Does Group Leadership affect Stress and Group Decision-Making?

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Abstract

Group-decision making increases stress levels in a group (Mullen & Roth, 1991). The current study examined the effects of group stress levels with and without an assigned (trained) leader through the Iowa Gambling Task. Groups were measured on task efficiency, cortisol levels, and emotional status. Assigned leader groups were expected to show less stress than non-assigned leader groups. Results showed a significant effect between having an assigned leader and the decision-making behaviors of the group.
Does Group Leadership affect Stress and Group Decision-Making?

The McDonough Leadership Center defines leadership as the way in which leaders and followers develop a relationship and work continuously and simultaneously to reach a common desired goal within the context of their environment, shaped by cultural social norms and values (Perruci, 2011). Some elements that enhance the relationship between leaders and followers may include strong communication, leader competence, positive interactions between the leader and followers, respect, and understanding. There are multiple leadership styles that leaders may implement in an attempt to reach the designated desired goal. Leadership styles encompass different thinking strategies and patterns that affect the situational understanding of the problem. These differences in leadership styles affect the way a leader thinks and facilitates processes of cognition (Antes & Mumford, 2012). Cognition is defined as the mental processes involved in perception, attention, memory, language, problem solving, reasoning, and decision-making (Goldstein, 2011). Specifically, the point of interest in this research study is the examination of cognitive processes through group decision-making tasks when an assigned leader is and is not present. Leaders engage in different cognitive tasks, depending upon the leadership style they implement, which influences the outcome of the group process (Antes & Mumford, 2012).

Effective group decision-making must include team members collaborating towards a common outcome, within specified roles of the team, in order to develop useful cognitive processes (Chou et al., 2012).

Every leader uses a unique style of leadership that fits their personality and motives, and that style in which a leader implements may greatly affect their leadership quality. Different styles of leadership may include, but are not limited to, servant leadership, transformational leadership, or transactional leadership. Servant leadership, used as the focus of the current study,
can be defined as a leader who wants to serve first, as opposed to lead first (Greenleaf, 1977/1995). For a leader to serve first means that this leader invests in the care of the follower’s needs, whereas a leader who leads first may be more concerned about the power or drive to acquire material possessions (Greenleaf, 1977/1995). For a leader who leads first, serving the followers is a later choice and not the fundamental goal for leadership (Greenleaf, 1977/1995). Gillet, Cartwright, and van Vugt (2011) examined the difference between selfish and servant leadership styles and concluded servant leadership values the good of the group more than selfish leadership practices, for servant leadership focuses on group members, not the leader. Additionally, MacDonald, Sulsky, and Brown (2008) conducted a study between transactional and transformational leadership. The researchers defined transactional leadership as a leader motivating followers through reward-based exchanges, and they termed transformational leadership as the development of awareness and acceptance among followers for the intent of the group and shared vision (MacDonald et al., 2008). Altogether, servant and transformational leadership both depend upon the collaboration of a team, and both leadership forms work towards an effective outcome through trusting, positive relationships within the group. The authors’ theory of servant leadership and transformational leadership claimed that strong relationships within a team produce effective and collaborated outcomes.

Successful servant leaders establish a strong, trusting relationship with their followers. Without trust, the success of the leader is quickly diminished. Senjaya and Pekerti (2010) examined the correlation between a leader who exemplified servant leadership and a follower’s trust within the leader. The researchers stated that trust is putting oneself in a position of risk, but expecting that the other member receiving the trust will not cause any damage to the individual. The researchers found a positive correlation between servant leadership and a follower’s trust in
If a leader does not retain their follower’s trust, either in themselves, the vision, or the organization, then they will not be able to lead their followers effectively.

Cognitive trust may be another component that contributes to successful leadership. Cognitive trust is a feeling by a follower in which they are confident that their leader is pursuing a promising and worth-while objective with the ending goal shared by all group members. Parayitam and Dooley (2009) examined cognitive-based trust through a survey sent to multiple hospitals in which they were asked to describe a recent strategic decision. The researchers found that cognitive trust enhanced decision quality and commitment. Trust corresponds with the effectiveness of decision-making, both through trust in relationships and trust in leader competence. Understanding what type of trust is more supportive for team cooperation could help establish a more effective group.

Leaders typically perform best when advanced mental processes of cognition are necessary in order to solve a situation or complete a task. Carnevale, Inbar, and Lerner (2011) indicated that leaders who have a high need for cognition do not necessarily make better decisions, but they are more likely to think through the potential outcomes due to increased thinking. More strategizing and deliberation may take place for leaders in need for cognitive, but the increase in mental processing of a situation does not necessarily guarantee better outcomes. Additionally, Marcy and Mumford (2010) stated that the higher the level of complexity for a given task, the higher the level of leader performance. Also, producing a creative solution to a presented problem typically requires more mental processing, and if a leader is able to facilitate a method that encourages higher cognitive processing among followers, then they may easily create new, original, and productive solutions to a given problem (Reiter-Palmon & Illies, 2004).
Leaders who facilitate creative cognitive practices during decision-making and problem solving are likely to produce well thought out, effective solutions and outcomes to the given task.

