the stress response system, many scientists have used physiological measures, such as heart rate, sweating, eyebrow movement, and products of the HPA axis (such as cortisol). Heart rate, sweating, and eyebrow movement are biophysical markers that help to determine if an individual is experiencing a stressful event. They are easy to obtain but, sometimes have mixed results or confounds. In addition, these measures are primarily measures of the sympathetic branch of the autonomic nervous system. Social stressors appear to primarily activate the HPA axis, particularly in humans (Dickerson & Kemeny, 2004). Cortisol levels are frequently used as a biophysical marker. When a stressful event occurs, the level of the hormone cortisol rapidly rises in response. Because of the relationship between stress and cortisol release, the study of cortisol can be an accurate and reliable measure in the study of stress. Cortisol in saliva has been extensively validated and used as a non-invasive biomarker in naturalistic settings (Flinn, 2006). The change in cortisol levels from pre-stressor to post-stressor marks the HPA activity of the individual. Cortisol in the saliva is determined by time-resolved fluorescence immunoassay (Hellhammer, Buchtal, Gutberlet, & Kirschbaum, 1997). The time of day that the saliva (cortisol level) is taken can have an effect on the results, as HPA activity follows a diurnal pattern. Cortisol levels are at their lowest around midnight and start to rise before waking time. Cortisol

levels rise sharply in the first 30 to 40 minutes after waking and then begin to decrease for the remainder of the day unless a stressor is encountered (West, et al., 2010). For this reason, many researchers choose to measure cortisol in the afternoon or early evening.

Cortisol is part of the neuroencrine system that controls reactions to stress and regulates a number of bodily processes, including immune functioning. The prefrontal cortex regulates the HPA activity during stressful conditions by providing a negative feedback loop once cortisol is released (Diorio, Viau, & Meaney, 1993). Studies have shown that the HPA system operates similarly for both sexes. However, males do tend to show greater amounts of cortisol, adrenaline, and noradrenaline (Frankenhaeuser, 1978). Because the HPA system is responsible for controlling how the body reacts to stress, and determines the amplitude and recovery of that response, it is also a determining factor in disease and illness (Kudielka & Wüst, 2010). This system is highly adaptive and individually variable.

Individual variability in the stress response has been the interest of many researchers (Bruce, Davis, & Gunnar, 2002; Davis, et al., 1999; Diorio, et al., 1993; Francis & Meaney, 1999; Frankenhaeuser, 1978; Kudielka & Wüst, 2010; West, et al., 2010). Ellis, Essex, and Boyce (2005) state that both genetic and environmental factors can contribute to the development of an individual's stress response system. They go on to state that with development, the stress response system begins to stabilize. Flinn (2006) used an evolutionary viewpoint to study the ontogeny of the stress response system in children on the island of Dominica. He found that social environment plays a pivotal role in the development of the stress response. For example, the level, timing, and duration of social stress in an infant's life can impact how they respond to such

stressors when they get older. Stress response systems can be blunted or heightened due to chronic stress. From an evolutionary perspective, this was most likely due to natural selection of the stress response feature. For humans, it was most likely selected to help deal with changing social environments (Flinn, 2006). Humans need to be able to respond to changes and be alert. The stress response system can help prepare individuals for unexpected or expected changes in their lives and environment.

Many stressors are psychological, particularly for highly social species such as humans. Sapolsky (2004) identifies five different types of psychological stressors. These stressors are lack of predictability, lack of control, lack of outlets for frustration, the interpretation of the stressor, and lack of social support. Lack of predictability is often seen when the subject is not given a warning about what will take place. Without such an indication, the stress level is heightened. Lack of control is seen when subjects do not have sufficient control over events in their environment. In one study, for example, mice were housed in social groups. An aggressive mouse was introduced into the home cage (social group) of the other mice. Social disruption in the home cage created significantly augmented splenic function (related to immune functioning) in subordinate mice (Avitsur, Kinsey, Bidor, Bailey, Padgett, & Sheridan, 2007). Lack of outlets for frustration has been examined in studies where smokers were not allowed to smoke after a stressful situation. This leads to an increase in perceived stress and increased blood pressure reactivity. Psychological stress may be incurred as a result of the interpretation of the stressor. For example, if an individual is in pain, the stress can be increased if they believe that pain is life threatening. Finally, lack of social support can increase and create stress. Studies have shown that lack of social support, or gaps in social support

networks can increase overall stress (Taylor etal., 2000). Also, friendships have been associated with protection from psychosocial stress (Uchino, Uno, & Holt-Lunstad, 1999). For humans in particular, the HPA system appears to be responsive to stressors that involve socio-evaluative threat (Dickerson & Kemeny, 2004). This underscores the importance of examining individual variability in how this system reacts to naturally occurring socio-evaluative stressors, such as hierarchies within a peer group.

One way researchers have studied stress reactions is to create a stressful situation for the individual that is being studied. The most commonly used stressor technique is the Trier Social Stress Test (TSST). This test consists of an anticipatory phase and a test phase. The test phase has two parts which are a mock interview and an arithmetic problem (Kirschbaum, Pirke, & Hellhammer, 1993). This test has been used for many years and studies have shown it does not discriminate based on gender (M. M. Kelly, Tyrka, Anderson, Price, & Carpenter, 2008). The TSST has been used to determine an individuals' physiological reactivity (e.g., cortisol) (Jönsson et al., 2010). Although the TSST is useful, it can create problems for certain age groups. Young children cannot take part in the TSST, because they cannot do arithmetic. Also, a job will not be relevant to them. Other age groups such as adolescents might not have a rise in stress level from arithmetic if they do not find the question salient. Further, adolescents in particular are unlikely to experience such a stressor in their daily lives, rendering its ability to predict HPA activity in naturalistic settings fairly limited. Current research is being done with more salient paradigms such as reward allocation.

A reward allocation task involves examining equality. This is seen usually through a hypothetical situation and the variation of distribution between the individuals

involved (Miller & Komorita, 1995). Reward allocation tasks typically ask each person in a group to distribute resources in any way they choose. Multiple trials of the task are conducted. Some trials contain equal amounts of resources to be distributed. Other trials contain inequality in resources. Previous research found there was an association between expressing a social orientation and choosing to allocate equally, and between expressing a task orientation and choosing to allocate equitably (Meeker & Elliott, 1996). Reward allocation is useful for many ages and groups, but many factors such as salience of the reward and social situation can affect the results and the stress response to this task.

In summary, cortisol and stress can affect individuals in many different ways. For example, it can have an overall negative or positive affect on a person's body, depending on whether the stressor is chronic or acute and coping techniques available to the individual. Cortisol helps humans deal with the ups and downs of everyday life by influencing the amount of energy released, the immune activity, the level of mental alertness, memory, and learning (Flinn et al., 1995). However, if the HPA system is activated repeatedly it can cause many negative consequences. Chronic stress can be a risk factor for a variety of illnesses including auto-immune disorders, mental illness, hypertension, digestion problems, irregular ovulatory cycles, irritable bowel syndrome, erectile dysfunction, muscle atrophy, fatigue, increased morbidity and many other problems (Sapolsky, 2004). Research has also been conducted on psychosocial stress and the risks as well as benefits associated (Ghaed & Gallo, 2007). Stress can be caused by many different situations. However, for humans, social situations and placement within

stable and unstable social hierarchies are the most salient stressors. Social hierarchies have two key features likely to elicit a stress response: lack of control and predictability.

Social Dominance and Perceived Popularity

One salient aspect connected with stress is social dominance. Social dominance is based on hierarchical group-based systems of inequality (Pratto, Sidanius, Stallworth, & Malle, 1994). These hierarchies have served to maintain human survival (Wilson & Liu, 2003). Other animals also have social hierarchies (Avitsur et al., 2007; Czoty, Gould, & Nader, 2009; Ostner, et al., 2008; Poisbleau, et al., 2005). Most social hierarchies in animals involve a competition for resources. In Mallard and Pintail birds, the most aggressive birds, the winners of threat, fight or avoidance were deemed the most dominant and the reverse scaled birds were deemed the most subordinate (Poisbleau, et al., 2005). Cynomolgus monkeys were also studied using observations of aggressive, submissive and affiliative behaviors. The monkeys that were ranked the lowest received the most aggressive behavior and initiated the most submissive behavior. Monkeys ranked as most dominant received 75% of the total grooming (Czoty, et al., 2009). Social rank in animals is often easily identifiable through observations. However, in humans there are many different hierarchies and it is more difficult to determine who is on the top and who is on the bottom and the associated consequences.

