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Anxiety and aggression: The role of social threat, intent attribution, and emotion regulation

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**Anxiety and aggression: The role of social threat, intent attribution, and emotion
regulation**

by

Anna Therese Wehde

A thesis submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of
MASTER OF SCIENCE

Major: Psychology

Program of Study Committee:
Monica Marsee, Major Professor
Patrick Armstrong
Carl Weems

The student author, whose presentation of the scholarship herein was approved by the program of study committee, is solely responsible for the content of this thesis. The Graduate College will ensure this thesis is globally accessible and will not permit alterations after a degree is conferred.

Iowa State University

Ames, Iowa

2020

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TABLE OF CONTENTS

	Page
LIST OF FIGURES	iiv
LIST OF TABLES	v
ABSTRACT	vi
CHAPTER 1. INTRODUCTION.....	1
CHAPTER 2. LITERATURE REVIEW.....	3
Anxiety and Aggression	4
Cognitive and Emotional Processing.....	7
Attentional Bias and Psychological Wellbeing	13
Interpretation Biases and Negative Outcomes	14
Emotion Dysregulation.....	15
Understanding Anxiety and Aggression in Emerging Adults	17
Statement of the Problem	18
Hypotheses	19
CHAPTER 3. METHODS.....	21
Participants	21
Measures.....	23
Demographics.....	23
Anxious Symptoms.....	23
Aggression.....	24
Hostile Intent and Negative Emotional Response	24
Emotion Dysregulation.....	26
Social Threat Bias.....	26
Procedure	28
CHAPTER 4. RESULTS.....	30
Data Preparation and Cleaning	30
Descriptive Statistics	31
Moderated Serial Mediation Model.....	34
Generalized Anxiety Model.....	34
Social Interaction Anxiety Model.....	37
Regression Analyses.....	39

CHAPTER 5. DISCUSSION	40
Implications	44
Limitations and Future Directions.....	45
Conclusion.....	47
REFERENCES	48
APPENDIX. INSTITUTIONAL REVIEW BOARD MEMO.....	56

LIST OF FIGURES

Figure 1. Social Informational Processing Model.....	12
Figure 2. Moderated Serial Mediation Model.....	20
Figure 3. Serial Mediation Model for General Anxiety and Reactive Aggression.....	37
Figure 4. Serial Mediation Model for Social Anxiety and Reactive Aggression.....	35

LIST OF TABLES

Table 1. Demographics.....	28
Table 2. Descriptive Statistics of Main Variables.....	37
Table 3. Zero-Order Correlations for Main Variables.....	39
Table 4. Mediation Model Summary for GAD and Reactive Aggression.....	42
Table 5. Mediation Model Summary for SIAS and Reactive Aggression.....	44

ABSTRACT

When individuals experience psychological distress, many respond either by internalizing (turning inwards; e.g. experiencing anxiety/depression) or externalizing (turning outwards; e.g. aggressive behaviors). However, internalizing and externalizing problems may also be comorbid. Previous research suggests that anxiety and aggression have a strong positive relationship, and increased anxiety may be connected to increased aggression. However, there may be other factors impacting this relationship. Social information processing theory suggests that as a person reacts to ambiguous situations and chooses their response to the situation, there may be social cognitive biases, such as attention to threat or intent biases, mediating the decision process. Further, an individual's ability to regulate their own emotions may moderate this process. The present study examined the role of these biases and emotion regulation in the relationship between anxiety and aggression within an emerging adult population. Participants were Iowa State students (N=545) enrolled in an undergraduate psychology or communication studies course. Participants completed self-report measures on anxiety, aggression, hostile attribution bias, and emotion dysregulation and they completed a computerized task (Probe Detection Task) to assess attention to social threat. Contrary to expectations, results did not support these social-cognitive biases as mediators in the hypothesized moderated serial mediation model. However, these biases may still play an important role in the relationship between anxiety and aggression.

Keywords: anxiety, aggression, social threat, hostile attribution bias, emotion dysregulation

CHAPTER 1. INTRODUCTION

In response to distress, individuals may exhibit internalizing (depression, anxiety, withdrawal) or externalizing behaviors (aggression, rule-breaking, intrusiveness) (Achenbach, 2003). However, internalizing and externalizing problems may be co-morbid (Costello et al., 2004; Fanti & Henrich, 2010; Kunimatsu & Marsee, 2012). Specifically, anxiety (an internalizing disorder) and aggression (externalizing) have frequently been found to be connected, and there are shared risk factors associated with both (Bubier & Drabick, 2009; Costello et al., 2004; Crick et al., 2006; Fite et al., 2010; Kunimatsu & Marsee, 2012; Marsee et al., 2008). Further, continuous co-occurring internalizing and externalizing in childhood are often associated with negative outcomes later in life, such as risky behaviors or social changes (Fanti & Henrich, 2010).

