

Prosocial Behavior as a Stress Moderator: The Physiological and Psychological  
Components

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## Abstract

Stress is a major part of everyday life for the majority of people, especially college students. Stress has a physiological response and serves an important purpose in the body. If an individual does not take the proper measures to reduce stress and it continues for long periods of time, the outcome can be damaging to the stressed individual. Stress can cause problems both physically and mentally. There are many different ways to reduce stress and to counteract the damage that stress can cause on the body. Prosocial behavior is an action that elevates others' needs over an individual's needs. Studies have been completed to see if this type of behavior is capable of reducing stress. This coping mechanism appears to be effective because the physiological effects and psychological effects that prosocial behavior has on the body are opposite of the effects that stress produces in the body. Prosocial behavior also allows the individual performing the action to take his or her mind off the overwhelming circumstance and thus, stop the effects from taking a toll on the body. This paper will review the literature in order to determine if prosocial behavior would be a better coping mechanism in reducing stress, specifically in college students, than other coping mechanisms, such as exercise or temporal distancing. The paper will also try to determine if prosocial behavior can be effective in preventing long-term stress or if it is only helpful in reducing stress after it has occurred.

*Keywords:* stress, prosocial behavior, physiology, psychological, college students

Prosocial Behavior as a Moderator of Stress: The physiological and psychological  
Components

Stress is a common everyday occurrence. An individual experiences stress when he or she is running late to work, deciding what to wear for a meeting, meeting new people, thinking that the individual is always forgetting something in the back of his or her mind, having difficulties in school or with family and friends, and dealing with a wide variety of other stressors that can occur throughout the individual's day. Healthy stress is needed in order to be able to recognize the unplanned events that occur in life. If a person does not recognize an event as threatening then he or she might not be able to respond appropriately to the event to keep him or herself out of danger (Khan, Fatima, Shanawaz, Fathima, & Mantri, 2016). Stress can be either the physiological and/or psychological response to an event and is thought to be a product of evolution. The person who is able to respond to the stressor in the best way possible is most likely to be the best fit specimen. While stress can be considered to be part of evolutionary theory, it does not have to be in order for an overwhelming event to be thought of as an adaptive response to a situation.

People need to be cautious, because like any potentially good thing, too much stress can be detrimental. If an overwhelming circumstance is allowed to continue for excessive periods of time, diseases and even death could occur. The results of prolonged stress occur because of the body's fight-or-flight system taking over in response to a stressor. Even though the fight-or-flight system is a natural and necessary response to mild and demanding events, if this system is activated for long periods, it can cause an

increase in inflammation, increased cortisol levels, and other responses (Brown & Brown, 2015).

The coping mechanisms that individuals use to handle anxiety can determine the severity of the stress response, and the amount of time that stress is allowed to run its course in the body. Coping mechanisms range from exercise to ignoring what is happening and pushing through pressure. One potential coping mechanism is prosocial behavior, which is a behavior that is used to promote the well-being of others and seeks to elevate the needs of others over an individual's own needs. When the helper decides to remove his or her focus from his or herself, it allows the helper to be able to take his or her mind away from the stressor and move towards being relaxed. There has been a tremendous amount of evidence to show that altruism has the ability to counteract stress by not only specifically targeting the pathways that activate the fight-or-flight system, but also targeting antagonistic pathways of this system.

### **Background of Stress**

Stressful events occur “when the demands of the event outweigh the person's available resources” (Shiffrin & Nelson, 2010, p. 35). The perception of the event as severe has an important influence on an individual's psychological response to the stressful event (Garcia, Puez, Reyes-Reyes, & Alvarez, 2017); this means that stress is different for everyone. As a result, someone might perceive one event as overwhelming, while someone else could perceive that same event as not demanding at all. Even if the same event is stressful for two different people, their response to the situation may be different. The response is dependent on the person's coping mechanisms and how that

person handles being overwhelmed, which is also different for everyone. If an individual fails to cope with the stressful occurrence, a high allostatic load that is defined as “the physiological and psychological burden placed on the brain and body by stress” (Ménard, Pfau, Hodes, & Russo, 2016, p. 63) may result in the individual experiencing stress. In order for stress to develop, there are three major components that have to be present: the presence of a stressor, the individual’s view of the stress as harmful or aversive, and the response (Maydych et al., 2017).

Stress has been measured previously by physiological symptoms, major life events, prevalence of daily stressors, and cognitive appraisal (Shiffrin & Nelson, 2010). Consequently, a person could have the same string of events occur to him or her during different times of his or her life, and at one time it would be too much to handle and another time it would not. Therefore, a situation only becomes stressful if the person experiencing the event does not have the necessary means to get him or herself through the specific demands.

Stress is not always considered to be a bad response. Stress also can have positive qualities; therefore, it is divided into two categories: eustress and distress. Eustress is “a positive form of stress having a beneficial effect on health, motivation, performance, and emotional well-being” (“Eustress”, 2018), whereas distress is “a state of great suffering of body or mind” (“Distress”, 2018). Distress is the type of stress that the majority tend to focus on and is the topic of most of the research on stress. Distress affects many systems in the body, as well as an individual’s mental health and well-being. Long-term distress has drastic effects on the body and can lead to the development of different diseases

(Brown & Brown, 2014). For the purposes of this paper, wherever the word stress is written, it is assumed that the definition is the one pertaining to distress. Stress can affect the physical aspects of the body, as well as the psychological aspects. Physical stress evokes the stress response immediately, whereas psychological stressors require a cognitive evaluation before a response may occur (Maydych et al., 2017). The majority of the stress referred to in this paper is psychological stress, which after cognitive evaluation, can bring about some of the same responses in the body as physical stress.

Stress occurs because of an individual's reaction to a stressor. Everyone experiences times when an event is too much to handle, and so they react. The reaction is known as stress reactivity, which is most critically developed during adolescence and is different for everyone; however, some people are more reactive to stress than others. Females have a higher stress reactivity than males, and extroverts have a lower stress reactivity than introverts (Britton, Kavanagh, & Polman, 2017). As an individual ages, stress reactivity can change over time. Therefore, what may be stressful for a five-year-old is not often overwhelming for an elderly person. One group of people that has been highly studied in regard to stress is college students.