In humans, a distinction is often made between two types of social status or rank. One type is referred to as sociometric popularity. Individuals that score high in sociometric popularity receive a lot of "like" nominations by their peers and are usually

seen as having prosocial behaviors and low aggression (Puckett, Aikins, & Cillessen, 2008). The other type of social status is referred to as perceived popularity. These individuals are not always liked and are referred to as bi-strategic controllers. Hawley (1999, 2007) developed a questionnaire to determine if individuals were bi-strategic. Bi-strategic controllers use a combination of coercive or aggressive behaviors and prosocial strategies. Coercive behaviors are persuasive and usually include monopolizing the situation as well as controlling others. Aggressive behaviors involve asserting physical or mental harm. Prosocial strategies are voluntary behaviors that benefit other people. These individuals are rated by peers as being high on intimacy and fun, but also high on conflict (Hawley, Little, & Card, 2007). The dominant position in one's peer group is indicated by a reputation of being popular and having access to valuable resources (Hawley, 1999). Perceived popularity is highly sought after in almost all facets of human life, most likely because of the associated benefits (e.g., control of resources).

Individuals that are bi-strategic, socially dominant, or perceived as popular often take part in aggressive acts. There are two types of aggression, overt and relational. Overt aggression is usually identified as direct physical or verbal aggression (Rose, Swenson, & Waller, 2004). Relational aggression is not physical and may include acts such as excluding others and spreading rumors. The purpose of relational aggression is to disrupt the social networks of competitors (Crick & Grotpeter, 1995). Relational aggression requires social skills and is used to obtain higher social status. Relational aggressors need social understanding (e.g., theory-of-mind) and the ability to read and decode social situations (Bosacki, 2003). Individuals that are aware they are effective socially may engage more often in manipulations than those who believe they are

ineffective socially. This may lead to more socially dominant individuals that are relationally aggressive. For example, dominant individuals may begin to use aggression, and if peers rarely censor them, they may become increasingly aggressive (Rose, et al., 2004). Members of dominant peer groups often use relationally aggressive techniques to maintain their exclusive position at the top of the social hierarchy. Children in high status groups tend to gossip and pick on lower status children in order to uphold a sense of superiority (Witvliet et al., 2010). Individuals who use relational aggression tend to create groups to control resources. These groups help to construct social hierarchies (Geary, 2010).

Relational aggression and physical aggression are often used to maintain social status. Perceived popularity is strongly related to aggression. Different situations and viewpoints can lead to different interpretations of status. Status can be determined by money, athletic ability, title, family name, and many other aspects. Personality traits often help elevate one's status. Social orientation, prosocial skills and relationally aggressive acts together can help a person reach a higher status. On one hand, one study asked 742 parents with children ranging from elementary school to 11th grade "what made children popular?" The top two answers were "being an open, friendly, person" and "having a strong personality" (Tatar, 1995). On the other, in children, perceived popularity has often been associated with bullying. One study used 461 boys and girls in the fourth through sixth grade to identify popularity characteristics and bullying behavior. It was found that older children participated more in relational aggression while younger children participated more in physical aggression. The results also showed that relational

bullying appeared to be higher for children who belonged to peer groups that were perceived as popular but not likeable by classmates (Witvliet, et al., 2010).

Individuals who are social subordinates often are the recipients of bullying behavior. This is often seen as a way for dominant individuals to increase or keep their high status in the group. The question is: Why is social dominance important and something worth maintaining? In children perceived popularity and social dominance can lead to higher rewards such as more benefits and support from their social groups. This has also been seen in adults in the workplace. One study revealed that within the workplace an employee's popularity is associated with the receipt of favorable treatment even if the individual is not liked (Scott & Judge, 2009). Social status seeking is a common feature within human groups across history and cultures (Geary, 2005). This is also seen in the animal literature because animals with dominant positions receive more resources such as grooming, food, and sex partners (Sapolsky, 2004). Thus, being socially dominant has many rewards in animals as well as in humans. It remains to be determined whether social dominance is associated with physiological benefits or costs.

Stress and Social Hierarchies

Many studies have examined the relationship between stress and social hierarchies. This relationship has been observed in animals as well as in humans. As already stated, stress can have many negative effects on the body. Social hierarchies have been found to be associated with sustained stress response (Sapolsky, 2004). However, hierarchies are needed in order to disperse resources and create leadership in order to establish an organized society. They have been present throughout our evolutionary history, as is true for any social animal. The need for hierarchies has led to

a circulatory problem of hierarchies and stress. Past and current studies emphasize the importance of determining the benefits and risks of the stress and social hierarchy relationship. One problem that has been examined, and has led to mixed results, is whether subordinate or dominant individuals are more aroused by dominance hierarchies. As stated previously, lack of predictability and control might lead to differences in the HPA response. Below is a review of animal and human studies that can help clarify this concern.

One study was conducted on mallard and pintail birds (Poisbleau, et al., 2005). Six adult male pintails, 11 adult female pintails, 8 male mallards, and 8 female mallards were all observed for aggressive encounters and blood samples were taken in order to assess corticosterone levels. The results showed a linear relationship between social dominance and increased corticosterone levels. Dominant ducks in both mallard and pintail groups showed greater corticosterone levels than subordinates. This result is counter-intuitive because it is usually expected that subordinates will show more HPA activity. These results underscore the importance of viewing the HPA system as an arousal system responsible for attention to social dynamics and maintaining position as much as or more so than a general "stress" system. This study's results were also consistent with a previous study with wintering birds (Poisbleau, et al., 2005).

One study that was briefly mentioned above was conducted by Cozty et al. (2008) on twenty adult male cynomolgus monkeys. Blood samples were taken in order to determine cortisol and testosterone concentrations. The results showed an inverse relationship between cortisol and future social rank. Monkeys who would eventually occupy the lowest position in the dominance hierarchy had significantly higher

concentrations of cortisol than future dominant monkeys. However, the authors also state that monkeys' social stress can vary according to sex, social structure, and stability of the hierarchy.

Sapolsky (2004) has studied stress and social status in many different animals. His studies found that reproductive suppression among subordinate animals could be due, at least in part, to four different mechanisms: harassment by dominant animals, fewer calories, more work, and impaired gonadal function. According to Sapolsky, among males, there has been little evidence to support the belief that social dominance is synonymous with aggression and high levels of testosterone. Overall, his findings show that there is support for social subordination to be related to cortisol levels, but the rank and cortisol relationship can be influenced by many factors such as temperament and "culture" of the group.

Most human studies are conducted on children or adult males. Cortisol levels have been studied in elementary school children in relation to starting school (Bruce, et al., 2002; Davis, et al., 1999). These studies discovered that temperament was associated with cortisol changes during the first few days of a new school year. In particular, the studies found that extroverted children had the largest cortisol response in the first few days of school. Another study was conducted with 15 year old Scottish students (West, et al., 2010). Within the study, three factors (scholastics, peers, and sports) were assessed based on in order to determine the students' social status. The students also gave two saliva samples in order to determine the morning decline in cortisol levels. They found that social status in school hierarchies is a more important source of cortisol level than family socioeconomic status. As seen in Saplosky's work, cortisol results differ in

relation to stable verses unstable hierarchies. Females in the top hierarchical position, usually unstable hierarchies (Savin-Williams, 1978), are distinguished from other positions as having higher cortisol. Also, they found that a school is not made up of one hierarchy but a number of different hierarchies. The importance of these hierarchies is determined in part by the sex of the participants. Females rated themselves higher on the scholastic hierarchy while males were higher on both peer and sports hierarchies.

In another study, sixty-three male army recruits that were participating in boot camp training were studied to determine the stress response related to hierarchies (Hellhammer, et al., 1997). The men filled out questionnaires assessing personality traits. They also took part in the "Trier Social Stress Test," and the "Cooper Physical Stress Test," and cortisol was collected. In addition, all participants were asked at weekly intervals to write the names of their roommates in order of their dominant positions. The results of this study showed that the hierarchies remained stable after the first week in boot camp. Dominant individuals showed a large rise in cortisol response to the first "Trier Social Stress Test" as well as to the first "Cooper Physical Stress Test" the first time they were given. There was no correlation between social rank and cortisol responses in the second round of tests, however. Furthermore, personality traits were not shown as predictive of any social status. This study did not adequately control for many confounds. For example, all the men showed increasing elevated baseline levels of cortisol throughout the five weeks mainly because of chronic stress due to the boot camp. Chronic stress can create elevated overall higher cortisol levels for some individuals. However, it does provide some information regarding dominant and subordinate men's cortisol levels during chronic stressful situations.