There are several social cognitive biases that may impact the relationship between anxiety and aggression. The first is social threat bias, which is a form of attention bias that involves an individual having increased attention towards threat stimuli in their surroundings (Helzer et al., 2009). The next is hostile attribution bias: a cognitive bias involving interpreting intent in an ambiguous situation, which may contribute to whether an individual chooses an aggressive response (Crick & Dodge; 1994). Social information processing theory has been used to better understand these cognitive mechanisms and how they underlie the experiences of anxiety and aggression (Crick & Dodge, 1994; Dodge, 1980; Lemerise & Arsenio, 2000). Lemerise & Arsenio (2000) created an updated social information processing model, which incorporates the impact of affect in how individuals process ambiguous situations. Emotion and affect appear to influence how an individual experiences an ambiguous situation, as inhibiting negative emotions can tax cognitive resources that may have otherwise gone towards attention

facilitation or intention interpretations (Conway, 2005). Therefore, due to the role emotions and affect may play in these situations, emotion regulation may act as a moderator within the relationship between anxiety and aggression.

Previous studies have explored elements of this topic. However, the present study aimed to explore each of these variables in one model, in order to better understand the different factors contributing to the process of aggression in ambiguous situations, specifically for emerging adults. Implications of this study include an increased understanding of potentially aggressive individuals, which allows for a better understanding of appropriate intervention strategies.

CHAPTER 2. LITERATURE REVIEW

Individuals may experience distress in different ways, which can be significant to understanding how the individual functions. Specifically, individuals may internalize or externalize when experiencing psychological difficulty. Internalizing involves turning inwards when experiencing distress, and may present as mood concerns (such as anxiety or depression), withdrawal, or somatic symptoms (Achenbach, 2003). Due to the inward nature of these problems, they may be more difficult to observe. Externalizing behaviors may be easier to notice, as they present as expressing distress outwards, such as aggressive or rule-breaking behavior and intrusiveness (Achenbach, 2003).

Typically, externalizing behaviors tend to decrease as an individual ages. However, some individuals may follow a lifelong course of externalizing problems, particularly if these problems start in early childhood (Moffitt, 1993). In contrast, internalizing problems tend to increase as an individual ages, as they start to have an increased ability to anticipate negative events or show increases in self-reflection (Fanti & Henrich, 2010).

Internalizing and externalizing problems may also co-occur (Costello et al., 2004; Fanti & Henrich, 2010; Kunimatsu & Marsee, 2012). For instance, anxiety (an internalizing disorder) is often co-morbid with externalizing disorders, such as conduct disorder (Costello et al., 2004). As Fanti & Henrich (2010) suggest, this may be connected to shared risk factors. It is important to understand this overlap, as there may be negative outcomes associated with the combination of both internalizing and externalizing problems for both adolescents and adults (Chen, Dennis, & Funk, 2008; Fanti & Henrich, 2010). For example, researchers have found that youth with comorbid internalizing/externalizing problems may show increased difficulty in peer relationships, delinquency, and association with delinquent peers, compared with others who

show only externalizing behavior problems (Fanti & Henrich, 2010). Additionally, internalizing and externalizing behaviors may be connected to increased likelihood of substance abuse (Chen et al., 2008).

Anxiety and Aggression

Anxiety is a prevalent concern for many individuals, particularly emerging adults, and can impact how an individual experiences their environment. According to the National Institute of Mental Health (NIMH, 2017), in the period of one year approximately 19% of adults in the United States had a diagnosable anxiety disorder. Further, approximately 30% of adults in the United States experience an anxiety disorder in their lifetime (NIMH, 2017). While this refers to adults of any age, NIMH also reports that in the period of a year, approximately 22.3% of emerging adults (aged 18-29) had a diagnosable anxiety disorder (2017). *The Diagnostic and Statistical Manual of Mental Disorders* (DSM-5) criteria for Generalized Anxiety includes excessive worry that may be associated with irritability, fatigue, restlessness, muscle tension, and sleep disturbance (American Psychiatric Association, 2013). Anxiety is the most common mental health concern in the United States, but even more individuals experience symptoms of anxiety that are not at the clinical level (Anxiety and Depression Association of America, 2016).