Decision-making, one of several cognitive processes, involves deciding an outcome between alternatives (Goldstein, 2011). Reasoning, on the other hand, is also a cognitive process, but it involves drawing conclusions that go beyond the original information provided (Goldstein, 2011). There are two types of reasoning: deductive and inductive. Deductive reasoning centers around a sequence in which an individual will draw conclusions; yet, inductive reasoning involves basing conclusions off of evidence that is probably true (Goldstein, 2011). Both of these forms of reasoning are important for individuals to make a group decision.

Group decision-making has a five step process, which Janis and Mann (1977) describe as: appraising the challenge, surveying alternatives, weighing the alternatives, deliberating about commitment, and adhering despite negative feedback. It is important to note that group members are likely to be at different stages within the decision-making process. A unique attribute to group decision-making is that each group member has the opportunity to incorporate new information or alternatives within the course of coming to a group decision. The more people who are involved in the decision-making, the more viewpoints and ideas there will be available for potential discussion.

When groups work together on a decision-making task, group members are bound to feel a sense of arousal due to stress (Mullen & Roth, 1991). Stress is an automatic arousal state that results from the fight or flight system. The process in which a group must work together to develop a collaborative decision generates a stressful situation for members within the team. A stressful environment heightens our awareness and alertness (Mullen & Roth, 1991). When an individual feels stressed, they may take any necessary actions to reduce the unpleasant feeling.
Stress can be used in a productive manner to motivate an individual to respond to the corresponding challenge, or, stress can be harmful by influencing an individual to make poor decision-making strategies (Mullen & Roth, 1991).

The process of decision-making incorporates multiple aspects of the brain (Goldstein, 2011). The prefrontal cortex plays a major role in decision-making because this part of the brain has a central focus on complex cognitive behaviors, including decision-making (Goldstein, 2011). Another area of the brain that is included for an emotional decision-making process is the amygdala. The amygdala is a part of the brain that interprets the emotional value of incoming stimuli (Gupta, Koscik, Bechara, and Tranel, 2011). Gupta et al. (2011) studied the process of the amygdala within a decision-making process. The emotional response exhibited by the amygdala is created through anticipation for a future event based off a past experience. The amygdala also plays a part in impulsive decisions. When an individual makes an impulsive decision, they attach a highly emotional, initial evaluation of the perceived decision to a spontaneous outcome. Making a decision forces us to make an initial choice between stimuli, and this choice is followed by an outcome of a reward or punishment. Whether the outcome is a reward or punishment depends on the emotional response arbitrated by the amygdala (Gupta et al., 2011). Understanding the workings of the amygdala brings understanding as to how the brain processes incoming stimuli when needing to make a decision.

As mentioned, a key component of a given leadership style is trust. The amygdala is also involved in the process of judging the trustworthiness of individuals with whom we encounter. Koscik and Tranel (2011) examined the amygdala in times of development and expression of trust. The amygdala processes social, emotional, and reward-based information within the brain. Social evaluation of an individual’s trustworthiness is often accomplished through monitoring
facial expressions and emotions. Koscik and Tranel (2011) studied whether individuals with amygdala damage had a difficult time forming normal patterns of interpersonal trust and reciprocity. Through this study, the researchers found that the amygdala is necessary for creating normal interpersonal trust, and the amygdala plays a crucial role for examining the trustworthiness of a particular social situation. Every time we meet new people, we cognitively perceive the trustworthiness of individuals within these new social interactions. To collaborate with servant leadership, which centers on the trusting relationship between the leader and the follower, normal amygdala activity is likely inherent to determining the initial trustworthiness of the leader.

The current study aimed to examine whether a mentally stressful decision-making task induced different levels of stress through behavioral and biological measures between a control group and an experimental group, and it explored whether decision-making was affected by this manipulation. The goal of the current study was to examine whether assigning a servant-based leader within a decision-making group showed different stress levels and decision-making among group members, when compared to a group without an assigned servant-based leader. The researcher measured biological stress levels through cortisol by taking a saliva sample to examine whether cortisol levels changed between a baseline measure and after the experimental task. Cortisol levels were taken from all participants and compared between individuals in the experimental and control groups. Through self-report measures, behavioral stress was also measured. Additionally, the researcher examined the overall performance of the experimental task between groups with an assigned leader and groups without an assigned leader. Participant groups were compared through both individual cortisol and group efficiency measures. It was expected that after participants experienced a stressful discussion, stress through cortisol and
behavioral measures would increase. Also, it was expected that the control group, without an assigned leader, would show higher levels of cortisol and thus higher levels of stress during the experimental task compared to the experimental group. The experimental group, with the assigned leader, was expected to show greater efficiency on the experimental task due to productive group decision-making.