Women have also been studied in relation to stress and social hierarchies, though to a lesser extent. In one study, 92 women were examined in order to determine the relationship between stress, subjective social status, and many other factors (Ghaed & Gallo, 2007). All participants were given the MacArthur Scale of Subjective Social Status in order to determine women's perceived social status in the community. Participants also filled out questionnaires in order to determine social economic status, psychosocial measures (such as depression), and behavioral factors (such as smoking and eating habits). Stress was determined by the dynamic inflation in blood pressure (measured by a blood pressure monitor) that corresponded to physical or mental stressors that were recorded in a diary kept by the participants. The results showed that behavioral risk factors were less associated with subjective social status than were psychosocial factors such as stress, anxiety, and social support. Furthermore, women with higher subjective social status had better nutrition habits. They consumed more fruits and vegetables and, overall, tended to participate in physical activity during leisure-time. The overall results showed that the women with lower subjective social status had higher anxiety, pessimism, stress, and blood pressure. These important results were found even after controlling for socio-economic status. This study shows the negative relationship between stress and social hierarches for subordinate individuals. It is not clear whether the differences mentioned in this study were due to arousal vs. stress or due to the issue of stability of male hierarchies vs. instabilities of female hierarchies.

Several studies did not just examine stress and social hierarchies, but they also looked at how individuals respond to social stressors. Males and females respond to stress with a cascade of hormonal responses. One way individuals, often males, respond

to stress has been referred to as fight-or-flight (Cannon, 1932). Fight-or-flight responses involve two interacting stress systems. These systems are the sympathetic nervous system and the hypothalamic-pituitary-adrenocortical axis (Taylor, 2006). Together they release hormones and trigger strong vascular responses such as increased heart rate and blood pressure. The fight-or-flight response is often observed when a stressor occurs. The individual either fights for survival or flees the environment containing the stressor. Until recently this was the only theory of stress response.

A relatively new study and theory was developed by Taylor, Klein, Lewis, Gruenewald, Gurung, and Updegraff (2000). This theory is termed "tend-and-befriend" and is often, but not always demonstrated by women (see also Geary & Flinn, 2002). Tending is nurturing behavior designed in order to protect oneself and their offspring. This is often seen when individuals form coalitions to provide and receive protection during threatening events. Befriending is creating and maintaining social networks. From an evolutionary perspective, selection pressures for responses to threats that benefit both self and offspring may have been greater for females than males. Therefore, women may have a stronger affiliative response to some stressors than men. Tending and befriending can be seen as a counterpart to mother-infant attachment bonds. This new theory provides another aspect into the study of stress responses. Geary and Flinn (2002) expanded on Taylor's theory by adding that men also tend and befriend. They state that tending is a form of parental investment and therefore may be typical of both sexes. Also, befriending is done by men but takes a different form, that of kin-based collations. This expanded theory helps identify tending and befriending as a social de-stressor/stressor for both sexes.

Present Study

The study of stress and social hierarchies is extremely important in modern society. Bullying is one example of the negative impact of social hierarchies. According to the American Justice Society, one in every four children is bullied (Bryn, 2011). If these hierarchies are studied and a link between bullying, stress, and status can be determined then effective intervention plans can be put into place. The studies mentioned above are helpful in creating an expansion of such knowledge. More research is needed to determine the potential benefit of social hierarchies, such as maximizing the benefit of positive leadership roles, and how they might be used to change a given social context away from bullying and toward prosocial behaviors. The following study helps to determine the costs and benefits of social hierarchies, and how they may differ for each sex.

One such aspect that needs to be examined is the link between social dominance and perceived popularity. In other words, why are individuals deemed popular, is that popularity the same as being socially dominant, and what do the physiological profiles look like in response to social dynamics? Hawley's (2007) theory of the bi-strategic controller is particularly useful in this context. The theory suggests that individuals that are perceived as popular are not necessarily liked. They are popular because they are bi-strategic, meaning they demonstrate both aggression and prosocial skills, depending on the demands of the particular social context (Hawley, Shorey, & Alderman, 2009). Bi-strategic individuals are often rated by peers as high in intimacy and fun as well as high in conflict, and are particularly effective at controlling social resources (Hawley et al., 2007). This theory is a great starting point, however; a larger amount of data is needed to

clarify the relationship between physiological responses and social resource control. Also, this theory needs to be addressed in different age groups. Studies should be conducted that determine the traits and characteristics that contribute to a person being considered as popular. For instance, the current study looks at what qualities are needed to constitute popularity and if aggression and prosocial skills underlie the popular position. If the idea of popularity can be separated from likeability, then perhaps less dominance or aggression would be seen in popular individuals.

Other aspects that have yet to be thoroughly examined are age and sex differences in stress and social status. Most studies involve males or young children. Some studies even have suggested that the importance of social hierarchies decreases as the age of an individual increases. However, others suggest they remain and increase or decrease depending on the stability or instability of the hierarchical situation (Sapolsky, 2004). Girls and women's hierarchies are often seen as more unstable (Geary & Flinn, 2000, Geary et al., 2003, Furman, 1979, Savin-Williams, 1978). Therefore, social stress might be higher for adolescent girls and women vying for the dominant position or the position of most "popular" due to the unpredictable nature of that position. The literature is lacking in some age groups, specifically older adolescents. This period of development is one in which many hierarchies are formed and perceived popularity is a valuable commodity.

Novel aspects of social stress are important to examine, as this will tell us how the stress response system responds to the often novel aspects of the peer group. Often stress is measured physically by aggressive acts or socially by questionnaires or assessments such as the Trier Social Stress Test. Self-report measures are often inaccurate and the

Trier Social Stress Test does not mimic the stressors in everyday life. Other measurements should be used in order to better determine social stress. For instance, reward allocation can be used to determine hierarchical systems. A reward allocation task is when participants are given objects of value to them and are asked to distribute the objects however they feel appropriate. The objects are often given in uneven numbers so that they cannot be distributed evenly. This task demonstrates who in the hierarchy would receive the most or least rewards. It is similar to what happens in hierarchies during everyday life. There is always a struggle for the distribution of salient resources. Additionally, cortisol or biophysical measures can be used as biomarkers during reward allocation tasks. Reward allocation tasks would be useful because they can be made socially relevant to everyone at every age. The Trier Social Stress Test is not useful in small children and in most adolescents. Reward allocation tasks are also non-invasive and can be conducted at a very minimal price. Also, cortisol levels can be obtained and studied during observable socially stressful times. Some studies could be conducted at sporting events, parties, or other social gatherings to better assess the HPA activity of the individuals. For example, the current study examines cortisol at a high school students lunch period in order to examine naturalistic, recurring psychosocial stressors.

This study examines the characteristics and physiological profiles associated with perceived popularity. It helps to determine the qualities that involved in social dominance. The study will also look at the physiological profiles (e.g., cortisol levels) of both dominant and subordinate individuals and examine how socially stressful situations affect both groups. Overall, this study looks at whether socially dominant (i.e.

popular/bi-strategic) individuals will be more physiologically reactive than subordinate individuals in both laboratory as well as naturalistic psychosocial situations.

Hypotheses:

- It is predicted that individuals ranked as popular (scoring the highest number on the popularity ranking questionnaire) will be a bi-strategic controller (scores based on questions 5, 9, 12, and 22 on the popularity questionnaire).
- It is predicted that the individuals who were ranked as low popularity will have the greatest change in cortisol levels after the reward allocation task.
- It is predicted that the individuals who were ranked as low on popularity will have the highest cortisol levels upon entering the lunch area.
- It is predicted that females will show a stronger response to both the game and lunchroom situations, and the female subordinates will show a stronger response than the female dominants.

CHAPTER III

METHODOLOGY

Common Methods

Participants

Participants were students in grades 10th, 11th, and 12th from a high school in rural Oklahoma. Students were asked to participate through informed consent forms distributed to parents and informed assent forms given during the students' English classes.

Materials and Procedures

Salivary Cortisol

In session two and three students were asked to give a sample of their saliva. All students were instructed to avoid all potential confounds, if at all possible, at least one hour prior to collection of the saliva. Potential confounds include, but are not limited to, sleep, exercise, tobacco use, caffeine, and food (S. J. Kelly, Young, Sweeting, Fischer, & West, 2008). They were asked about confounds by a research assistant prior to their

Participation in order to control for these confounds. Saliva was obtained from participants by instructing them to place a 1 X 4 CM absorbent swab in their mouths and saturate it with saliva for approximately 1-2 minutes. The swabs were collected, labeled, and froze until time when saliva samples can be assayed for cortisol.

On the day of testing saliva samples were centrifuged at 3000 rpm for 15 minutes to remove mucins. Following Granger and colleagues (2007), samples were assayed for cortisol (enzyme immunoassay) using commercially available reagents (Salimetrics, State College, PA) without modification to the manufacturers recommended protocols. Cortisol levels were reported in micrograms per deciliter (ug/dL). These assays have average intra- and inter-assay coefficients of variation less than 5% and 15% respectively. The mean intra-assay coefficient is a measure of the average variability for each assay from the same sample. The mean inter-assay coefficient of variation provides a measure of the average variation from the controls provided in the assay kits. It is the average difference from expected values for the control samples.