Previous research suggests that the experience of anxiety manifests in four domains (Koksal & Power, 1990). Cognitions (negative thoughts or worries), physiological arousal, negative emotions, and behavioral responses (e.g., avoidance) are all important elements of the experience of anxiety according to this model. The “fight or flight” (Cannon, 1929), or “fight, flight, or freeze” response (Brancha et al., 2004) is often discussed to explain how physiological arousal during a stressful situation can lead to a behavioral outcome (Kunimatsu & Marsee, 2012; Taylor et al., 2000). This model may help explain why individuals often experience a

combination of both internalizing symptoms (e.g., anxiety) and externalizing behaviors (e.g., aggression) (Achenbach, 1991; Costello et al., 2004; Kunimatsu & Marsee, 2012), given that one potential behavioral response in anxiety-provoking moments is to “fight.”

Aggression can be defined as the intent to harm another (Coie & Dodge, 1998), however, a behavior does not need to be violent to be considered aggression. Aggression may take different forms and serve different functions (Marsee & Frick, 2007). There are two functions aggression may serve for the individual: reactive or proactive. Reactive aggression refers to when an individual is reacting aggressively in response to a perceived threat (Dodge & Coie, 1987). Berkowitz (1989) examined the frustration-aggression hypothesis, which suggests that aggressive behaviors may be enacted in response to a frustration (i.e. a condition the individual experiences that was incited for the individual as a reaction to their environment). Meanwhile, proactive aggression is when an individual behaves aggressively, not in response to provocation, but for a means to reach an outcome, such as self-gain or dominance through aggression (Dodge & Coie, 1987; Marsee, Weems, & Taylor, 2008). Therefore, reactive aggression is retaliatory, while proactive aggression is about instigating aggression in order to achieve a certain outcome. Additionally, there are two forms aggression can take. First, there is physical aggression, which involves physical harm to another, such as punching or kicking an individual (as qtd. in Marsee et. al, 2008). On the other hand, relational aggression is a form of aggression that damages social ties, relationships, and inclusivity through gossip, silent treatments, exclusion, or other similar behaviors (Crick et. al, 1998; Crick et al., 1999; Marsee et. al, 2008). Each of the forms and functions of aggression are highly correlated with each other (Marsee & Frick, 2007).

Repeated occurrences of aggression over time towards a particular person constitutes bullying (Olweus, 1991). According to the Center for Disease and Control, in 2017 19% of high

schoolers reported being bullied at school, 14.9% reported being bullied online, 6% reported being threatened or injured with a weapon at school, and several other aggression/violence concerns were discussed (USDHS). Further, while bullying in school-age years is often discussed in connection with aggression, aggression appears at all developmental stage in a person's life (Liu, Lewis, & Evans, 2013). Aggression has been suggested to be relatively stable over time, and as a result, childhood aggression has been found to be predictive of adolescent aggression (Liu et al., 2013; Marcus, 2007). Further, Marraccini, Brick, & Weyandt (2017) found that 32% of their college student participants had been bullied by their peers, 61% reported witnessing college peers bully another student, and 14% reported that they had bullied another student. Additionally, it is also possible for aggression to start in adulthood, particularly in response to situations (trauma, substance use, or brain injuries) (Liu et al., 2013). Moffit (1993) suggests that there are two types of aggression and anti-social behaviors—it may be a life-course trajectory or socially-learned and age-limited (in adolescence and emerging adulthood). Adolescence and young adulthood is a time period with peak rates of antisocial behaviors and aggression, as it may be modeled and socially reinforced during this time period (Moffit, 1993). Additionally, aggression is essential to consider with emerging adults, as in the transition from adolescence to adulthood aggression can lead to aggressive behaviors being exacerbated into violence, such as domestic violence or homicide (Liu et al., 2013).

High prevalence of aggression has a significant impact, even if is not a violent act, as there are negative outcomes for victims of aggression, but there are also negative outcomes for the perpetrators of aggression as well. One consequence may be interpersonal difficulties for the individual that may result in social rejection (Dodge & Coie, 1987). Further, as previously discussed, anxiety and aggression are often connected (Bubier & Drabick, 2009; Crick et al.,

2006; Kunimatsu & Marsee, 2012; Marsee et al., 2008). Anxiety is typically most correlated with reactive aggression (versus proactive), which suggests the aggression is serving a function as a response to a threatening stimulus in the environment (Fite et al., 2010; Marsee et al., 2008). Individuals who act aggressively may be expressing maladaptive coping and behavioral responses to an underlying experience of anxiety. Consequently, there may be a cost for psychological well-being for perpetrators of aggression. There are also cognitive and emotional factors that may increase the probability of the occurrence of aggression and/or anxiety (Kunimatsu & Marsee, 2012).