### **College Students and Stress**

A group of researchers used the Perceived Stress Scale (PSS) (May & Casazza, 2012) and two other questionnaires to measure academic and life stress. They discovered that up to 75 percent of the group of students being studied (212 students in psychology courses at a community college) were moderately stressed, and 10 percent of these students were severely stressed (May & Casazza, 2012). The same research found that

hard science majors (those containing at least six courses of biology, chemistry, math, nursing, dental, pre-med, exercise science, pharmacy, or engineering) experienced more stress than students in soft science majors (those containing less than six of the aforementioned hard sciences courses) (May & Casazza, 2012). There has also been an increase in the levels of stress for college students over the decades due to an increase in the demands that are placed on these students (Moore, Burgard, Larson, & Ferm, 2014).

Academic course load can affect stress. Academic examinations appear to fall between the continuum of acute (the stress that is experienced right before and during an exam) and chronic stress (the stress that would be experienced in the preparation or review period for an exam) (Maydych et al., 2017). The stress associated with exams is known as examination stress, and when a person experiences this type of stress there is an excessive amount of the hormone cortisol released (Murphy, Denis, Ward, & Tartar, 2010). Researchers, Coccia and Darling (2014), examined a group of undergraduate students and their responses to the PSS and an online questionnaire about family demographics, health behaviors, dating status, and their involvement in various activities like texting, television watching, sleeping, and studying. The researchers then looked at the effects of phone usage, relationships, studying, and stress on life satisfaction. They found that stress had the greatest effect on life satisfaction. The study also found that students who spent more time alone studying had higher stress levels, which inversely affected life satisfaction, resulting in lower life satisfaction scores (Coccia & Darling, 2014). This provides evidence that connectedness can reduce stress levels.

### **Stress and Health**

Stress can have an impact on health and overall well-being. Stressors stimulate the activation of the nervous, endocrine, and behavioral systems of the body to develop physiological adaptations and preserve homeostasis (Ergang et al., 2015). People experience fluctuating stress levels every day; therefore, it is important for them to be aware of what is happening in their mind to try and prevent illness. However, not all overwhelming circumstances are considered bad, and if stress is maintained in a healthy manner, it can push an individual to accomplish more than he or she ever thought that he or she was capable of doing (Khan et al., 2016). The reverse is also true, if stress lasts for extended periods of time, it can cause various diseases. The majority of people establish adaptive coping mechanisms that promote resilience – defined as “the integrated process involving multiple peripheral and central mechanisms that promote an appropriate, non-pathological stress response” (Ménard et al., 2016, p. 63) – in the face of demanding events. As a result, they do not experience detrimental effects from stress.

### **Physiological Aspects**

Stress is an important psychobiological mechanism and has a wide range of physiological responses depending on the stressor that is presented (Von Dawans, Fischbacher, Kirschbaum, Fehr, & Heinrichs, 2012). Stress can be defined as acute, which “refers to a cascade of neurohormonal and metabolic responses to situations characterized by unpredictability and uncontrollability, leading to rapid activation of the sympathetic nervous system and somewhat slower activation of the hypothalamic-pituitary adrenal (HPA) axis” (Singer et al., 2017, p. 72). During periods of acute stress,

the fight-or-flight response of the sympathetic nervous system is active. The sympathetic nervous system allows for the release of pro-inflammatory cytokines (Brown & Brown, 2014), and the stress-related cytokine expression in the brain is mediated by inflammasomes and signaling pathways, which impact synaptic plasticity and neurotransmission (Berkhbat & Neigh, 2018). The effect of cytokine expression on neurotransmission is detrimental, and thus may affect the signaling to other parts of the body that could reduce the stress response. In the past, the impact on synaptic plasticity has been considered to be negative, but it might have a protective function as it could help the brain be prepared if a similar stressor in the future is encountered (Berkhbat & Neigh, 2018).

Stress hormones, such as cortisol, inhibit excessive inflammation throughout the body; however, if these hormones are released for long periods of time, tissue damage can occur. The damage is the result of the body's desensitization to the stress hormone's inflammation reduction response and can result in chronic inflammation during periods of excessive stress (Brown & Brown, 2014). The excessive stress response can cause problems with brain function and can lead to neuronal impairment, and ultimately leads to the development of an exaggerated inflammatory response and results in many diseases (Brown & Brown, 2014). Among the top ten causes of death, chronic inflammation can lead to seven of these, which include cancer, stroke, heart disease, respiratory disease, diabetes, and Alzheimer's (Brown & Brown, 2014). Other physiological responses include an increase in cardiovascular and neuroendocrine measures, which are controlled by the autonomic nervous system (ANS) and the HPA

axis (Von Dawans et al., 2012). The HPA axis is an essential element of the stress response and manages its own pathway through a negative feedback mechanism that involves its end products: cortisol and corticosterone (Ergang et al., 2015).

Cortisol is a catabolic hormone that the adrenal cortex of the kidneys produces. It maintains blood glucose levels and represses the nonvital organs in order to be able to provide energy and nourishment to the brain and neuromuscular system with glucose (Hannibal & Bishop, 2014). Since cortisol supplies energy to the brain and the neuromuscular system, it is also a key player in the stress response. When a physical or psychological stress is presented, there is a surge in cortisol release in the body in order to be able to cope with the threat or to escape the threat (Hannibal & Bishop, 2014).

There are two phases to the stress response. The first phase involves the amygdala perceiving the threat and signaling the brain stem to release norepinephrine and epinephrine to activate the SNS. These hormones increase heart rate, respiration, and blood pressure as well as stimulate sweat secretion and pupillary dilation. The second phase is the more delayed phase, but it lasts for longer periods of time than the first. After the amygdala recognizes the threat, it stimulates the HPA by signaling the hypothalamus to release corticotrophin-releasing hormone (CRH). The CRH then triggers the release of adrenocorticotrophic hormone (ACTH) from the anterior pituitary that ultimately acts on the adrenal cortex to release cortisol. The initial release takes about fifteen minutes, but its effect can last for several hours (Hannibal & Bishop, 2014).

Other molecules involved in the stress response are enkephalins (ENK). ENK are involved in emotional conditioning in the limbic system of the brain, including: fear,

anxiety, and the stress response. In a rodent study, researchers discovered that mice that did not have ENK had an increased anxiety response when put through tests that cause stress for rodents. These mice also had a decreased amount of social interaction, suggesting that stress may inhibit interactions with others. However, when ENK were downregulated in the mice, there was a decrease in the stress response and the knockout mice appeared to be more resistant to chronic stress. The decrease in stress reactivity over time without ENK suggests that ENK might enhance reactivity to stress over time (Henry, Gendron, Tremblay, & Drolet, 2017).