Session One

Participants

Participants were 35 students in the 10^{th}, 11^{th}, and 12^{th} grade at a rural high school in Oklahoma. Seventeen males and eighteen females participated in session one. Thirteen participants were in the 10^{th} grade (M=7, F=6). Twelve participants were in the 11^{th} grade (M=7, F=5). Ten participants were in the 12^{th} grade (M=3, F=7).

Materials and Procedures

Only students for whom both parental consent and child assent was attained were included in the study. Participants were given a list of everyone in their grade that had

returned the consent forms. They were asked to rank those students as popular or unpopular on a Likert scale of one to five with one being not popular and five being very popular. The students were then given questionnaires regarding what makes individuals popular. These questionnaires are a modified version of the Resource-Control Strategies Inventory (RSCI). These questionnaires were developed using previous research from Hawley (1999, 2007, 2009). They filled out three of these questionnaires. On each questionnaire they listed one individual they rated as highly popular in the first ranking questionnaire and answered the questions about that person (See Appendix A). In addition, participants filled out a demographic questionnaire (See Appendix B). They also completed a relationship questionnaire (See Appendix C), an opinion questionnaire (See Appendix D), and a ten-item personality inventory (TIPI) (See Appendix E).

These questionnaires were used to determine social hierarchies and characteristics of popular individuals. Students were not allowed to see each other's questionnaires and no names were written on them in order to keep identities confidential. These surveys were then used to organize the students into groups for the second part of the study.

Session Two

Participants

Participants were 27 students in the 10^{th}, 11^{th}, and 12^{th} grades in a rural high school in Oklahoma. Ten 10^{th} grade students (M=6, F=4), eight 11^{th} grade students (M=6, F=2), and nine 12^{th} grade students (M=3, F=6) participated. These students had completed the first session of the study. Eight participants that took part in the first

session did not take part in the second session because they had moved or were not in school at the times the study was conducted.

Materials and Procedures

The second part of the study was conducted on a separate day from the first study. Students took part in a reward allocation task. This task lasted approximately 30 minutes. Students were divided by the experimenter into groups of three, four, or five. The placement of the students was based on the popularity ranking that were conducted in session one. Without the participants' knowledge, they were placed in groups with high and low popularity students or in groups with middle ranking students.

The reward allocation task involved students being given $30, $40, or $50 dollars in $10 increments. The amount was determined based on the group size ($30 = 3 participants, $40 = 4 participants, and $50 = 5 participants). They were told to distribute it anyway they saw fit. All students were given a turn to do this. The students then repeated the game with uneven increments of money (groups of 3 = $40 & $50, groups of 4 = $50 & $70, groups of 5 = $60 & $80). Participants were informed that a record was being kept of how the money was distributed. The individual in each group that receives the most money during the game were entered in a drawing to win a 50 dollar gift card. This was to help insure the saliency of the game. The game was intended to activate their HPA axis with a social reward situation.

The participants that took part in the reward allocation task were also asked to complete a questionnaire addressing how their stress level and mood was immediately following the task. They were then asked to give saliva to be assayed at a later time for cortisol. Saliva was taken as they arrived, immediately following the reward task, and 15

minutes following the task in order to determine their stress/arousal level before and after the game. Cortisol takes approximately 15 minutes to peak after the stressor. Therefore, the final saliva samples were used to determine how reactive they were to the task.

Session Three

Participants

The participants in the third session were 14 students in the 10^{th}, 11^{th}, and 12^{th} grades at a rural high school in Oklahoma. These participants took part in either session one, session two or both sessions. The participants include six 10^{th} graders (M=3, F=3), six 11^{th} graders (M=5, F=1), and four 12^{th} graders (M=1, F=3).

Materials and Procedures

The final session was conducted at one lunch period where saliva samples were obtained from the participants. This allowed measurement of the HPA activity of individuals in a naturalistic social setting. In addition, the students completed the same survey as in the second session that asked their stress level and mood level at the current time.

CHAPTER IV

FINDINGS

Session One

Session one employed the use of mean scores on the popularity ranking questionnaires. Participants average popularity rankings ranged from 1.50 (low popularity) to 4.60 (high popularity) with a mean score of 3.02. Participants were labeled as highly popular or dominant if they fell in the top 30% of their class on popularity ranking. They were labeled as low popularity or subordinates if they fell in the bottom 30% of their class on popularity rankings.

The Resource Strategies Control Inventory was used in order to determine if individuals that are highly popular are reported as bi-strategic controllers. Bi-stragetic controllers were defined as anyone scoring high on prosocial and coercive questions.

The scores for bistrategic controllers were configured using questions 5 and 9 (prosocial questions) and questions 12 and 22 (coercive questions). This is based on previous work by Hawley (2009). The students were then given a small demographic questionnaire where they listed their age, gender, grade, parents' income, parent's highest grade level completed and how popular they feel they are on the same Likert scale listed above. In total, all questionnaires took approximately 15 to 30 minutes to complete.

A series of correlation analyses were conducted in order to determine if individuals that are highly popular are reported as high in bi-strategic controller strategies. In addition, scores on the 'Total Scores on Resource Control Inventory' were correlated with average popularity scores. Question 15 (He/She has difficulty sitting still during lessons, fidgets uneasily in his/her seat, and may also be talkative and noisy) was reverse coded and the numbers were changed before the total score was figured. All questions in the popularity questionnaire except questions 7, 8, 13, 18, 21, and 23 were called 'Total Scores on Resource Control Inventory' and by omitting the previously mentioned questions, which were added by the author, the document became the original Resource Control Strategies Inventory (Hawley, 2001, 2007). Table one shows the correlations. Average popularity was significantly correlated with coercive strategies (*r=.438, p<.014)*, prosocial strategies (*r=.579, p<.001)*, bistrategic strategies (*r=.616, p<.000)*, total scores on the resource-control strategy inventory (RCSI) (*r=.537, p<.002)*, extraversion (*r=.607, p<.000)*, number of friendship years (*r=.367, p<.030),* and parents yearly income (*r=.506, p<.003).* In addition, it was found that coercive strategies were also significantly correlated with parents yearly income (*r=.532, p<.003).*

No significant interactions with sex were seen except the boys reported higher levels of emotional stability (*t=2.993, p<.005).*

Table 1

Popularity Correlations

	Coercive Strategies	Prosocial Strategies	Bistrategic Strategies	RCSI	Extraversion	Friendship Years	Yearly Income
Average Popularity	.438*	.579**	.616**	.537**	.607**	.367*	.506**

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Session Two

Session two employed a 2 (Male/Female) X 3 (High Popularity/Middle Popularity/Low Popularity) X 3 (cortisol 1/cortisol 2/cortisol 3) design. Participants' levels of salivary cortisol were measured (pre-task, immediate post-task, 15 min. post-task). The resulting data was analyzed through a repeated measures Analysis of Variance (ANOVA) utilizing a series of planned contrasts. An alpha level of .05 was used. The greenhouse-geiser correction was used in order to account for violations of sphericity. A main effect for salivary cortisol was found $F = 17.424$, $p = .03$. The interaction of salivary cortisol and sex was significant $F = 13.03$, $p = .042$. The interaction of salivary cortisol and average popularity was also significant $F = 16.151$, $p = .028$.

Follow up tests to break down the main effect of salivary cortisol levels in samples were conducted with three paired sample t-tests and a Roy Bose adjustment. There was a statistically significant effect with the Roy Bose adjustment between salivary cortisol at time one and salivary cortisol at time two and time three. Also, there was a

statistically significant effect with the Roy Bose adjustment between salivary cortisol at time two and time three.