Cognitive and Emotional Processing

In order to understand the processing that occurs when an individual behaves aggressively, researchers rely on several different theories that aim to explain cognitive mechanisms. Simon & Newell (1964) suggested that human behavior is a result of processes that can be organized to understand how individuals process information in their surroundings, and Simon then built on this to explore the contribution of motivation and affect (1967). Dodge (1980) later used information processing in connection to aggression to better understand the cognitive elements behind aggressive behaviors. Crick & Dodge (1994) applied information processing theory further to create a model for understanding the cognitive mechanisms occurring within individuals as they determine whether or not to act aggressively (See Figure 1). Social information processing theory (SIP) suggests that individuals within an ambiguous situation experience immediate cognitive processing to analyze the situation and select an appropriate response to the situation (Dodge, 1980). These cognitive mechanisms are not conscious evaluations, but unconscious processing that occurs in a matter of seconds. The assessment of SIP within this model typically involves presenting vignettes with ambiguous

situations and asking participants how they would interpret and react to them (Crick et al., 1995).

An example of one such vignette states “you make plans with one of your friends to go on a short trip for the weekend. You’re very excited about these plans and have been looking forward to the trip. However, at the last minute, your friend says that he (or she) no longer wants to go on the trip and has made plans with another friend for the weekend” (Coccaro et al., 2009).

Participants are then asked to rate whether the person or persons within the situation was acting with either benign (neutral) or hostile intent, and whether they would feel angry or upset if the situation occurred (Coccaro et al., 2009).

In the beginning of this process, an individual has certain cues they are attending to, both in the environment and internally (Crick & Dodge, 1994). For some individuals, this step in the process may become problematic. If the cues in the environment suggest a threat, they may disproportionately attend to these (i.e., facilitation to perceived threat), and have difficulty disengaging from the situation (where they cannot move their attention away from the event) (Crick & Dodge, 1994; Dodge et al., 2013). This may impact how the individual interprets the situation, as well as how they decide to react (Crick & Dodge, 1994; Dodge et al., 2013). Both facilitation to threat and difficulty disengaging from threat are examples of an attentional bias, which can be anxiety-provoking for the individual. Additionally, an individual who already has heightened anxiety may especially struggle in these moments. For instance, anxiety sensitivity refers to the interpretation of anxiousness as having negative outcomes (Reiss, 1991), and may be connected to catastrophizing and cognitive biases (Weems et al., 2007).

After an individual has encoded the situation, they start to interpret what has happened (Crick & Dodge, 1994). When an individual interprets the situation as accidental, they are less likely to react negatively. For example, an individual making accurate interpretations may not

feel the need to respond in an ambiguous situation. However, intent biases, such as the hostile attribution bias, can play a role here, as some individuals will interpret the friend who canceled plans as having a negative intent towards them, such as trying to ruin their weekend. When an ambiguous situation leads towards these intent biases, the individual is more likely to feel threatened and a need to react. Additionally, during this stage, individuals may begin evaluating past responses, which involves considering how effective those past responses were and how accurate their expectations of past situations were (Crick & Dodge, 1994). If this individual could think of a situation where they had their friends had bailed on them before, they may contemplate this previous exchange, and that may impact their interpretations in this moment. Additionally, aggressive individuals may already be biased towards making inaccurate, hostile attributes (Dodge, 1980; Dodge et al., 2013).

When entering these early stages, an individual will likely also be cued in on, and encode, various emotions from the other individuals in the situation (Lemerise & Arsenio, 2000). The current mood of the individual will act upon which cues from the environment (or internally) receive attention and how these are interpreted. The individual whose friend canceled may be more likely to assume their friend wanted to hurt their feelings if this is already congruent with their current mood (Lemerise & Arsenio, 2000).

After the individual has made an interpretation, they may begin the clarification of goals stage. In this stage, an individual starts to consider what they hope to get from their reaction. If they want the situation to end, and have people not focusing attention on them, their goal may lead them to be more likely to consider calm reactions in an attempt to diffuse the situation. However, if they determine their goal is to get back at their friend, they will be more likely to consider reacting aggressively. Aggressive individuals tend to form more retaliatory goals

(Dodge et al., 2013). The individual from the example may interpret that the person who canceled on them was trying to be mean to them, and then determine their goal is to be mean to them back, and this can influence the types of goals that are considered as a response. However, the response an individual has access to may be influenced by emotion. The individual may only be able to come up with aggressive responses due to their heightened level of emotional arousal (Lemerise & Arsenio, 2000).