Stress can both heighten and repress immune function depending on the stressor type, the duration, the recurrence of stressors, and the type of stress hormones that are released (Berkhbat & Neigh, 2018). If an individual is presented with a stressor for long periods of time (from hours to weeks), the biology that enables normal improvement or reduction of the immune system by stress can result in permanent alterations. The change in the body is characterized by either chronic excessive inflammation or a state of immunosuppression. An increase in inflammation is most likely due to an increase in the levels of cortisol, which can also be correlated with an increase in the severity of depression in women and an increase in anxiety levels in men (Bekhbat & Neigh, 2018).

The differences in the body's stress response due to gender are most likely due to the area of the brain that is activated and the hormones that are involved. In a study that examined the plasma levels for corticosterone and C-reactive protein for males and females, it was found that women display stronger and more drawn-out activation of the HPA axis after an acute stressor is introduced, but men display a greater induction of the

adrenocorticotrophic hormone (ACTH) and cortisol. The increase in ACTH and cortisol in men is most likely due to testosterone having a negative correlation with ACTH. In women, estrogen acts on both the hypothalamus and adrenal glands to trigger the output of the HPA axis (Bekhbat & Neigh, 2018).

Psychological stress can also promote monocytosis (an innate immune response), which occurs when a heightened number of monocytes are circulating in the blood (Ménard et al., 2016). There also appears to be an adaptive immune response when an individual is overwhelmed. Research has found a storage of immunological memory cells after the occurrence of a stressor that would allow for protection against a future stressor that is similar to the one that the person was exposed to when he or she was stressed (Ménard et al., 2016).

Stress can also reduce the number of natural killer (NK) cells. Not only does being overwhelmed reduce the number of these cells, but it can also reduce their cytotoxicity. The decrease in the activity of the NK cells could be attributed to loneliness, emotional instability, and an increase in anxiety (Maydych et al., 2017), suggesting that social connectedness and altruism could reverse the NK cell deficiencies. The decrease in NK cells is coupled with a decrease in the percentage of CD4 helper T cells and CD8 cytotoxic T cells. The number and type of cells that are reduced vary depending on the type of stressor and the individual experiencing the stress. For example, a decrease in NK cells is normally associated with chronic stress (Maydych et al., 2017). The cell count reduction can be reversed by engaging in relaxing actions. Maydych and coauthors (2017) found that relaxation was able to increase the percentage of T helper cells on the

day of a college examination and resulted in an increase in the number of T and B lymphocytes during the exam.

### **Psychological Aspects**

Stress can increase the likelihood of the onset of depression and can trigger anxiety (Ahles, Mezulis, & Hudson, 2016; Berkhat & Neigh, 2018). Unresolved stress responses may intensify stress vulnerability and increase the development of mood disorders, which is most likely due to a greater pervasiveness of depression with inflammatory diseases (Ménard et al., 2016). Demanding events appear to trigger depression and these events often precede the development of anxiety disorders. Anxiety often precedes depression as well, which means that the development of depression from being worried could be due to anxiety that results from prolonged stress (Schneiderman, Ironson, & Siegel; 2005). Anxiety and depression are also characterized by a lack of sleep, which can also be a symptom of stress (Schneiderman et al., 2005). The lack of sleep is problematic because cortisol levels are the lowest at night when people go to sleep and are the highest in the morning in order to wake them up. If an individual is not sleeping, then cortisol levels are not able to decrease as much as the levels would normally. Thus, overwhelming events could occur more than normal and result in an increase in the presence of cortisol in the body.

Melatonin is a hormone that is produced and released from the pineal gland that is involved in the circadian rhythm for sleep. The release and production of melatonin is controlled by the suprachiasmatic nucleus (SCN) of the hypothalamus. The control is the result of changes in light, so when it is dark, melatonin is produced and causes

drowsiness and it stops being produced when it gets lighter (Cipolla-Neto, Amaral, Afeche, Tan, & Reiter, 2014). In a study that involved administering melatonin to mice, researchers found that melatonin administration was able to reverse behaviors that are associated with stress, especially the depressive symptoms that accompany stress (Haridas, Kumar, & Manda, 2013). If melatonin can reverse the effects of stress, this suggests that stress might interfere with melatonin and be one of the reasons why people do not sleep as well when stressed. The research also provides a possible explanation as to how to reverse the effects of depression that is associated with stress.

There is a possible inverse relationship between stress and happiness. The inverse relationship was discovered through a study using ten different surveys that measured happiness and stress with 100 undergraduate students (seventy-two females and twenty-eight males) with a mean age of 18.6 who received psychology credit from a public liberal arts college in the mid-Atlantic region (Schiffrin & Nelson, 2010). The happiness surveys included the Satisfaction with Life Survey and the Subjective Happiness Scale, and stress was measured with the PSS. The decrease in the levels of happiness could provide a possible explanation as to why depression can develop from stress. If people are not able to be happy when stressed, it is hard to find areas of life that provide hope and meaning. Thus, without these aspects of happiness, depression could easily develop.

### **Coping Mechanisms**

The way individuals handle stress largely determines the effects of it on the individual. A problem-focused strategy directly addresses the source of what is causing an individual to be anxious in order to nullify it, as opposed to the emotion-focused

strategy, which attempts to regulate emotions in response to stress. The last strategy is the unhealthiest and is the avoidance strategy, which is when the individual physically or psychologically disengages or distances him or herself from the source of stress (Britton et al., 2017). These strategies can all play a role in any coping mechanism being used, and they can alter the effectiveness of the mechanism being used.

**Temporal distancing.** Temporal distancing is the process of viewing negative experiences from a future time perspective and not just looking at their implications for the present time. Bruehlman-Senecal, Ayduk, and John (2016) combined seven separate studies with college students from large universities into one. These different studies used different surveys to measure temporal-distancing, stress, and emotion regulation. They found that those who practiced temporal distancing ruminated less than low temporal distancers, and had more effective responses to stress (Bruehlman-Senecal, Ayduk, & John, 2016). The information here shows that when trying to limit overwhelming thoughts, a person should evaluate how much this demanding event is going to matter in the long term. People need to be careful when completing the evaluation of the demanding event, because it could cause more stress when trying to think about the event in future terms. Individuals also need to pay attention to what strategy they use when they are most stressed because the avoidance strategy would prohibit a person from being able to see the implications of the stressful event in the long term.