Even when a leader is not assigned to the group, such as the control group, a leader among the participants may emerge independently. A leader, or several leaders, may emerge when an individual is recognized as the leader by other group members, without formal appointment to the position (Taggar, Hackett, & Saha, as cited in Emery, Calvard, & Pierce, 2013). Likewise, followers in groups emerge in the same way (Emery, Calvard, & Pierce, 2013). Group members recognize an individual as a leader once a group has had the opportunity to interact and establish a status position within the group. This position status is determined through cognitive categorization of members within a group (Lord & Hall, as cited in Emery, Calvard & Pierce, 2013). There are multiple characteristics that can define an emergent leader. Personality of group members plays as a central determining factor as to whether an individual is capable of leading the group (Emery, Calvard, & Pierce, 2013). If a leader does naturally emerge from the group, it will create an important factor for establishing group cooperation. A leader who serves the interests of the group creates cohesive group dynamics (Gillet, Cartwright, & van Vught, 2011). According to Gillet, Cartwright, and van Vught (2011), it is likely that an emerged leader will take either a leadership-as-dominance view or a leadership-as-coordination view. If the leader emerges with a leadership-as-coordination view, as expected by the researcher, which develops as a pro-social trait, then that leader exhibits servant leadership (Gillet, Cartwright, & van Vught, 2011). The researcher defined an emergent leader for the current study as an
individual who takes on the task of being the group leader upon their self, exhibited by facilitating a group consensus, mediating discussions among the group, and actively engaging all group members within the group decision-making task. In this type of leader, the researcher hypothesized that lower cortisol levels will exist due to the presence of a leader in the group.

**Method**

**Participants**

Participants for this experiment \((N=63)\) were recruited from Psychology courses at Marietta College. There were 39 male and 24 female participants, and all participants were between the ages of 18 and 29. The majority of participants identified as White/Caucasian (57), followed by Asian/Pacific Islander (3), Black/African American (2), and Latino/Hispanic (1). 28 participants were freshman, 14 sophomores, 9 juniors, and 12 seniors. Students received course credit for their participation in the study. Participants were randomly assigned to one of two groups. There were 8 groups in the assigned leader condition and 7 in the no-leader assigned condition. The experimental groups included a confederate who acted as a group leader for the consensus building portion of the experiment. The control groups did not have the confederate, and these groups of participants were examined as to whether or not a natural leader emerged. Additionally, 3 unbiased, outside sources (raters) were asked to examine emerged leadership in some of the videotaped groups.

**Materials**

Multiple surveys were used during the experiment. A demographic questionnaire was distributed for all participants and included basic information such as the student’s major, year, extracurricular activities, leadership positions on campus, etc. It also asked participants oral contraceptives and caffeine intake, two components which could disrupt cortisol levels. The
Student Stress Scale was used to measure current stress levels in all participants. The Student Stress Scale provided a series of stressful events that typically occur in the lives of college students. The scale used three domains for measuring stress: low (scores under 150), moderate (scores between 150 and 300), and severe (scores above 300). The PANAS-X Scale was another measure used to determine negative emotion in participants, which was used as an indicator of stress. When using this scale, participants mark their current emotions on a scale of 1 (low) to 5 (high). A group satisfaction survey was also used for measuring approval of the group after the experimental task. Finally, a video camera was used as a method to examine whether an emerged leader existed in non-assigned leader groups. 3 unbiased raters were asked to analyze these videos.

The Iowa Gambling Task (IGT) was the experimental task. The IGT is a decision-making task that includes four decks of cards. Each group started with $2000 and every click either increased or decreased monetary values. Some decks of cards are preprogrammed to distribute a few large gains but even more large losses, while other decks were designed to allot a few small losses but even more small gains. Likewise, the deck of cards with small gains and small losses progressed to be more advantageous in the long run, meaning these desks had less=. The values of the cards changed depending on the number of clicks from the participants. Because the distributed monetary values in each deck of cards varied depending on the participants’ choices, each group was asked to work together to develop a strategy that delivered the highest amount of monetary gain to their total winnings. The researcher was interested in measuring how long the group spent on the task, as well as how much money groups earned and the number of advantageous decisions made, depending on group condition.
Procedure

Participants arrived to the experiment in groups of five (four when the confederate was present). Upon arriving, participants received an overview of the experimental procedure and signed an informed consent. After agreement to proceed with the study, participants were asked to read a magazine for approximately 5 minutes. The reading period was used to help relax participants before the experimenter proceeded with a stress survey and the stressful task. The experimenter took a salivary sample as a baseline measure after the reading period. Then, participants were given a demographic questionnaire. Upon completion of the questionnaire, participants were asked to complete the Student Stress Scale. Participants were asked to mark which events had occurred in their lives over the past year. The sum of the participants’ scores on the scale measured stress levels prior to participating in the study.