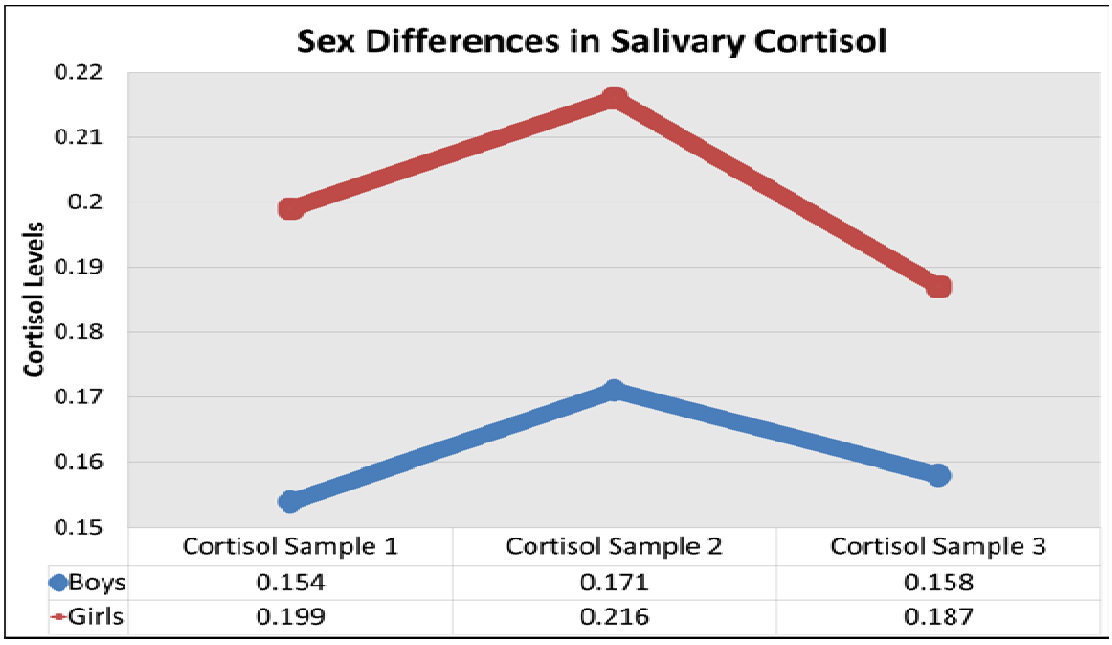
In order to test the interaction of salivary cortisol and sex, three paired sample t-tests were conducted with a Bonferroni correction. There was a significant effect with the Bonferroni correction between sex and salivary cortisol at time one, two, and three. Girls had higher salivary cortisol levels at all three times (See table two and graph one).

Table 2

Sex-Cortisol Means

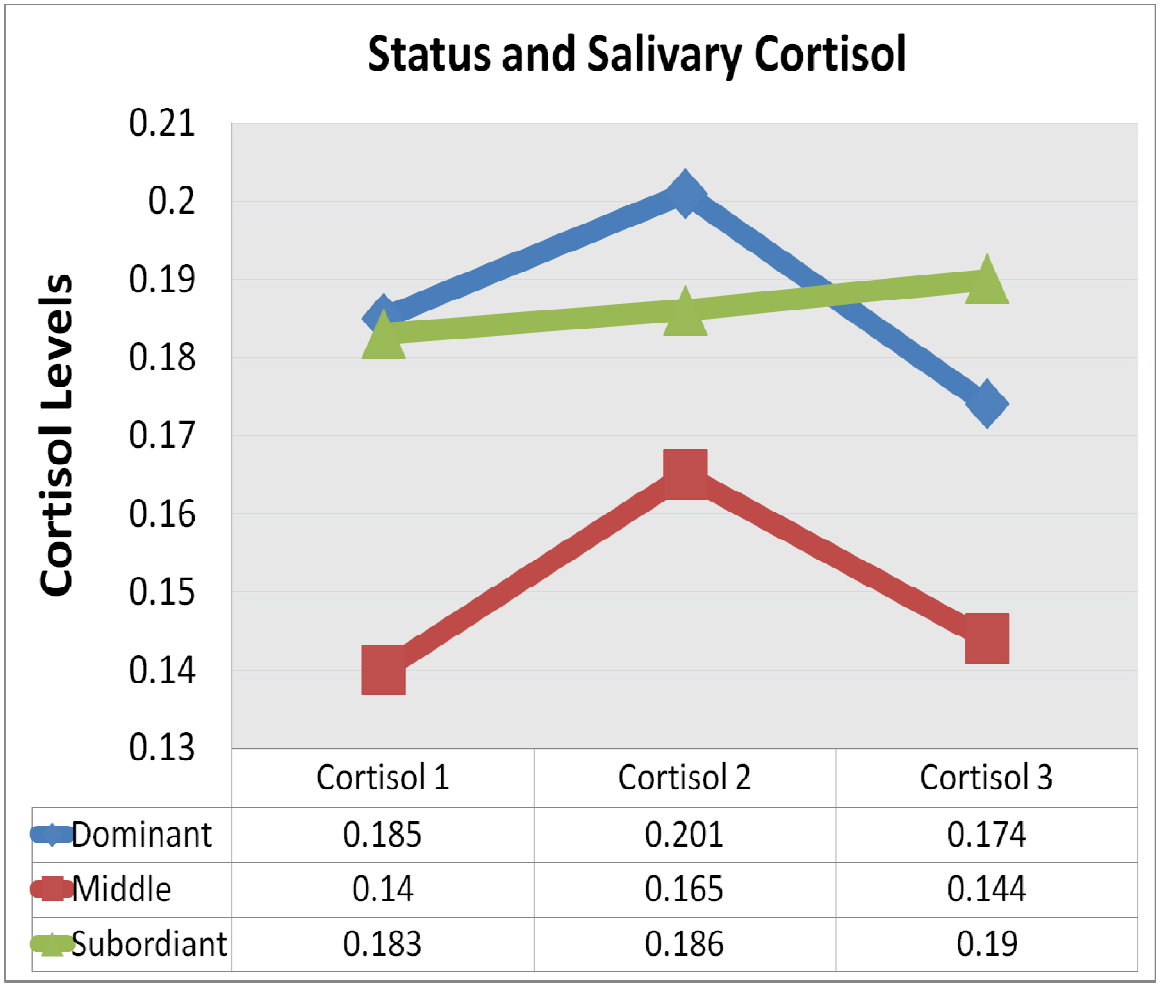
Sample	Sex	N	Mean
Sample 1	Boys	16	.15156
	Girls	14	.19221
Sample 2	Boys	16	.16569
	Girls	14	.20993
Sample 3	Boys	16	.15413
	Girls	14	.18143

Figure 1



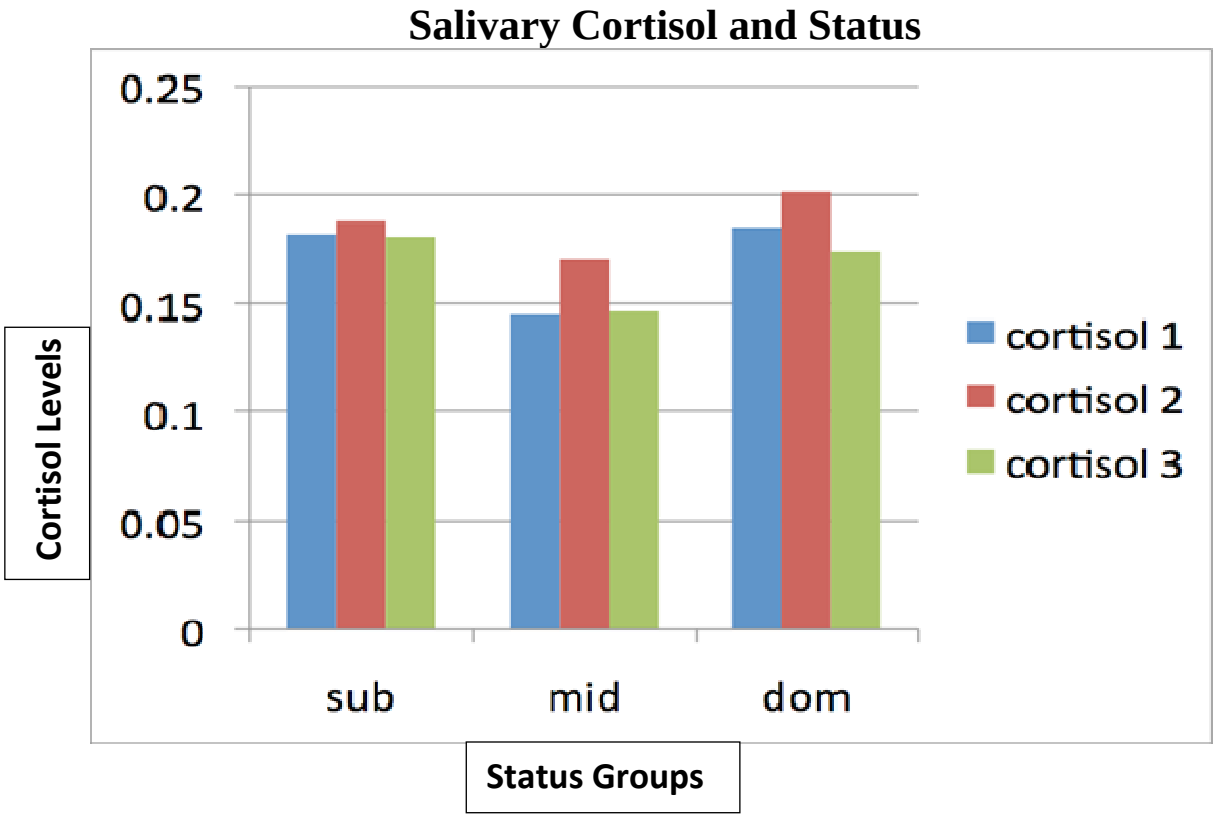
In order to probe the significant interaction of average popularity and salivary cortisol, the average popularity was divided into groups based on the 30% - 40% - 30% (dominant, middle, and subordinate) class ranking categories that were used in session one. The salivary scores were then averaged within these categories and a paired sample t-test was conducted. Results revealed middle ranked individuals were significantly different from subordinate and dominant individuals ($t = 4.722$, $p = .042$, $t = 8.523$, $p = .013$). There was not a statistical difference between the subordinate and dominant group. The middle ranked individuals had the lowest levels of salivary cortisol throughout the task (See figures 2 and 3).