**Religious beliefs.** Religious backgrounds and beliefs within that background can also play a role in the response to stress and can also affect the way that prosocial behavior could counteract stress. One study by Ahles, Mezulis, and Hudson (2016)

created a study to determine if people's religious beliefs (positive or negative) helped regulate their response to stress and the development of depression as a result of the pressures that life brings. Positive religious beliefs are defined as "beliefs that God or one's higher power will use the experience to strengthen one's faith, seeking help from clergy or spiritual support from others, and engaging in religious helping" (Ahles et al., 2016, p. 228). In comparison, negative religious beliefs are defined as, "beliefs of a hostile higher power and disconnect from one's religious community" (Ahles et al., 2016, p. 228). A positive or negative religious coping mechanism would also affect the emotion-focused and the problem-focused strategies that people will use because the positive or the negative beliefs will change the way a person feels about or views a problem.

The study by Ahles and other experimenters had 320 undergraduate students from a private Christian university fill out surveys to determine their religious coping style, participation in religious behaviors, and depressive symptoms. Once the study began, the student kept a diary for eight weeks and at the end of each week the students would complete questionnaires that reported stress exposure and current depressive symptoms. The authors found that positive religious coping beliefs did not mitigate the effect of stress on depressive symptoms; however, there may be a protective factor against depressive symptoms for individuals who exhibit positive religious beliefs (Ahles et al., 2016). It has also been demonstrated that religious beliefs can aid in reevaluating stressful situations as a mild threat or as a challenge, which provides perspective on the situation.

The effects of religious beliefs far extend this description on their effect on stress, but for the purposes of this paper this overview is sufficient.

**Exercise.** Exercise can improve stress resiliency, and an increase in the amount of physical activity correlates with an increase in levels of resiliency (Burg et al., 2017; Thogersen-Ntouman, Black, Lindwall, Whittaker, & Balanos, 2017). Regular exercise also leads to a reduction in the physiological and psychological responses to stress (Thogersen-Ntouman et al., 2017). An individual does not have to participate in a significant amount of exercise either because thirty minutes of exercise after being stressed can decrease stress levels (Burg et al., 2017). However, life pressures can impact people's willingness to engage in physical activity because anticipated stress is associated with a lower likelihood of exercise, and stress predicts periods of less physical activity or intentional exercise. On the other hand, exercise can result in lower end-of day reported stress (Burg et al., 2017).

**Substance abuse.** Psychostimulants, specifically those that treat the symptoms of Attention Deficit Hyperactivity Disorder (ADHD), have been used by college students to increase their focus, and are a negative coping mechanism that many college students fall prey to. A study examined if there is an increase in substance abuse during one of the most stressful times for a college student, which is finals week. Its methods involved self-report on substance abuse with question prompts, such as "How often, if ever, have you used any of the substances below?" (Moore et al., 2014, p. 989). It also tested wastewater samples to measure the amount of different substances being abused throughout the semester and used a survey that measured stress, wellness, and coping. The results

support the researchers' hypothesis that there is an increase of drugs, psychostimulants to be exact, during more overwhelming periods, such as midterms and finals than less stressful periods. The researchers also measured drug use the week after midterms, and found that substance abuse decreased, thus further supporting their hypothesis (Moore et al., 2104). These results are important because abusing drugs as a coping mechanism is detrimental for the health of the individual and can have very negative consequences. Therefore, it is important to find another mechanism for college students with more positive effects, which could be prosocial behavior.

**Prosocial behavior.** There has been an increase in the research of prosocial behavior and its effects on stress, mental and physical health, and the physiology associated with altruism. Prosocial behavior has been defined as an action that is positive and beneficial to the society as a whole; this type of behavior can benefit a group or an individual (Nugent, 2013). It has many forms: "altruism, cooperation, caregiving, mutual coordination, and experiencing moral emotions like compassion, elevation, and gratitude" (Keltner, Kogan, Piff, & Saturn, 2014, p. 427). Helping can either be providing casual support to friends and family or participating in formal volunteer work (Whillans, Dunn, Sandstrom, Madden, & Dickerson, 2016). Prosocial behavior can be linked to one's ability to feel compassion and is also linked to agreeableness. Agreeableness and prosociality are demonstrated by the fact that individuals who are more agreeable are more likely to exhibit prosociality (Keltner et al., 2014). Some people have a tendency of being more altruistic over others, and this tendency is known as prosocial personality orientation. Prosocial personality orientation is "the enduring tendency to think about the

welfare and rights of other people, to feel concern and empathy for others, and to act in a way that benefits them” (Bowman & Brown, 2015, p. 330). Prosocial personality orientation and compassion are linked.

Compassion is a state of anguish or concern for the hardship of another person that is combined with a desire to ease the hardship of the individual (Stellar, Cohen, Oveis, & Keltner, 2015). The concern for others has been demonstrated to drive altruistic actions (Keltner et al., 2014). Thus, in order to be able to model this behavior, a person must care more about others and try to help them improve their current condition, regardless of the needs of the person performing the helping action (Yu, Hao, & Shi, 2018).

In order to engage in prosocial behavior, individuals have to make a choice. That choice is to either focus on the self and only give self what he or she wants, or help the other individual. There tends to be a conflict between the helper’s needs and the recipient’s needs. In order to fully provide for the recipient, the helper must put aside his or her desires, interests, and wants (Yu et al., 2018). The decision to engage prosocially has to occur every time someone is to provide help to the recipient; for some people it comes more naturally, and for others it is a constant battle back and forth of whether to help or not. An individual’s desire or drive to help can still occur when his or her own needs are not met. Even when the most evident forms of self-interest—social rewards and distress reduction—cannot be gratified, people are still willing to help when others are in need (Keltner et al., 2014).