The experimental task was the Iowa Gambling Task (IGT). A laptop computer was provided to perform the IGT. During this task, participants were presented with four decks of virtual cards. Participants were told that when they clicked on a deck they may: gain money, lose money, or gain and lose money simultaneously. The goal for the task was to gain as much money as possible. Prior to starting the experimental task, participants were told that they must stop the task briefly after the initial 10 trials and again after 30 trials. The group may stop more often if desired, but these two pauses were mandatory. During these break periods from the task, participants were to work as a group to figure out the best pattern for gaining the maximum amount of money. Once the group discussed the best method for gaining the most money, they proceeded with the next trial. Participants completed a total of 50 trials of the task. After completion of the experimental task, cortisol levels were taken again through another salivary sample.
After the task concluded and the second cortisol sample was taken, participants completed the PANAS-X survey. When filling out this survey, participants marked their current emotions from a provided list on scales from 1 (low) to 5 (high). This survey was used to measure negative emotional states, which was interpreted as behavioral stress emerged from the experimental task. Participants concluded the study after they completed a group satisfaction survey. This final survey asked participants to mark their overall approval of the group decision-making process.

Groups were randomly assigned to one of two groups before arrival: a control group or an experimental group. The confederate was placed in the experimental group as the assigned leader. Prior to beginning the research study, the confederate was trained by the researcher, which included a discussion outlining the role of the assigned leader for the group task. The confederate was trained to facilitate discussions about the experimental task and to tend to the needs of other group members. The confederate used a specific leadership style, servant leadership, to facilitate group discussions. When the group stopped at trials 10 and 30 of the IGT, the confederate automatically stepped in as the leader. Through servant leadership, the confederate leader was also trained to reach out to participants in the group who did not contribute much so that their voice was equally heard, and the confederate was asked during the training session to remain neutral for any decision-making process in order to avoid potential bias. The assigned leader for experimental groups was part of the McDonough Leadership Center at Marietta College, so this person had already been previously educated on leadership styles and theories. Control groups without the confederate did not have an assigned leader. A leader, or multiple leaders, may have emerged within the group, even though no assigned roles were
established. Videotaping of the experiment was used for later interpretation of emerged leadership from an outside, unbiased participant used as a rater.

Once participants in the experimental or control groups finished all components of the study, they were debriefed. During the debriefing, the experimenter explained that the study was not simply a measure of the final outcome of the gambling task, but also a measure of stress levels after a group decision-making task with and without an established group leader. Participants were free to leave after debriefing.

Results

Participants’ scores on the Student Stress Scale were examined through three levels of stress indicated by the scale: mild stress (scores less than 150), moderate stress (scores between 150 and 300), and severe stress (scores above 300). Participant’s scores ranged from scores of 96 to 574 ($M = 292.33, SD = 122.81$). The majority of students who participated in the study indicated above average levels of stress before the beginning the experimental stress task (See Figure 1).

Using Wilk’s statistic, there was a significant effect of having an assigned leader on the decision-making behaviors of participants, $F(1,59) = 38.56, p < 0.001$. Follow-up univariate analyses (using a Bonferroni correction for multiple tests) on the decision-making behaviors revealed a significant effect of having an assigned leader on the amount of time spent on decisions by the group, $F(1,61) = 14.28, p < 0.001$ (Figure 2), showing that groups with assigned leaders spent more time on the IGT than groups without an assigned leader. There was also a significant effect of having an assigned leader and the amount of money earned in the decision-making task, $F(1,61) = 5.10, p = 0.03$ (Figure 3). Groups with an assigned leader actually earned less money overall than groups without an assigned leader. The number of advantageous
decisions made by the group showed a significant effect, $F(1,61) = 36.44, p < 0.001$, indicating that groups with an assigned leader overall made more advantageous decisions than groups without an assigned leader (Figure 4). While groups with an assigned leader made less money than groups without an assigned leader, they also made more advantageous decisions (less risky) over the duration of the decision-making task. See Table 1 for descriptive statistics of decision-making. Using a repeated-measures test with a Greenhouse-Geisser correction for sphericity, there was not a significant effect of group leader condition on cortisol levels, $F(1,54) = 0.84, p = 0.36$ (Figure 5). See Table 2 for descriptive statistics of pre- and post-cortisol levels and group leader condition. Additionally, using a correlation measure, there was a significant effect between hostility emotion and group satisfaction $r(61) = -0.65, p = 0.001$, indicating a negative correlation (Figure 6).