Following this stage is response access or construction, where the individual starts narrowing down the responses they have generated as possible options to reach their goal. In this stage, they will eliminate options they may not realistically have access to. This leads into the response decision stage, where they evaluate their potential responses based on previous experiences, expectations of the outcome following each response, whether they believe they have the ability for their response, and if it is appropriate. The individual who was canceled on may consider saying mean things about their friend to others. However, if they attempted this in the past, and it ended poorly, they may consider this. Further, they may consider if they expect this response to get them punished (outcome expectation), if they have self-efficacy in their ability, or if they feel the moment is an appropriate time for that response. Otherwise, an aggressive individual may act impulsively and not contemplate consequences (Dodge et al., 2013). On the other hand, if an individual wants to diffuse the situation by talking, and would rather not be aggressive, but does not believe they have the efficacy to hold such a conversation or believes the individual would only laugh at an attempt at conversation, they may opt towards aggression instead, as they may view it as a more achievable response with a better potential outcome. Further, this ability to generate and consider responses may be limited for individuals

who are experiencing very heightened levels of emotion or difficulty regulating emotions (Lemerise & Arsenio, 2000).

At this point, the individual enters the behavior enactment stage, where they actually act out their decision. When enacting the behavior, the emotional intensity of the situation may impact whether they proceed with their generated response, or if they determine it must be changed (Lemerise & Arsenio, 2000). If a situation appears calm, their response may be reconsidered in order to match that. Lastly, the way emotion is displayed by each individual impacts how the other attends to and encodes the situation, which changes the result (Lemerise & Arsenio, 2000).

Following the chosen action, peers and others in the surrounding area will respond to what has occurred. The way others in the environment respond is important, as this will then be considered in future occurrences. If the individual from the example chose to isolate their friend from their friend group, got attention from the situation, upset the other student, and lowered their own anxiety, then this may be encouragement to choose this response again in the future. However, if they were not successful in their goals or had a negative outcome, they may be less likely to consider this behavior in the future. This stage will add to the individual's database of previous experiences and views of social behaviors next time they enter a situation where they need to determine a response, and this creates a learning cycle.

While an individual is proceeding through these steps, there are certain individual differences that are constant. Each individual has a database of past experiences, memories, societal rules and social schemes, and other individually based differences that impact how they respond (Crick & Dodge, 1994; Dodge, 1986). Individuals have different learned experiences, rules, and norms they adhere to, and these can impact an individual throughout the model.

Further, according to Lerner & Arsenio's (2000) revised SIP model, affect is another individual difference that may impact this process (see Figure 1). For instance, this model suggests the individual's current mood may impact their thought processes and choices. Additionally, there may be "affect-event links" where an individual cues into certain emotions in response to an event, or vice versa (Lerner & Arsenio, 2000). When processing a social event, individuals will consider past affective experiences and these memories may alter the individual's response in the current moment. Therefore, inclusion of affect within this model allows for a better understanding of how individual differences may also impact information processing.

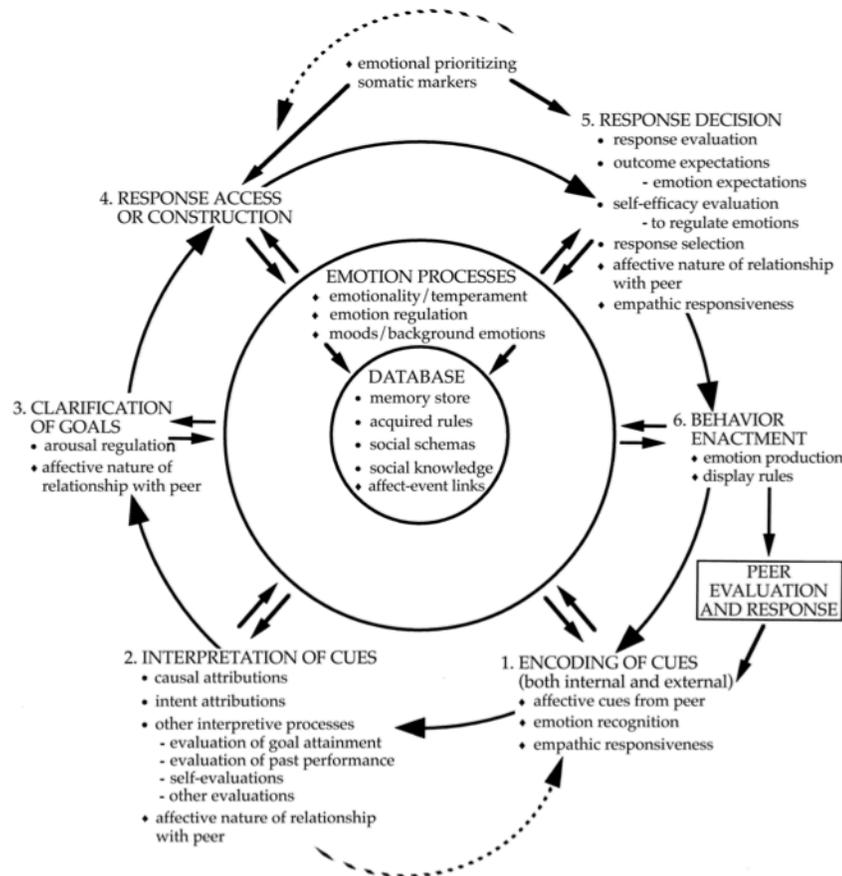


Figure 1. *An Updated Social Informational Processing Model Incorporating Emotional Processing.* From "An Integrated Model of Emotion Processes and Cognition in Social Information Processing." E.A. Lerner & W.F. Arsenio (2000), *Child Development*, 71 (1), 107-118.