Prosocial behavior is not a new concept. In the United States more than thirty

percent of the population recorded volunteering in some form or another in 2005-2006, and in 2008 about 4.7% of the nation's total income was donated to charity (Keltner et al., 2014). The outcome that results when someone engages in actions that benefit others is an elevation of the helper's mood and an alleviation of negative states, like sadness, distress, and guilt (Brown & Brown, 2014), which could be the result of distraction from stressors or an increase in one's sense of purpose, meaning, and belief in one's ability to succeed (Raposa, Laws, & Ansell, 2016). Brown and Brown (2014) demonstrated that giving—not receiving social support—resulted in the improvement of well-being for the individual who gave, as well as a reduction in morbidity and an increase in longevity. Finally, volunteers tend to have better health and are at a lower risk for mortality than those who do not engage in volunteer work (Brown & Brown, 2014). Research suggests that the group that obtains the greatest rewards from helping is the elderly (Whillians et al., 2016); however, the ability to engage prosocially develops at a very young age.

*Developmental and personality aspects.* Prosocial behaviors appear to develop first within the family background and can be seen in children as young as 12 to 14 months by their ability to help in household responsibilities (Scrimgeour, Davis, & Buss, 2016). However, the toddler and preschool years seem to be the fundamental period for the development of prosociality because at this time, children are able to observe the need for helping action and engage in this behavior (Scrimgeour et al., 2016). The ability to recognize a need and respond to the need is dependent on the child's, and even an adult's, ability to regulate his or her own emotions. Therefore, children who have trouble regulating emotions risk a greater chance of either freezing during a crisis or becoming

distressed themselves over another person's stress (Scrimgeour et al., 2016); this has the potential to prevent the child from engaging prosocially.

Prosocial behavior may be innate, but it also can be reinforced by the parent or another person who is able to teach a child the skills necessary to be able to engage in altruistic actions. The way an authority figure responds to a child's emotions can help teach the child the proper response to someone else's emotions in the future. In response to a child's negative emotions, the authority figure can model skilled coping behaviors or coach the child to apply effective coping strategies (Scrimgeour et al., 2016). A child's ability to sympathize with the victim also increases the child's ability to engage in helping behaviors. Scrimgeour and coauthors (2016) provide evidence to show a positive correlation between sympathy and altruism. A child that is more sympathetically inclined is more likely to help another and will engage in helping behavior faster than children who are not as inclined sympathetically (Scrimgeour et al., 2016).

There has been some evidence to show that self-esteem may have a negative effect on the development of helping behaviors in adolescents, and envy also has an effect on prosociality (Yu et al., 2018). Yu and coauthors (2018) conducted a study with adolescents to determine how prosocial behavior, self-esteem, and envy affect an individual. They found that as a general rule, dispositional envy negatively predicts altruism and has an even greater impact if the adolescent has high self-esteem. The fact that dispositional envy causes the adolescent to seek superiority and results in feeling like an individual is threatened, is most likely the reason for the negative correlation with prosocial behaviors (Yu et al., 2018). The adolescent would then not want to engage in

helping others because he or she would not be able to provide an opportunity for the recipient to get ahead of the helper so to speak.

The researchers on Yu's team only found the negative prediction of envy on prosocial behavior in non-emergency situations (Yu et al., 2018); this could be due to the fact that emotions influence one's decision to provide help in emergency situations, whereas personality and cognitions influence the decision in non-emergencies. In their experiment, when adolescents were allowed to be hostile, Yu and other experimenters (2018) found that hostility only occurred for those who had a favorable view of themselves, which only occurred in anonymous and altruistic helping behaviors. Lastly, the reason self-esteem plays a role in whether adolescents act prosocially, or if they do not act this way, is due to the fact that those who have high self-esteem view themselves as valuable and important to others (Yu et al., 2018). The adolescent who has a high self-esteem and is envious does not feel bad for not helping others when they need it because he or she already feels important. However, for those who are low in self-esteem but still have envy, may end up providing help to a person in need because they desire to feel important and helping could gain others' approval of these adolescents.

There also appears to be a difference in prosocial behavior between genders. In comparing gender, Yu and coauthors (2018) found that girls display more altruistic and anonymous helping behaviors (a behavior that occurs when the individual being helped does not know who the helper is) than boys. Girls also tend to be more sympathetic than boys. However, there is no difference in gender for public displays of benevolence, probably due to the fact that boys care more about gaining others' approval (Yu et al.,

2018). There is also a possibility that females will show more tend-and-befriend responses during stress, which means they will seek others out for help or provide help to others; whereas, males may primarily utilize the fight-or flight response during stress (Von Dawans et al., 2012).

*The physiological mechanisms that control prosocial behavior.* Some recent research has begun to discover the physiological mechanisms that control prosocial behavior in the body and how this affects stress. Prosociality arises from the neurophysiological process that fosters attachment and caregiving, which is accomplished by the hypothalamus dispensing oxytocin and vasopressin (Keltner et al., 2014). The hormone oxytocin appears to play an important role in the prosocial behavior response. Oxytocin is a neuropeptide that doubles as a neurotransmitter and hormone and acts as a stress- and inflammation-reducing agent (Brown & Brown, 2014; Keltner et al., 2014). Oxytocin has been shown to reduce unpleasant feelings of fear and distress and also could regulate the neurological circuits that control and activate help (Raposa et al., 2016; Brown & Brown, 2014).

Other research has shown that oxytocin is released during stressful situations and that this hormone increases social support behavior. Oxytocin allows for social influences to occur by targeting the emotional processing areas of the brain, which include the amygdala, septal area, and reward circuitry, and has been found to have a strong presence in the periaqueductal gray area that processes pain of self and others (Keltner et al., 2014). Von Dawans and other experimenters (2012) speculate that since acute stress is shown to increase oxytocin availability in the brain for animals and that this hormone promotes a

social form for buffering stress reactivity, oxytocin would also increase males' willingness to respond with social approach behavior due to the social promotion oxytocin produces. The researchers went on to show that social support and intranasal administered oxytocin decreased cortisol levels and trusting behavior. The trusting behavior is accompanied by activity in the brain areas that mediate emotional processing, such as the amygdala and the midbrain regions (Von Dawans et al., 2012). This hormone decreases the amygdala activation and the brain stem regions that are involved in fearful responses (Keltner et al., 2014). Oxytocin can thus reverse the effects that the stress hormone cortisol has on the body during periods of being excessively overwhelmed.