Figure 2



	Cortisol 1	Cortisol 2	Cortisol 3
Dominant	0.185	0.201	0.174
Middle	0.14	0.165	0.144
Subordiant	0.183	0.186	0.19

Figure 3



In order to better interpret these results, graphs of the sexes, status and salivary cortisol levels were examined. Although the interaction of sex, status group, and cortisol levels are not statistically significant ($F = .602$, $p = .634$), the graphs show subordinate boys with the highest reaction that begins to drop off after the task. For boys, dominant and middle groups have lower beginning scores. However, middle groups drop off after the task and dominants are still slightly continuing to elevate. For girls, the dominant group has the largest cortisol scores although they also have the largest drop off after the task. Subordinate girls peak after the game and appear to rise drastically. In both boys and girls the middle group starts low, peaks during the game, and begins to decrease (See figures 4 and 5).

Figure 4

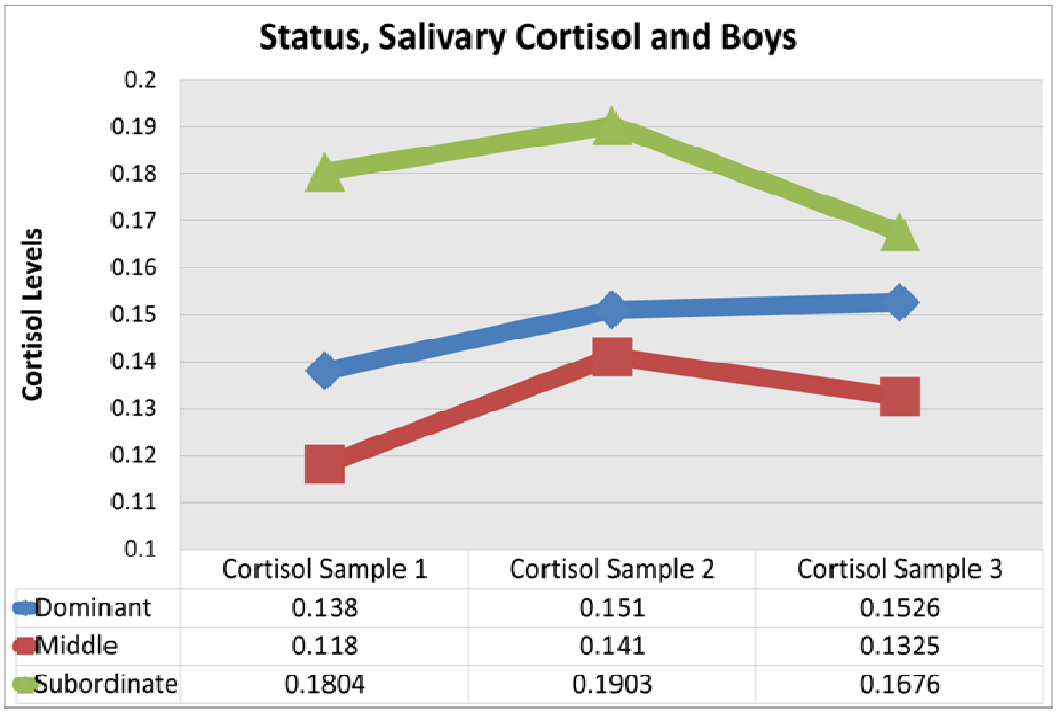
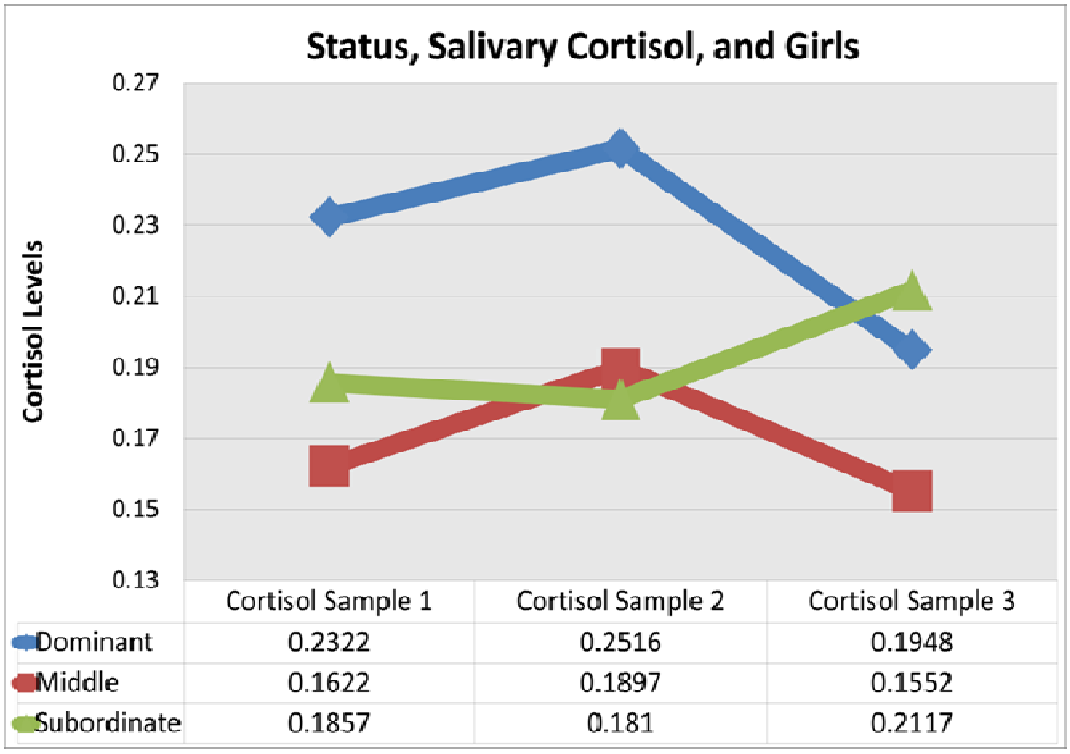


Figure 5



Regression Analysis

To examine popularity more closely, a regression analysis was conducted, rather than an ANOVA, because average popularity is a continuous variable and not a dichotomous variable. In addition, the overall change in cortisol levels, or the reactivity, was of particular interest as it related to popularity. Therefore, the change scores between the salivary cortisol samples were examined and as well as specific sex differences in a linear regression. The change scores of salivary cortisol from time one to time two, from time two to time three, and from time one to time three were determined. A number of regression analyses were run to determine if Sex and Popularity were predictive of cortisol change scores. There was a significant relationship between average girls' popularity and change scores between time two and time three (F = 7.826, p = .016, β = .628, t = 2.798), but not for boys (F = .026, p = .874, β = -.043, t = -.161).

In addition, an independent sample t-test was conducted to determine if average popularity was associated with who won or lost the reward allocation task. The results revealed there was a statistically significant relationship between average popularity and winning (t = 3.444, p = .002). However, using a linear regression of popularity and winning, defined by sex, it was determined that the significance was based on the females only (F = 38.673, p = .000, β = .882, t = 6.219), males were not significant (F = 1.559, p = .232, β = -.317, t = -1.248).

Session Three

A linear regression was conducted to determine if lunchroom cortisol was related to average popularity based on sex. Girls' average popularity was related to their lunchtime cortisol as seen in a linear regression (F = 8.032, p = .037, β = -.785, t = -

2.834). However, boys lunchroom cortisol was not statistically related (F = .431, p = .533, β = .241, t = .656).

CHAPTER V

CONCLUSION

General Discussion

Social Hierarchies and perceived popularity play an important role on both a social groups and individual level. The results from the questionnaires in session one show that, as predicted, as the popularity level increases the amount of coercive and prosocial strategies increases. Taken together, the results show popularity is positively correlated with bistrategic strategies as was reported in previous literature (Hawley, 1999). The findings suggest that, on average, if a person is considered popular by their peers, they will use coercion like threats or physical aggression, as well as prosocial skills like helping behavior that benefits another. This combination appears to allow for the greatest control of resources.