Relationships between cortisol levels, behavioral stress, and decision-making were also examined. There was not a significant effect between group condition and the behavioral stress scale (PANAS-X), $F(1,61) = 0.53, p = 0.76$. These results show there was not a relationship between having an assigned leader and participants’ rating on the PANAS-X scale, which indicated present stress levels after the IGT. In terms of the decision-making behaviors (latency, advantageous decisions, and total money earned), there was not a significant difference between decision-making and the PANAS-X Scale for negative emotions (Table 3). There were also no significant relationships between group decision-making and cortisol differences or group satisfaction measures (Table 4). Finally, significant effects did occur between the difference in cortisol measures for assigned leader groups and PANAS-X Negative Affect $r(6) = -0.51, p < 0.05$, PANAS-X Basic Negative Fear $r(6) = -0.46, p < 0.05$, and PANAS-X Basic Negative Hostility $r(6) = -0.52, p < 0.01$. There was no significant effect between cortisol differences for
assigned leader groups with PANAS-X Basic Negative Guilt, PANAS-X Basic Negative Sadness, or group satisfaction, as well as no significant effect for cortisol differences for non-assigned leader groups and the PANAS-X Scale (Table 5).

There was also no significant effect of sex and stress levels. There was not a significant effect between males and cortisol differences ($M = -.001, SD = .06$) or female participants and cortisol differences ($M = .02, SD = .06$). Looking at the PANAS-X Scale for negative affect emotions as a measure of stress, there was not a significant relationship between the PANAS-X Scale and males ($M = 13.82, SD = 3.95$) or females ($M = 14.83, SD = 5.86$). Some participant groups had all male participants. When looking at all male groups and the PANAS-X Scale for negative emotions there was not a significant effect ($M = 13.36, SD = 3.93$), and there was not a significant effect between the PANAS-X and mixed sex groups ($M = 14.48, SD = 4.93$). Finally, there was not a significant relationship between all male groups and cortisol differences ($M = 0.02, SD = .06$) or mixed sex groups and cortisol differences ($M = -.02, SD = .06$).

To measure for potential emerged leadership in the non-assigned leader groups, three separate participants were used as raters. The raters viewed video clips and were asked whether a leader was present in the group (and if so, whom). Through a reliability test, there was not a significant effect among student’s responses to emerged leadership, where an intraclass correlation coefficient had a $p$-value of $p=0.46$. These non-significant results indicate that participants were unable agree that a group participant in the video clip may have been an emerged leader.

**Discussion**

As expected, there was a significant effect between group conditions (with or without an assigned leader) and decision-making. Groups with an assigned leader were more likely to make
advantageous decisions (categorized as less risky decisions) than groups without an assigned leader, and groups with an assigned leader also spent more time on each trial of the IGT task. If more time was spent on each trial for groups with an assigned leader, then these groups expended more time discussing the potential outcomes of each trial of the IGT, thus leading to more advantageous (less risky) decisions. Groups with an assigned leader also gained less money than groups without an assigned leader, which may be a result of less risky decision-making from assigned leader groups. More money earned does not mean groups were making more advantageous decisions. Rather, advantageous decisions were categorized as to how the money was distributed through specific decks of cards. Thus, groups making more advantageous decisions were more often choosing decks with small gains and small losses. If more trials were added to the task, it is likely that the advantageous decision-making groups would earn more money in the long run compared to the risky decision-making groups. In the short term, risky decision-making might earn more money, but in long term decision-making processes, the advantageous decision-making groups will catch up and surpass the risky decision-making groups in total money earned.

More group discussions of the task, shown through the latency measure of decision-making, may be a result of more emotional investment in the task for groups with an assigned leader. More discussion of potential outcomes also creates more personal time invested in the task, thus creating a desire for positive rewards. Groups with an assigned leader who spent more time on the task may have acknowledged that positive rewards were more likely if the group made less risky decisions. This process of decision-making supports research from Gupta et al. (2011), stating that our brain makes an emotional response to associate with either a reward or a punishment. The outcome of our decisions is either a rewarding or punishing experience through
an emotional association. In the case of assigned leaders, perhaps less risky decision-making did exist as a result of more emotional investment of the group in the IGT. With more time spent on the task, the decision-making process was advanced further for groups with an assigned leader compared to groups without an assigned leader.

The experiment did not show a significant effect between the difference in pre and post cortisol measures and group leader condition, showing that having an assigned leader did not lower biological stress levels more than groups without an assigned leader. Non-significant results may have been related to participants previously knowing each other prior to beginning the study, unavoidable at an institution of this size. As a result, stress levels may have already been reduced due to preexisting social comfort within the group. Leadership is a group phenomenon that may have led to both group conditions not achieving significant cortisol differences due to the establishment of trust and comfort within the group through prior social relationships. Coinciding with the research presented by Parayitam and Dooley (2009), cognitive trust enhances decision-making quality and commitment. Trust can be established in relationships and within the leader’s competence. Both forms of trust may reduce stress levels within a group due to comfort in a shared group experience and collaborated end goal. As a result, working among peers, whom the participants already feel comfortable, may have reduced the potential for stress in the environment before beginning the IGT. Working alongside a group of peers may not have created a stressful enough atmosphere to show significant effects in cortisol levels.