Attentional Bias and Psychological Wellbeing

As mentioned, one mechanism theorized to play a role in aggressive responding is attentional bias, which involves focusing a disproportionate amount of one's attention onto a perceived threat in the environment and/or experiencing difficulty disengaging from threat (Roberts, Hart, & Eastwood, 2010). Attentional biases have been consistently connected to anxiety for both young adults and adolescents, both as a potential cause of anxiety or as a potential response to anxiety (Helzer et al., 2009; Roberts et al., 2010). However, the direction of this relationship has been unclear in the past, as few studies have focused on outside factors, such as situational variables (stress) or dispositional variables (vulnerability) (Helzer et al., 2009). Yet, research suggests that anxious individuals tend to place greater focus on threat cues than non-anxious individuals (Vasey et al., 1995; Vasey et al., 1996). Additionally, there are other psychological costs associated with attentional biases. For instance, adolescents reporting increased vigilance towards threat also report higher social stress (Helzer et al., 2009) and attentional control has been linked to depression for both children and adolescents (Compas et al., 2004; Muris et al., 2004). Additionally, for college students, low self-efficacy and low rates of optimism may also be connected with threat-related biases, and increased self-efficacy and optimism have been suggested to help mediate the relationship between attention tasks and perceived distress (Karademas, Kafetsios, & Sideridis, 2007).

Research suggests that it may be difficult for individuals with increased negative emotions to accurately assess threat and control attention within a situation, as controlling negative emotions can tax cognitive resources that would have been allocated into the situation otherwise (Conway, 2005; Cole, Zahn-Waxler, & Smith, 1994). For example, an individual attempting to suppress anger may experience difficulties in focusing or attention-shifting

(Conway, 2005), and inhibiting negative emotions has been found to be cognitively demanding in adults and children (Conway, 2005; Gross & Levenson, 1997, Richards & Gross, 1999). Therefore, increases in suppression or inhibition of emotions can be problematic. An anxious individual may enter a situation, spend their cognitive resources on suppressing their anxiety, and this could create difficulties in shifting attention from threat, and potentially predispose individuals towards intent biases as well. Intent biases been found to mediate the relationship between attention to social threat and reactive aggression for children (Schippell, Vasey, Cravens-Brown, & Bretveld, 2003), and while more research needs to be done on the connection between interpretation biases and attention to threat, attention to threat may impact how ambiguous information is interpreted for young adult women as well (White, Suway, Pine, Bar-Haim, & Fox, 2011). Specifically, attention to threat biases may increase the likelihood of interpretation biases due to the possibility of making interpretations on potential threat-related details that may not have been otherwise observed (White et al., 2011). Further, increased attention to negative information has been connected with aggression for youth (Reid, Salmon, & Lovibond, 2006), and difficulties with attention suppression in response to rejection, ridicule, or failure threat cues has been connected with reactive aggression in children (Schippell, et al., 2003). Increased social threat bias has also been connected with increased aggression and reduced empathy for others within a sample of female adults (Karos, Meulders, Goubert, & Vlaeyen, 2017).

Interpretation Biases and Negative Outcomes

Conway (2005)'s description of cognitive resources being taxed by emotional suppression and inhibition may also impact intent biases, as a reduction in cognitive resources may reduce the amount of focus allowed for interpreting the situation. Intent biases, specifically

the hostile attribution bias (HAB), involve an individual's bias towards interpreting ambiguous situations as intentional or hostile (Dodge, 1980). Intent biases may contribute to the relationship between anxiety and aggression, as they have been found to have relationships with each (Dodge & Coie, 1987; Marsee et al., 2008). Social cognitive biases, such as HAB, have been suggested to mediate the relationship between anxiety and aggression (Dodge, 1980; Marsee et al., 2008). Intent biases have specifically been connected with reactive aggression (Bubier, & Drabick, 2009; Dodge & Coie, 1987; Marsee et al., 2008), as reactive aggression is retaliatory and may occur in response to a hostile interpretation of an ambiguous situation (as the intent bias may provide the reason for the possible retaliation).