However, oxytocin is not the only hormone involved in the prosocial response. Serotonin has a wide range of influences on the body which include: mood, sleep, appetite, and memory (Keltner et al., 2014). Keltner and other researchers (2014) demonstrated that increasing the levels of serotonin in the brain by selective serotonin reuptake inhibitors (SSRIs) also had an effect on prosocial behavior. The effect on prosociality is most likely the result of the fact that SSRI administration decreased the number of points that a person gives to self and increased cooperative messages in the prisoner's dilemma game, which is an example of increased affiliative behavior (Keltner et al., 2014). If the reverse is also true, that prosocial behavior can increase serotonin levels, prosociality could then possibly reduce symptoms of depression associated with stress. Depression is normally associated with too little serotonin; therefore, increasing the serotonin levels in a depressed individual through the engagement in prosocial behaviors could decrease the intensity of depression in that individual.

A neural region called the subgenual anterior cingulate cortex (sgACC) regulates stress hormones and creates an emotional response, giving reason to believe that seeing a need in others and responding to that need can regulate the stress hormone levels. The scientific background suggests that the hormones released when helping others can buffer against stress and lead to better health because these hormones reduce the inflammation normally associated with stress (Brown & Brown, 2014). Some research has led to the development of the hypothesis that the medial preoptic area of the hypothalamus might regulate caregiving motivation, an action that is related to prosocial behavior (Brown & Brown, 2014).

The reward circuitry in the brain appears to be activated when someone engages in a prosocial behavior. It is hypothesized that the desire to help others could be due to the fact that prosocial behavior might activate the dopaminergic pathway and is seen by the activation of the reward system of the body (Raposa, et al., 2016). One of the areas involved in the reward circuitry is the caudate nucleus; this region is important in feedback processing that is associated with social learning, rewards, punishment and cooperation. The reward circuit is dopamine-rich and plays a part in prosociality, specifically in that it produces a “feeling good” effect after an individual acts kindly toward another person (Keltner et al., 2014). The activation of this system under normal conditions is through beta-endorphins that are produced in the anterior pituitary gland. In the central nervous system, the beta-endorphins bind presynaptic nerve terminals and inhibit the release of GABA (an inhibitory neurotransmitter). The blockage of GABA release results in the excess production of dopamine, which is a feel-good hormone and is

associated with pleasure (Sprouse-Blum, Smith, Sugai, & Parsa, 2010). The release of dopamine would then trigger the person engaging in prosocial actions to have a positive response and would cause him or her to want to engage in more of these behaviors in the future.

The reward circuitry is also linked to changes in the ANS which varies greatly from the ANS's response to stress, which include an increase in vagal activity, decreased heart rate, and reduced skin conductance (Raposa et al., 2016). All of the aforementioned results of prosocial behavior on the body are the result of an up-regulation of the peripheral nervous system (PNS), and the down-regulation of the sympathetic nervous system (SNS). There appears to be a correlation between the amount of helping behavior and the physiological responses that occur with it, such as a reduction in blood pressure due to the hormones that are released when an individual helps another individual. The correlation is demonstrated by the fact that higher levels of generosity are associated with greater PNS activity and lower SNS activity (Whillians et al., 2016), which is the exact opposite of the effects of stress on the body. The up-regulation of the PNS could provide an answer as to why altruism could be a coping mechanism for stress or why this system prevents the body's response to stress.

The ability to decrease heart rate and increase other branches of the PNS due to prosocial behavior might be the result of compassion. Compassion might compel individuals to decrease their own negative emotions and distress in order to be able to engage with someone else who is distressed. The effect of compassion on the PNS has been confirmed by the fact that expressions of compassion seem to be correlated with

deceleration of heart rate (Stellar et al., 2015). There also appears to be a correlation between respiration and its effect on prosocial behavior. Respiratory sinus arrhythmia (RSA) is a variability in heart rate that is coupled with respiration that results in the R-R interval of an electrocardiogram (EKG) to decrease during inspiration but increase during expiration (Yasuma & Hayano, 2004). A group of 73 college students participated in a study to see how RSA affects social behavior. In the study, the participants had a baseline RSA measured before the study began (Kok & Fredrickson, 2010). After the baseline was taken, the students recorded their top three social interactions every day for 63 days and how this made them feel, i.e. if they felt close to the person they were interacting with or not. Then at the end of the study, another baseline for RSA was measured (Kok & Fredrickson, 2010). Kok and Fredrickson's study allowed Stellar and coauthors (2015) to hypothesize that an increase in resting RSA can lead to an increase in social connectedness and prosocial behavior. For that reason, practicing breathing regulation can increase an individual's ability to engage in benevolent actions and possibly decrease the stress state of the individual.

The vagus nerve is another major component of the prosocial response and also works with oxytocin to decrease heart rate. It is one of two of the cranial nerves that are part of the primary branch of the ANS and has been linked to attention, self-regulation, exercise, respiration, and sleep. The central release of oxytocin adjusts output of the dorsal motor nucleus of the vagus nerve and effects changes that are related to compassion and sympathetic expressions such as, eye gaze, facial expressions, vocal communication, orientation, and social gestures (Keltner et al., 2014). Oxytocin also

promotes relaxed states by parasympathetic-mediated heart rate deceleration. The relationship between heart rate deceleration and the aforementioned decrease in amygdala activation appears to reduce arousal, and thus allows individuals to shift their attention to a person in need (Keltner et al., 2014).

Prosocial behavior might also be able to reduce the immune response that happens when stress occurs. Research was completed that looked at lymphocytes and the effect that prosocial behavior had on lymphocyte counts. Ménard and coauthors (2016) found that after a transplantation of lymphocytes to lymphocyte deficient mice, the experimenters were able to generate a resilient phenotype that was characterized by prosocial behavior and a reduction in the levels of anxiety in mice. The results of this experiment suggest that stress can decrease the number of lymphocytes circulating in the blood, but that prosocial behavior might be able to counteract the reduction. As a result, as one displays more acts of prosociality, the increase in lymphocytes will reinforce this behavior and further increase the number of helping actions the individual will perform. It has been determined that students who engage in more prosocial behaviors during exams have higher S-IgA (antibody) levels than their peers who did not engage in helping behaviors (Murphy et al., 2010). The increase in antibodies could protect the individual from the sicknesses that are associated with stress and social support could serve as a protective function in the body against the damage that stress can cause.