A significant effect also did not appear between measures of the group condition and the PANAS-X Scale. No significant effect was evident between group decision-making and the PANAS-X Scale, cortisol differences, or group satisfaction. Also, significant relationships did
not appear between cortisol differences and the PANAS-X Scale or group satisfaction. Finally, there was not a significant effect on behavioral or biological stress levels and sex differences among participants or group make-up. Relationships between these various measures from the experiment may not have been significant as a result of the high levels of stress already indicated by the Student Stress Scale. Considering the majority of participants indicated an above average level of stress prior to taking cortisol samples and beginning the IGT, perhaps the experimental scales and measures did not induce enough stress to make a significant difference on the participants. If participants already felt a high level of stress from their personal lives, then the experimental task may not have created a stressful enough environment to create more stress. The personal stress experienced by the participants in their daily lives may have outweighed the stress that the IGT could have induced. Relationships between these surveys and experimental measures did not exist as a result of the already established stressful personal environment from the participants.

The PANAS-X Scale was used to measure behavioral stress in participants through five emotional categories: overall negative affect, negative affect of fear, negative affect of hostility, negative affect of guilt, and negative affect of sadness. Although the results did not show a significant effect of increased behavioral stress among participants in either group condition, there was a significant difference in the hostility emotion and group satisfaction. When the hostility negative affect measure was compared to the group satisfaction survey, there was a negative correlation between hostility emotions and group satisfaction. These results indicate that as hostility increased among the group, then satisfaction of group decision-making and group effectiveness of the task, decreased.
There was also a significant effect between assigned leader groups with the difference in cortisol measures and the PANAS-x Negative Affect, PANAS-X Basic Negative Fear, and PANAS-X Basic Negative Hostility. These significant effects showed a negative correlation between these specific behavioral stress emotions (PANAS-X) and cortisol differences from assigned leader groups. In other words, as differences in pre and post measures of cortisol increased, reported measures of fear and hostility decreased. These results indicated the opposite of what was expected from the current study, thus questioning whether the PANAS-X Scale or the salivary sample of cortisol was truly the best measure of stress for this context. It is also possible that the two different group conditions perceived the PANAS-X Scale differently, thus resulting in the discrepancy of the correlation trends between the PANAS-X and cortisol differences. Perhaps a better scale could be used to measure behavioral components of stress. Also, without any significance between cortisol differences and group condition, perhaps the measuring cortisol through salivary samples is not the most effective method. Future directions could consider a skin conductance test or hormonal measures to understand stress levels.

One of the main research questions for this study examined whether assigning a leader to a group affected stress levels, also affecting decision-making. There is a direct relationship between assigning a group leader and decision-making, but there is not a significant relationship between an assigned leader and stress relating to decision-making. If stress was not a direct relationship with decision-making, perhaps another factor mediates the relationship between leader and decision-making. According to the McDonough Model (Figure 7), the environment and cultural context also play a significant role in the leader-follower relationship and process of leadership. If a group decision is the main goal, the environmental surrounding the group affects the decision outcomes. In other words, decision-making in a group context develops through the
leader-follower relationship, but this relationship varies depending on the environmental situation, including the leadership style implemented and outside pressures to complete the goal. Cultural values also affect the pathway to the goal. Through cultural norms and values, differences in the cultural context affect the leadership process through the leader-follower relationship.

Through the design of this study, there was a great potential for emerged leadership in non-assigned leader groups. In order to examine whether emerged leadership did exist, several groups were videotaped, and 3 participants were used as raters to watch the videos to identify whether a leader was present. The raters watched three video clips on non-assigned leader groups and one clip of the assigned leader group. Each rater correctly identified the group with an assigned leader; however, one rater identified the wrong leader. Through a test of inter-rater reliability, there was not a significant effect of raters’ responses to identify emerged leadership. The discrepancy in the raters’ responses to identify leadership shows that perhaps emerged leadership did not exist in the study. Although someone in each group must have taken some initiative to physically complete the task by clicking on the decks of cards, it seems that the differences in responses from the videos indicate that most groups shared leadership. Or, since a leader was not assigned prior to the beginning of the task for non-assigned leader groups, the process to establish a leader within the group may not have existed at all. Prior to beginning the study, the researcher identified emerged leadership as an individual who takes on the task of being the group leader upon their self, exhibited by facilitating and mediating group discussions, as well as keeping all group members actively engaged in the task. These leadership qualities for an emerged leader also identify with servant leadership, which the confederate leader used in all experimental group conditions. Emerged leadership takes place through cognitive categorization.
of members within the group (Calvard & Price, 2013). When leadership was not specified in the group for the non-assigned leader conditions, these groups may have considered the task and end goal a small personal commitment, and perhaps a case where establishing a leader may not have been necessary.