Parental income was correlated with average popularity as well as coercive strategies. Although this has not been previously studied, some current literature does

suggest that socio-economic status can impact popularity, especially for Hispanics and Whites groups (Kennedy, 1995). For the current study, this can show that with more resources comes greater popularity as well as greater skills needed for keeping those resources.

Extraversion was correlated with average popularity. This supports past literature that shows extraversion has an impact on aspects of friendship and social likeability and that shy and reserved individuals are not seen as a strong force in group settings (van der Linden, Scholte, Cillessen, Nijenhuis, & Segers, 2010; Young & Bradley, 1998). To be popular, a person must be visible in the social group. Extraverted individuals are often seen and known by all members of the group. In addition, they are more socially motivated and therefore are more motivated to control social resources (John, Caspi, Robins, & Moffitt, 1994).

The current findings did differ some from the previous stated hypotheses. Low ranked individuals (subordinates) did not have the greatest cortisol change or the highest level of cortisol upon entering the lunchroom. One study in which lower status individuals had the highest cortisol level was conducted by Cozty etal., (2008) in which cynomolgus male monkeys that occupied the lowest position or would soon occupy the lowest position had the highest cortisol levels. In addition, Sapolsky's (2004) work suggests that the subordinate groups have higher cortisol levels but, this can be impacted by culture and temperament or change in hierarchical status. In the current sample, perhaps the social hierarchy was not changing or was not about to change. Therefore, the subordinates did not have the greatest stress because they knew their position in the social

situation. However, the girls did show a greater difference than the males in cortisol activity. This could be due to the instability of girls social hierarchies (Savin-Williams, 1978).

This study shows that there is a difference in HPA activity between the sexes and individuals of different status. The students' HPA system was reactive to the reward allocation task. However, females had higher cortisol levels during the entire reward allocation and saliva collection period. This has been seen in previous literature (Weekes et al., 2008). Cortisol can be affected by estrogen and oral contraceptives (Granger et al., 2012). The students in this study were not asked about possible oral contraceptive usage and this may have an effect. In addition, female hierarchies are more unstable (Savin-Williams, 1978). Therefore, the raised cortisol level for girls could be due to the anticipatory stress that arises as the females anticipated the reward allocation task. They could be stressed or aroused based on the unstableness of the hierarchy and the unknown outcome of the task (Dickerson & Kemeny, 2004; Huether, 1998).

This effect was further displayed when the girls winning scores were examined. The more popular the girl was, the more money she won during the reward allocation task. When this is examined in relation to the salivary cortisol scores of dominant girls, it appears that these girls were aroused during the beginning of the game but became less aroused when they won or began to win the game. In this case, the outcome was more secure, and thus related to deceleration of HPA activity.

When examining the scores of the different groups, the dominant and subordinate individuals had much higher cortisol levels than the middle ranked individuals throughout the task. Based on previous literature (Sapolsky, 2004), the middle ranked

individuals might not be as aroused/stressed overall by this task. The middle ranked individuals often are less stressed because they have enough resources without fighting for the top (dominant) or struggling to get higher in the group (subordinate). In addition, they might be unmotivated to try to get any more resources. Middle ranked individuals originally had levels of cortisol that rose but after the game they began to drop. It is important to note that middle ranked individuals were playing with other middle ranked individuals so the stress of the social interaction might not have been the cause of the rise in cortisol but, instead the game itself. However, the other data observed shows that sex can make a difference in response to cortisol relative to status. It appears that the subordinates do not have a linear cortisol level but instead, the sexes have opposite reaction as subordinate and that creates the linear trend.

The overall results of session two seem to show that for males, as a subordinate, they are more reactive. In addition, it appears that simply entering the social situation can be stressful. After taking part in the task, the male subordinates do show a drop in cortisol. This appears to show that they are reactive to the overall social interaction but, losing the game was not stressful to them. The middle and dominant boy groups had similar cortisol responses to one another. However, the dominants' cortisol still rose after the game. This is most likely due to arousal and not stress of winning the game. Boys tend to be aroused by competition, especially if they are the winning group (Kivlighan & Granger, 2006; Kivlighan, Granger, & Booth, 2005). Dominant girls, on the other hand, were aroused upon entering the room and the game. However, as mentioned previously, after the dominant girls began to win or saw they could win their cortisol levels began to drop. It could also be that entering into a social setting was

arousing for the dominant girls. However, after taking part in the social group their arousal level may have decrease. This is not seen with subordinate girls. Their cortisol levels rose throughout the game and even following it. These results show that for subordinate girls the interaction with dominants generates a reaction overall regardless of the game (Sapolsky, 2004).

Although the lunchroom sample was small, it still showed that dominant girls had a reaction to entering the lunchroom. This is similar to when they entered the room to play the reward allocation task. The implications of these findings show that females, especially dominant females, have a large reaction to social situations. This may be, in part, because of the risk of position change within the hierarchy. This risk is seen in resource allocation as well as in normal daily situations (Weekes, et al., 2008). In addition, some of the rise in cortisol may be due to positive anticipation and not necessarily stress (Fortunato, Dribin, Granger, & Buss, 2008).

Many studies have been conducted on stress, social hierarchies, and perceived popularity. All these studies have added insight into social environments. The overall findings on the impact of social hierarchies on stress levels have been mixed. Therefore, more studies, such as the one outlined above, should be conducted in order to flesh out the nuances of social hierarchies and HPA arousal and to determine if there are common trends. This study and future studies can help with many issues in humans such as bullying, school shootings, and outcomes of chronic stress levels from peer interactions. The negative impact of stress and social hierarchies can been seen in almost every social animal. However, with continued research some problems may be reduced and positive results may be seen.

Limitations and Future Directions

This study serves as an introductory look into characteristics of popularity and stress. One limitation of the study is the lack of diversity of the sample population as well as the small sample size. Future studies should be conducted in large schools as well as in different cultural locations. This will determine if there is a situational or cultural component to popularity and stress. In other cultures (non-Western), popularity might not involve coercive skills. Some cultures view cooperation and that might be needed to be popular. However, because of the results seen in the current study, one future direction would involve interventions or coping skills being taught to children in order to decrease stress in social situations involving resources. The subordinate group appears to have higher overall stress and this can have a great impact on health and other aspects of their lives (Jackson, Twenge, Souza, Chiang, & Goodman, 2011). Past experiences or family situations might also have an impact on individuals' cortisol levels. Future studies can address life history to see if changes in cortisol may be due to blunted responses.

Also, future studies and interventions can explain the characteristics of popular individuals to students in order to allow understanding and develop strategies for greater cooperation. For example, if prosocial and coercive strategies are explained to younger children, they can identify and use the proper strategy and proper response in social situations. By-standards or middle ranked individuals can also play a large role in helping with social interactions by buffering the effects of dominant and subordinate negative interactions. This study helps to show the consequences of bullying through the

stress research. Overall, this study evaluates popularity and the level of stress that individuals face relating to social status.

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APPPENDICES

A - Modified Resource Control Strategies Inventory

List one of the most popular individuals from your grade (someone you rated as a one on the ranking questionnaire)_____

Answer the following questions based on the person listed above

1.) He/She is kind and agreeable	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
	[ ]	[ ]	[ ]	[ ]	[ ]
2.) He/She gossips or spreads rumors about others if he/she is mad at them	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
	[ ]	[ ]	[ ]	[ ]	[ ]
3.) He/She is good at getting what they want	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
	[ ]	[ ]	[ ]	[ ]	[ ]

4.) He/She tells his/her friends to stop liking someone in order to get what they want	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
	[ ]	[ ]	[ ]	[ ]	[ ]
5.) He/She has good ideas or suggestions that others like to follow.	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
	[ ]	[ ]	[ ]	[ ]	[ ]
6.) He/She is the kind of person who ignores others or stops talking to them	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
	[ ]	[ ]	[ ]	[ ]	[ ]
7.) He/She is sexually active	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
	[ ]	[ ]	[ ]	[ ]	[ ]
8.) He/She is good looking	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
	[ ]	[ ]	[ ]	[ ]	[ ]
9.) He/She is chosen by others to lead the group	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
	[ ]	[ ]	[ ]	[ ]	[ ]
10.) He/She pushes, kicks, or punches other because he/she has been angered by them	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
	[ ]	[ ]	[ ]	[ ]	[ ]

11.) He/She knows how to make someone smile	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
	[ ]	[ ]	[ ]	[ ]	[ ]
12.) He/She makes others do what he/she wants	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
	[ ]	[ ]	[ ]	[ ]	[ ]
13.) He/She makes good grades	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
	[ ]	[ ]	[ ]	[ ]	[ ]
14.) He/She usually gets attention from others	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
	[ ]	[ ]	[ ]	[ ]	[ ]
15.) He/She has difficulty sitting still during lessons, fidgets uneasily in his/her seat, and may also be talkative and noisy	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
	[ ]	[ ]	[ ]	[ ]	[ ]
16.) He/She can tell how others are feeling	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
	[ ]	[ ]	[ ]	[ ]	[ ]
17.) He/She says mean things to others	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
	[ ]	[ ]	[ ]	[ ]	[ ]