Associations have been found between intent biases with social threat bias (Karos et al, 2017; Reid et al., 2006; Schippell et al., 2003), anxiety (Waite et al., 2015), aggression (Coccaro et al., 2009; Orobio de Castro et al., 2002), with a combination of anxiety and aggression (Kunimatsu & Marsee, 2012; Marsee et al., 2008), and even with aggression and emotional distress (Mathieson et al., 2011). Yet, most previous studies have examined these variables separately, rather than a model of each contributing variable, which does not allow for the simultaneous study of multiple SIP mechanisms that are theorized to lead to aggressive responding.

Emotion Dysregulation

Emotions are thought to play an essential role in social information processing, as suggested by Lemerise & Arsenio's reformulated model, as the individual's mood, emotional arousal, and past affective experiences may all contribute to an individual's processing of threat or intent (2000). An individual may be more likely to cue in on (and encode) mood congruent material, may be more likely to interpret based on this mood, and the responses an individual is

able to generate may be impacted by mood (Lemerise & Arsenio, 2000). Further, the role of emotion regulation in these SIP pathways is not clear, but given that the ability to regulate emotional responses may have an impact on intent bias, and may lead to reactive aggression (Conway, 2005), it is critical to include this variable in models seeking to explain negative outcomes (Lemerise & Arsenio, 2000).

Several past studies have found increased emotional distress to be connected with increased levels of aggression (as qtd. in Mathieson et al., 2011), and emotion dysregulation has been connected with aggressive tendencies in multiple studies (e.g., Garofalo, Velotti, & Zavattini, 2018; Marsee, 2008). The occurrence of emotional dysregulation when processing a social situation may contribute to increased likelihood of anxious or aggressive reactions, in particular by making social threat biases (Johnson, 2009; Kunimatsu & Marsee, 2012) or HAB more likely (Conway, 2005; Kunimatsu & Marsee, 2012). As such, it may be that emotional regulation acts as a moderator of the associations between anxiety and aggression (see Figure 2), via their moderation of cognitive biases. However, many previous studies on this topic have not addressed the role of emotion regulation.

Interventions

Overall, the relationship between anxiety and aggression can be better understood by examining the shared risk factors, the underlying social cognitive processing, and the negative outcomes associated with each. This is essential, because this understanding can help guide the creation of effective intervention strategies. To target aggressive behaviors in an intervention, it is necessary to understand the underlying components, such as the risk factors, that must be targeted by said intervention (Liu et al., 2013). For instance, Lochman designed two youth-focused intervention groups: one which aims to increase an child's ability to cope adaptively

with situations and their emotions (emotion regulation) and another that aims to target social cognitive difficulties (including intent and attention to threat biases) (2004). Therefore, it is important to continue building knowledge about the relationship between anxiety and aggression, as this may help lead to more effective interventions, and in turn, a potential for a decrease in aggressive response and subsequent increase in well-being. Further, while previous research focuses on youth and adolescents, interventions should consider other age groups as well.

Understanding Anxiety and Aggression in Emerging Adults

Much of the research on internalizing and externalizing problems is done on children and adolescents, but development and manifestation of problem behavior does not end when youth reach adulthood. The study of young adults, or “emerging adults” is therefore important for the field, particularly with regard to the role of anxiety symptoms in problematic behavior patterns that may involve aggression. However, as discussed previously, this is still an age range with high rates of anxiety (NIMH, 2003), experiences of aggression (Liu et al., 2013), and the transition from adolescence to young adulthood may be accompanied by more violent forms of aggression (Liu et al, 2013). Additionally, aggression has been described as stable over an individual’s lifespan (Liu et al., 2013), and aggression from one age group may be predictive of aggression within the next age group (Marcus, 2007). There are many unique stressors that may appear for individuals in this age group that could contribute to their emotional distress as well, such as becoming more independent, moving away from family, and the increased significance of romantic relationships (Dresser, Clark, & Deschênes, 2015; Man Chow & Ruhl, 2014). Additionally, despite the prominence of research on youth and adolescents, a few studies have explored attention to threat in samples of young adults (Karademas et al., 2007, Karos et al., 2017; White et al., 2011), and many of the studies on adolescents range up to 18 years of age

(one year difference from being considered emerging adults). Therefore, if anxiety and aggression are both prominent difficulties faced by this age range, it is essential that this developmental period is explored within this area of research.