There were several limitations to this study. First, many participants in each group previously knew each other prior to the study. As a result, many groups may have already had a less stressful environment, compared to a group of strangers, because of the previously established comfort within the group. For further studies, it is suggested, if possible, to create a group of strangers to reduce the amount of potential group comfort. Group size may also be reduced to decrease the chance of participants knowing each other. Having a smaller group size may also place more stress on each participant, for there would be less distribution of task responsibilities. In smaller group sizes, each participant may feel more of a need to communicate and contribute to the group decision-making process.

Another way to reduce the comfort established in the group environment may be to place a time limit on the task. The current study allowed participants to take as much time as they desired to complete the task. As a result, this may have caused participants to feel less stressed because an external form of pressure did not exist. Establishing a time limit for the task may force participants to make quicker decisions and feel more stressed to complete the task on time. Finally, another way to reduce the level of comfort within the group is to create an incentive. For example, if participants knew that after completion of the task that an incentive, such as bonus points or a gift card, may be available for the most money earned by the end of the task among all groups, then each group may feel more stressed if there was a desire to receive the reward.
These suggestions may increase stress levels of the group, which may also result in significant differences between baseline and experimental cortisol measures.

Another limitation may be that the same leader was used for each assigned leader group. The researcher used the same leader, implementing the same style of leadership (servant leadership), to control for leadership differences. However, if the study used different styles of leadership, such as servant leadership and coercive leadership, then perhaps the results would show differences in stress levels depending on the leadership style implemented for the group. Additionally, future studies could consider different stress levels and decision-making by alternating between male and female assigned leaders. Adding another component to the study to consider differences in leadership styles or the sex of the leader may be beneficial as another method to examine stress in group decision-making.

The current research study supports that leadership does create a significant effect on decision-making. When a leader is assigned to a group, the number of advantageous decisions was higher compared to groups without an assigned leader. These results are important because having an assigned leader may be beneficial for the overall outcome. However, the study also supports that groups with an assigned leader spend more time on a given task and actually earn less money overall than groups without an assigned leader. For non-timed tasks, having an assigned leader may be more beneficial because these groups are likely to spend more time discussing potential outcomes as a group. Also, the amount of money earned from the task is a product of chance, meaning that if the groups were able to “figure out” the pattern in the IGT, then they were more likely to gain more money. Overall, in a setting where the end goal is to create a firm, effective, and productive decision, assigning a group leader is more beneficial than
not assigning a leader because as seen from the current study, these groups were less likely to partake in risky decision-making.


Janis, I., & Mann, L. (1977). Decision making: A psychological analysis of conflict, choice, and


Figure 1

*Note.* This graph shows participants’ stress levels before beginning the experimental stress task. These scores represent that the majority of students who participated in the study indicated above average levels of stress prior to participation.
Figure 2

Note. This graph shows the significant effect between groups with assigned leaders and groups without an assigned leader on the amount of time spent on the IGT.
Note. This graph shows the significant effect between group condition and the total amount of money earned during the experimental task.
Note. This figure shows the significant difference between group condition and the number of advantageous decisions made during the IGT.
Note. This graph shows data from pre and post measures of cortisol, used to measure biological stress levels. There was not a significant effect in cortisol differences.
Figure 6

Note. This scatter plot shows the significant effect between the negative affect measure of hostility through the PANAS-X scale and ratings of group satisfaction. There was a negative correlation between hostility and group satisfaction.
Figure 7

McDonough Leadership Model

Note. The McDonough Leadership Model identifies leadership as a relationship between a leader and follower(s) to reach a common goal, within an environmental context, shaped by cultural values and norms. This model is used to explain how assigned leader groups reach effective decision-making as a group.
Table 1

Descriptive Statistics for Decision-Making

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean- Leader</th>
<th>N</th>
<th>Mean- No Leader</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Money Earned</td>
<td>8</td>
<td>1901.56</td>
<td>7</td>
<td>2166.13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(588.67)</td>
<td></td>
<td>(417.41)</td>
</tr>
<tr>
<td>Latency (in milliseconds)</td>
<td>8</td>
<td>7384.17</td>
<td>7</td>
<td>5073.37</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2984.64)</td>
<td></td>
<td>(2667.93)</td>
</tr>
<tr>
<td>Advantageous Decisions</td>
<td>8</td>
<td>33.53</td>
<td>7</td>
<td>26.77</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(4.31)</td>
<td></td>
<td>(3.85)</td>
</tr>
<tr>
<td>Group Satisfaction</td>
<td>8</td>
<td>34.56</td>
<td>7</td>
<td>32.87</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(4.00)</td>
<td></td>
<td>(4.82)</td>
</tr>
</tbody>
</table>

Note. This table shows the descriptive statistics for all decision-making measures between group conditions derived from the IGT and group satisfaction survey. Standard deviations represented in parentheses.
Table 2