18.) He/She is good at sports	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
	[ ]	[ ]	[ ]	[ ]	[ ]
19.) He/She starts fights to get what they want	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
	[ ]	[ ]	[ ]	[ ]	[ ]
20.) He/She is thorough/planful	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
	[ ]	[ ]	[ ]	[ ]	[ ]
21.) He/She always has money to spend	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
	[ ]	[ ]	[ ]	[ ]	[ ]
22.) He/She forces others to follow his/her plans	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
	[ ]	[ ]	[ ]	[ ]	[ ]
23.) His/Her family is influential in the town	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
	[ ]	[ ]	[ ]	[ ]	[ ]

B – Demographic Questionnaire

Personal Questionnaire

Please ***CIRCLE*** the answer that *best* fits you

1.) Name:
_____

2.) Gender: Male Female

3.) Age: 14 15 16 17 18
19

4.) Grade: 10^{th} 11^{th} 12^{th}

5.) Parents yearly income: $0-$20,000 $21-40,000 $41-$60,000 $61-$80,000

$80-$100,000 $100,000+

6.) Highest grade mom completed: Jr. High High School 2-yr Degree 4-yr Degree Masters PhD

7.) Highest grade dad completed: Jr. High High School 2-yr Degree 4-yr Degree Masters PhD

8.) How popular are you: 1 2 3 4 5
Very Popular Not Popular

C - Network of Relationship Inventory

My Relationship

Now we would like you to answer the following questions about your best friend.

1. How much free time do you spend with this person?

Little or None	Somewhat	Very Much	Extremely Much	The Most
1	2	3	4	5

2. How much do you talk about everything with this person?

Little or None	Somewhat	Very Much	Extremely Much	The Most
1	2	3	4	5

3. How sure are you that this relationship will last no matter what?

Little or None	Somewhat	Very Much	Extremely Much	The Most
1	2	3	4	5

4. How satisfied are you with your relationship with this person?

Little or None	Somewhat	Very Much	Extremely Much	The Most
1	2	3	4	5

5. How much do you play around and have fun with this person?

Little or None	Somewhat	Very Much	Extremely Much	The Most
1	2	3	4	5

6. How much do you and this person disagree and quarrel?

Little or None	Somewhat	Very Much	Extremely Much	The Most
1	2	3	4	5

7. How much does this person really care about you?

Little or None	Somewhat	Very Much	Extremely Much	The Most
1	2	3	4	5

8. How happy are you with the way things are between you and this person?

Little or None	Somewhat	Very Much	Extremely Much	The Most
1	2	3	4	5

9. How long have you been friends with this person?

____ less than 1 yr. ____ 1 – 2 yrs. ____ 2 – 3 yrs. ____ 3 – 4 yrs. ____ 4 – 5 yrs.

____ 5 – 6 yrs. ____ 6 – 7 yrs. ____ 7 – 8 yrs. ____ 8 – 9 yrs. ____ more than 9 yrs.

10. How many good friends do you have?

_____0-1 ____2-4 ____5-7 ____8-10 ____11 or more

D - Opinion Questionnaire

	Strongly Disagree				Strongly Agree
1. I enjoy going to school	1	2	3	4	5
2. My favorite classes are math/science related	1	2	3	4	5
3. I enjoy writing assignments	1	2	3	4	5
4. School is a great place to make friends	1	2	3	4	5
5. School should be year round	1	2	3	4	5
6. Schools should have uniforms	1	2	3	4	5
7. High schools should have daily P.E. classes	1	2	3	4	5
8. I hope to go to college	1	2	3	4	5
9. I like the way I look	1	2	3	4	5
10. I like my personality	1	2	3	4	5

E -Ten-Item Personality Inventory-(TIPI)

Here are a number of personality traits that may or may not apply to you. Please write a number next to each statement to indicate the extent to which you agree or disagree with that statement. You should rate the extent to which the pair of traits applies to you, even if one characteristic applies more strongly than the other.

1 = Disagree strongly
2 = Disagree moderately
3 = Disagree a little
4 = Neither agree nor disagree
5 = Agree a little
6 = Agree moderately
7 = Agree strongly

I see myself as:

1. _____ Extraverted, enthusiastic.
2. _____ Critical, quarrelsome.
3. _____ Dependable, self-disciplined.
4. _____ Anxious, easily upset.
5. _____ Open to new experiences, complex.
6. _____ Reserved, quiet.
7. _____ Sympathetic, warm.
8. _____ Disorganized, careless.
9. _____ Calm, emotionally stable.
10. _____ Conventional, uncreative.

F – IRB Approval Page

Oklahoma State University Institutional Review Board

Date: Monday, August 08, 2011 Protocol Expires: 3/8/2012

IRB Application No: AS1115

Proposal Title: Social Hierarchies and Cortisol Levels in High School Students

Reviewed and Processed as: Full Board

Modification

Status Recommended by Reviewer(s) **Approved**

Principal Investigator(s):

Amber R. Massey
116 North Murray
Stillwater, OK 74078

Jennifer Byrd-Craven
116 North Murray
Stillwater, OK 74078

The requested modification to this IRB protocol has been approved. Please note that the original expiration date of the protocol has not changed. The IRB office MUST be notified in writing when a project is complete. All approved projects are subject to monitoring by the IRB.

X The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

The reviewer(s) had these comments:

The request to alter the planned compensation is approved.

Signature :

Shelia N. Kennison

Shelia Kennison, Chair, Institutional Review Board

Monday, August 08, 2011
Date

VITA

Amber Rhea Massey

Candidate for the Degree of

Master of Science

Thesis: THE EFFECTS OF SOCIAL HIERARCHIES AND PERCEIVED POPULARITY ON STRESS LEVELS

Major Field: Psychology

Biographical:

Education:

Completed the requirements for the Master of Science in Psychology at Oklahoma State University, Stillwater, Oklahoma in May, 2012.

Completed the requirements for the Bachelor of Science in your Psychology at Oklahoma State University, Stillwater, Oklahoma in May, 2010.

Experience:

Presented Poster at Southwestern Psychological Association Conference in April 2011 – *Affiliation Under Stress.*

Publication: Byrd-Craven, J., Auer, B.J., Granger, D.A., & Massey, A.M. The Father-Daughter Dance: The influence of father-daughter relationship quality on daughters' stress response to peer dynamics. *The Journal of Family Psychology.*

Presented Poster at Southwestern Psychological Association Conference in April 2012 – *Does Popularity Change*?

Presented Poster at Southwestern Psychological Association Conference in April 2012 – *Social Support during Pregnancy: Friendship and Mating Interactions Influence on Women's Health.*

Presented Poster at Southwestern Psychological Association Conference in April 2012 – *Climbing the Social Ladder: Social Hierarchies, Perceived Popularity, and Stress*.

Name: Amber Massey Date of Degree: May, 2012

Institution: Oklahoma State University Location: Stillwater, Oklahoma

Title of Study: THE EFFECTS OF SOCIAL HIERARCHIES AND PERCEIVED POPULARITY ON STRESS LEVELS

Pages in Study: 60 Candidate for the Degree of Master of Science

Major Field: Psychology

Scope and Method of Study: The purpose of this research is discovering a better understanding of the relationship between social hierarchies and stress levels in adolescents. This study uses a non-invasive approach (saliva samples) in order to assess salivary cortisol to reflect stress responses in a high school setting. Perceived popularity was studied in order to determine social hierarchical rankings and determinates for social positioning. Stress responses was studied both in a naturalistic setting as well as in an experimental setting (a reward allocation task). The research attempts to investigate what makes individuals socially dominant or subordinate and what role stress responses play in these hierarchies. The current results have implications for early intervention in social bullying as well as health consequences related to stress levels in teens.

Findings and Conclusions: The study shows that the more popular the individual is the more bistrategic strategies they use. The popular individuals were high in prosocial and coercive strategies as well as high in extraversion. In addition, coercive strategies were related to parent's income. The study also showed there is a cortisol difference between the sexes with females having higher overall cortisol. In addition, dominant females had the highest cortisol through the reward allocation task and dominant females won the game most often. However, the study showed that after they won that their cortisol level began to drop. Cortisol levels were also highest for dominant females upon entering the lunchroom. Overall, dominant individuals had the highest cortisol scores and changes between cortisol scores. Subordinate individuals did not have large change scores and therefore were viewed as having less stress in the task. The findings suggest that perceived popularity and social status is related to stress level and this is especially seen in females.

ADVISER'S APPROVAL: Dr. Jennifer Byrd-Craven