***Psychological aspects associated with prosocial behavior.*** Stress has been shown to affect some areas of the brain that are involved in moral-decision making: the prefrontal cortex, anterior cingulate cortex, and amygdala (Singer et al., 2017). The

arousal of these brain regions suggests that there could be an effect on the ability to engage prosocially when stressed. Raposa and coauthors (2016) conducted a study that had 77 adult (18 to 44-year-olds) participants keep a daily journal on the number of stressors they each experienced a day and the number of prosocial behaviors they engaged in each day. The results demonstrated that those who reported that they engaged in fewer prosocial behaviors showed a decrease in their positive mental health conditions when their stress levels increased. The opposite did not show any significant results, meaning that those who engaged in a greater number of prosocial behaviors did not have a correlation between increased daily stressors and mental health states that result from the stressors (Raposa et al., 2016). Singer and other experimenters (2017) performed a different study, and the results suggested that stress actually pushed individuals to behave prosocially due to an increase in cortisol levels that correlated with a greater number of altruistic behaviors performed. These outcomes indicate that prosocial behavior may be a natural coping mechanism in response to stress.

Prosociality as Zuffianò, Mart-Vilar, and Lopez-Perez (2018) defined it, is “the tendency to behave in favor of others, as an other-oriented disposition,” and is correlated with higher psychological well-being across a lifespan (p. 17). Zuffianò and experimenters (2018) found that the challenges that many college students face throughout their day-to-day life and the decrease in life satisfaction associated with these challenges, could be counteracted through building positive relationships and increasing prosociality. However, the use of prosociality in increasing life satisfaction appears to only be beneficial for college students who have low or medium levels of satisfaction

with their physical appearances (Zuffianò et al., 2018). The level of life satisfaction and its effect on prosociality could be due to students trying to make up for their lack of confidence in their appearance. In order to be able to offset these negative feelings, students with lower life satisfaction engaged in helping behaviors to have a sense of purpose. In contrast, students who were confident in their appearances may not feel the need to do something else to make them better appreciate themselves and because of this, these students were not be as willing to help.

Prosociality has also been shown to increase positive affect and vitality. The reason that helping behaviors are so beneficial for one's health and well-being could be due to the fact that benevolent acts have been demonstrated to satisfy all three basic psychological needs: relatedness, competence, and autonomy (Martela & Ryan, 2016). Altruism especially satisfies autonomy and competence since it demonstrates individuals' ability to be able to decide to do something and actually accomplish it with their own strength. Martela and Ryan (2016) also found that benevolent acts may be ego-depleting and can also provide energy. The energizing effects could be one of many reasons that benevolence is a helpful coping mechanism for stress.

### **Prosocial Behavior and Stress**

Some research has been done to see the effects that prosocial behavior has on stress. Helping behavior has been shown to possibly prevent events from being overwhelming by providing the necessary resources to progress through the demands of the event without being stressed. It has also been shown that altruism might counteract the effects of pressure from a stressful event that has already occurred.

## Experiments

Whillans and co-experimenters (2016) found that participants who volunteered at least four hours per week were less likely to experience high blood pressure four years later, which is a symptom of stress. The reason for this is that helping others might result in the decline of high blood pressure by decreasing activity in the hypothalamic-adrenal axis (Whillans et al., 2016). Inagak and coauthors (2015) performed an experiment that involved manipulating stress through answering math problems in a limited amount of time and then viewing images of others the participants were close in order to model affiliative behavior. These tasks were followed by self-report questionnaires designed to measure giving and receiving support, and the experiment then utilized neuroimaging to assess what areas of the brain responded to social support. The stress task involved math problems of different difficulties. Feedback was then provided after the completion of the problems, which was not always truthful. For example, the student would do increasingly worse compared to an average student as they answered more questions, even if they were answering the questions correctly and in a timely manner. At the end of the study, a prosocial task was performed that involved a raffle that allowed the participant to win money, as well as money for someone the participant knew who needed money. The authors documented that even though giving and receiving social support both resulted in lower self-reported negative psychological outcomes, only giving support had beneficial regions activated in the brain when the neuroimages were viewed (Inagak et al., 2015). Inagak and coauthors (2015) also found that undergoing stressful tasks with a friend resulted in a decrease in cardiovascular response compared to those who did not have a

friend accompany them in their stressful task. The friend could experience the stressful task with the participant or could be the recipient of social support, and the participant would experience the same decrease in sympathetic related stress responses either way (Inagak et al., 2015).

Research has shown that social support improves the outcomes and the recovery process following many types of human diseases and is associated with opposing cortisol and cardiovascular responses to the responses associated with stress (Von Dawans et al., 2012). Social support is demonstrated to have a decrease in the cognitive impact that stressful events have on the brain, allows for better regulation of negative emotions, and reinforced distractions (Garcia et al., 2017). Von Dawans and co-experimenters (2012) found that acute psychosocial stress increased prosocial behavior in men through a series of games (trust game – a decision to trust or not to trust for money, punishment game – a decision to divide an amount of money equally or unfairly, sharing game – a decision to share a monetary amount or keep it selfishly, and nonsocial risk game – a decision on a low or high risk gamble that rolling the dice determined the monetary amount received) (Von Dawans et al., 2012).

These games were used to create stress and then measured one's trusting, selfish, and risk behavior, which was most likely the result of an increase in oxytocin in the brain. The researchers did not find any correlation between stress induction and negative social interactions, such as punishment behavior, or nonsocial risk taking but it did affect willingness to accept risks through social interactions (Von Dawans et al., 2012). The fact that stress induction does not result in punishment behavior suggests that even when an

individual is stressed, he or she's desire is not to hurt others but instead the desire could be to possibly help when stressed

Von Dawans and other researchers (2012) also found that there is a single-nucleotide polymorphism (rs53576) in the oxytocin receptor gene that interacts with the stress-protective effects of social support. The polymorphism was found due to the fact that only carriers of the G allele for this gene had a decrease in the cortisol response to stress following social support (Von Dawans et al., 2012); this means that only certain people might be able to perform an act of prosocial behavior and experience a reduction in their stress levels. Not all the research is in agreement on this, as some other researchers have found consistent results on prosocial behavior's effect on stress reduction among experimental groups. Von Dawans and coauthors (2012) have shown that tend-and-befriend behavior (the act of seeking others in times of need and helping others in their time of need) to be a possible inherent and efficient coping mechanism in healthy humans during stress.