*Descriptive Statistics for Pre and Post Cortisol Measures and Group Condition*

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean-Leader</th>
<th>N</th>
<th>Mean-No Leader</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Cortisol Measure</td>
<td>8</td>
<td>.12 (.06)</td>
<td>7</td>
<td>.19 (.13)</td>
</tr>
<tr>
<td>Post Cortisol Measure</td>
<td>8</td>
<td>.11 (.06)</td>
<td>7</td>
<td>.17 (.11)</td>
</tr>
</tbody>
</table>

*Note.* This table shows descriptive statistics for pre and post cortisol measures for groups with and without an assigned leader. Standard deviations represented in parentheses.
Table 3

Correlations between PANAS-X Scale and Decision-Making Behaviors

<table>
<thead>
<tr>
<th></th>
<th>Total Money</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Earned</td>
<td>Latency</td>
<td>Advantageous</td>
<td></td>
</tr>
<tr>
<td>PANAS-X Negative Affect Pearson</td>
<td>-.88</td>
<td>-.05</td>
<td>.19</td>
<td></td>
</tr>
<tr>
<td>PANAS-X Basic Negative Fear Pearson</td>
<td>-.15</td>
<td>.10</td>
<td>-.01</td>
<td></td>
</tr>
<tr>
<td>PANAS-X Basic Negative Hostility Pearson</td>
<td>.02</td>
<td>.07</td>
<td>.26</td>
<td></td>
</tr>
<tr>
<td>PANAS-X Basic Negative Guilt Pearson</td>
<td>-.20</td>
<td>-.13</td>
<td>.14</td>
<td></td>
</tr>
<tr>
<td>PANAS-X Basic Negative Sadness Pearson</td>
<td>.01</td>
<td>.15</td>
<td>.18</td>
<td></td>
</tr>
</tbody>
</table>
| Note. This table shows correlations between the negative stress emotions from the PANAS-X Scale and decision-making behaviors. Parentheses represent non-assigned leader groups. Pearson correlations represent significance if $p < 0.05$ (*) or $p < 0.01$ (**).}
Table 4

**Correlations of Group Decision-Making with Cortisol Differences and Group Satisfaction**

<table>
<thead>
<tr>
<th></th>
<th>Cortisol Difference</th>
<th>Group Satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Money Earned</strong></td>
<td>Pearson Correlation</td>
<td>.02</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-.10)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>.36</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(.19)</td>
</tr>
<tr>
<td><strong>Latency</strong></td>
<td>Pearson Correlation</td>
<td>.18</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-.15)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-.04</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(.05)</td>
</tr>
<tr>
<td><strong>Advantageous</strong></td>
<td>Pearson Correlation</td>
<td>-.13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(-.17)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-.10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(.17)</td>
</tr>
</tbody>
</table>

*Note.* This table shows the non-significant relationships of group conditions with decision-making measures (money earned, latency, and advantageous decisions) and cortisol measures differences, as well as group satisfaction. Parentheses represent non-assigned leader groups. Pearson correlations represent significance if $p < 0.05$ (*) or $p < 0.01$ (**).
### Table 5

*Correlations between PANAS-X Scale, Cortisol Differences, and Group Satisfaction*

<table>
<thead>
<tr>
<th></th>
<th>Cortisol Difference</th>
<th>Group Satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PANAS-X Negative</strong></td>
<td>Pearson Correlation</td>
<td>-.51* (-.27)</td>
</tr>
<tr>
<td>Affect</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PANAS-X Basic</strong></td>
<td>Pearson Correlation</td>
<td>-.46* (.34)</td>
</tr>
<tr>
<td>Negative Fear</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PANAS-X Basic</strong></td>
<td>Pearson Correlation</td>
<td>-.52** (.21)</td>
</tr>
<tr>
<td>Negative Hostility</td>
<td></td>
<td>(.21)</td>
</tr>
<tr>
<td><strong>PANAS-X Basic</strong></td>
<td>Pearson Correlation</td>
<td>-.34</td>
</tr>
<tr>
<td>Negative Guilt</td>
<td></td>
<td>(.05)</td>
</tr>
<tr>
<td><strong>PANAS-X Basic</strong></td>
<td>Pearson Correlation</td>
<td>-.36</td>
</tr>
<tr>
<td>Negative Sadness</td>
<td></td>
<td>(.13)</td>
</tr>
<tr>
<td><strong>Group Satisfaction</strong></td>
<td>Pearson Correlation</td>
<td>.10</td>
</tr>
</tbody>
</table>

*Note.* This table shows the relationships between group condition and the behavioral measure of stress through the PANAS-X Scale and the Group Satisfaction Scale with the differences from pre and post cortisol measures. Parentheses represent non-assigned leader groups. Pearson correlations represent significance if $p < 0.05$ (*) or $p < 0.01$ (**).