Even though prosocial behavior may counteract the effects of stress, the timing of the action appears to be crucial. An experiment that tested the effectiveness of a benevolent action performed 70 minutes after the exposure to a stressor, found that there was no effect on the body's response to stress (Sollberger, Bernauer, & Ehert, 2017). Stress can also determine people's willingness to be able to give or want to give support to others. In the same study, Sollberger and other experimenters (2017) found that stress influenced the amount of money that individuals were willing to donate. The ability for someone to engage in altruistic behaviors when stressed is dependent on his or her

reaction to the stressor. Stress can result in a fear-induced priority to care for an individual's own needs first and can interfere with his or her capability of empathizing with others' needs. Some individuals might be willing to engage in helping behaviors after stress because then the receiver might give support to the giver when the giver finds him or herself in an overwhelming circumstance. Giving after stress might also be a natural response due to the fact that it provides an opportunity for the giver to counteract the negative emotions that arise from stress and it allows the receiver to feel better (Sollberger et al., 2017).

**Prosocial behavior's effectiveness in reducing stress in college students.**

College students might benefit from prosocial behavior since they experience a wide variety of different stressors on a day-to-day basis. Not only is this one of the most stressful periods of life for the majority of people, this is also the time where individuals begin to develop many unhealthy habits of dealing with the pressures that they experience in life. Prosocial engagement during college may help facilitate lower rates of alcohol use, which was demonstrated when prosocial behavior's influence was compared to pro-alcohol peer influence on drinking in high school and college students (White, Flem, Kim, & Catalano, 2008). A decrease in alcohol use would not only resolve an unhealthy coping strategy for stress, but it also could decrease the number of alcohol related deaths each year. When asked if one had drunk alcohol in the last month, almost sixty percent of college students said yes in a national survey. Out of that sixty percent, about two out of three students said they had engaged in binge drinking during that same month ("College Drinking", 2015). Alcohol affects academic performance, as well.

College students who reported binge drinking three times in one week were six times more likely to perform poorly on a test or project than those who drank but never binged (“College Drinking”, 2015).

The result of performing poorly could increase stress in the student, which ultimately could lead to more drinking. In contrast, prosocial behavior is associated with higher academic achievement both in the short-term periods of schooling but also in the long-term, which is most likely the result of fostering positive relationships in the classroom (Gerbino et al., 2017). Interventions to develop socially responsible behavior also results in an increase in academic achievement (Wentzel, 1993). Not only is prosocial orientation a predictor of long-term academic achievement, but it also is a predictor of positive outcomes post-graduation from college (Brandenberger & Bowman, 2015). Therefore, prosocial behavior not only could remove the negative coping mechanism of substance abuse that many college students turn to, but also result in better performance in school and thus better students.

A possible limitation for prosocial behavior as a coping mechanism is that prosocial orientation is stronger in some groups of people, but not as strong for other people groups. For example, engineering majors may have a reduced prosocial orientation but students who are studying social sciences have higher patterns of altruistic actions (Brandenberger & Bowman, 2015). A possible explanation for this is that engineering majors tend to be very logical thinkers, whereas students in the social sciences are taught to be more in tune with others. Also, religiously affiliated schools have a higher percentage of students who are prosocially orientated (Brandenberger &

Bowman, 2015). The higher percentage is most likely explained by the fact that many religions believe in doing good to others and so these students would have been taught to help others more than those who did not grow up with a religious background. Even though the effectiveness of benevolent behaviors on stress and the ability to engage in altruistic behaviors vary from one person to another, the benefits make it clear that prosocial behavior is the right choice when trying to counteract the negative effects of the pressure that college places on students.

### **Conclusion**

Prosocial behavior appears to have a negative effect on stress because when a person engages in more prosocial behaviors, he or she experiences a decrease in stress levels. Compared to substance abuse and drinking, engaging in actions of altruism appears to have a stronger and healthier ability in reducing stress. The reason for this is that some of the physiological and neurological pathways that are activated when people help others have the opposite effects that stress has on those same pathways that are activated when they experience situations that trigger the flight-or-fight response. The result is then a decreased reaction to being stressed, but also results in a more calmed and relaxed state.

One of the limitations that appears for prosocial behavior as a coping mechanism is that most research has looked at prosocial behavior's effect in reducing stress after the response to a stressor has occurred. However, an area that needs to be further studied is the effect of prosociality in the prevention of the onset of stress before a stressor is presented. The majority of the experiments that have been conducted have been done to

test the effects immediately following a stressor. While it has been concluded that prosocial behavior only has a short window of time to be able to counteract the effects of stress, more research should be done to see if engaging in a benevolent action before a stressful event, such as taking an exam, can reduce the negative effects normally associated with that event. If the hormone oxytocin that is released during prosocial actions is what causes calming effects and directly antagonizes cortisol, there should be reason to believe that altruistic behaviors could decrease the stress response. The results would most likely only be true for smaller, everyday stressors, as opposed to larger stressful events.

Another area that needs to be studied more in depth is exactly how prosocial behaviors impact the stress that college students face during their undergraduate careers. Some research has been done to show that college is a crucial time to develop and improve a person's agreeableness and his or her ability to engage in altruistic behaviors. However, there has not been a considerable amount of research that tests to see if prosocial behaviors are effective in reducing stress in college students versus other groups of adults. Since college students tend to be at a higher risk for a negative reaction to a stressor than other age groups, prosocial behavior could potentially not be as effective in this age group. One of the reasons for this could be that the lasting effects of prosocial behavior might not be able to reduce the amount of stress that college students experience daily. Another reason is that prosociality might not be the easiest choice for students when trying to reduce stress, because it requires a time commitment. However, if engaging in prosocial behaviors were to have the same effectiveness in college students

as it has had with other adults, the way college students act and function during their undergraduate life could significantly change. The change in stress levels during a student's time in college might even result in healthier behavior in the future.

All in all, prosocial behavior appears to be effective in reducing stress after an overwhelming event has occurred. Not only does this benefit the giver, but the receiver also benefits in return. If more people were to commit to being more proactive in altruistic actions, not only could there be a reduction in the high level of stress, but there could also be an increase in positive relationships and a better, more civil society. So, the next time someone is stressed, instead of thinking about the problem and everything that must be accomplished in order to counteract the problem, this person should look to the right or to the left in order to see if there is someone else that has a need that could be met. Even though this might take some of a person's time, that person may find that his or her mind is cleared of some of the stressors that he or she was experiencing. He or she may be able to accomplish much more in a shorter amount of time and with a lesser amount of stress, than if he or she adopted tunnel vision in an effort to be task-oriented rather than people-oriented. If more people made the decision to be prosocial, this could benefit not only the individual, but the society as a whole.

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