Statement of the Problem

In order to create effective intervention programs to target aggressive behavior, it is essential to understand the social-cognitive and emotional variables that may be contributing to the likelihood of an individual selecting an aggressive behavior. Anxiety and aggression have been found to be connected (Bubier & Drabick, 2009; Crick et al., 2006; Kunimatsu & Marsee, 2012; Marsee et al., 2008), specifically with reactive aggression (Fite et al., 2010; Marsee et al., 2008). Social-information-processing theory may be useful in understanding how anxious individuals select aggressive responses to a situation, as this theory suggests that in an ambiguous situation, an individual has many social-cognitive biases that may impact the response to the situation (Crick & Dodge, 1994; Lemerise & Arsenio, 2000). Specifically, there may be attentional biases, such as selective attention to threat, where an individual focuses a disproportionate amount of attention on perceived threat in the environment and has difficulty disengaging (Roberts et al., 2010). Increased difficulty with attention biases has been connected to anxiety (Helzer et al., 2009; Roberts et al., 2010), intent biases (Schippell et al., 2003; White et al., 2011), and aggression (Karos et al., 2017, Reid et al., 2006; Schippell et al., 2003). Intent biases, such as the hostile interpretation bias, have also been found to be connected to anxiety and aggression (Coccaro et al., 2009; Mathieson et al., 2011, Orobio de Castro et al., 2002; Waite et al., 2015), specifically, HAB has been suggested to mediate the relationship between anxiety and aggression (Dodge, 1980; Marsee et al., 2008). Further, affect and emotions are an essential addition to Lemerise & Arsenio's reformulated social information processing model

(2000). As emotional dysregulation has been connected with aggression (Garofalo et al., 2018; Marsee, 2008), social threat biases (Johnson, 2009; Kunimatsu & Marsee, 2012), and HAB (Kunimatsu & Marsee, 2012), it may be essential to consider how it impacts the relationship between anxiety and aggression. Specifically, emotion regulation may moderate the relationships in the model, which would suggest that if an individual is anxious, and they report these social-cognitive biases, they may be more likely to react aggressively; however, an anxious individual with high emotion regulation abilities may be better able to address their emotions adaptively and choose alternative responses.

However, while previous research has explored these aspects of these topics separately, the present study aimed to add to this research area by examining each of these variables combined into one model. Additionally, the present study explored these topics within an emerging adult population, as the majority of prior literature focuses on youth and adolescents, yet there are some studies that suggest that this may be essential in emerging adults as well. An increased understanding of this relationship is essential to form accurate intervention strategies, as it allows for increased awareness of the impact of aggression, the underlying emotions and cognitions behind the anxiety, and may allow for a more educated treatment plan with aggressive individuals.

Hypotheses

Hypothesis 1: Anxiety and aggression will be positively correlated with each other.

Additionally, there will be a significant, positive association between all of the main variables. This means anxiety, the hostile attribution bias, the social threat bias, emotion dysregulation, and aggression will all be positively correlated with each other.

Hypothesis 2: The main variables will form a serial moderated mediator model, with anxiety as the predictor variable and aggression as the outcome variable (see Figure 2).

2A. Attentional bias to social threat will mediate the relationship between anxiety and hostile attribution bias.

2B. Hostile attribution bias will mediate the relationship between attentional bias to social threat and aggression.

2C. Emotion regulation will act as a moderator for this model, suggesting that increased ability to regulate emotions may decrease the likelihood of reporting social-cognitive biases (attention to threat or HAB) and decrease the chance of responding aggressively.

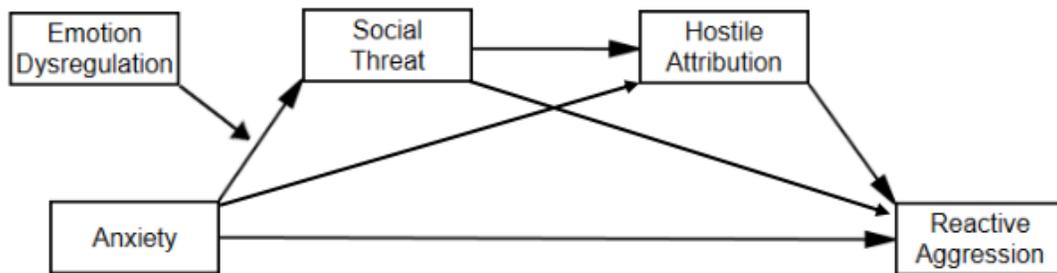


Figure 2. *Moderated Serial Mediation Model*

CHAPTER 3. METHODS

Participants

The necessary sample size was determined using a Monte Carlo Power Analysis for Indirect Effects, which has been suggested to be most effective for mediation models, as analytic methods of determining sample size have been suggested to underestimate the number of needed participants (Schoemann, Boulton, & Short, 2017). The Monte Carlo program was also chosen as it can run a power analysis for serial mediator models. However, this does not allow for consideration of the moderator. Yet, this method of power analysis was the closest fit to the present model. With a standard power level of 0.80 and an alpha of 0.05, 103 participants were required for a large effect, 105 for a medium effect, and 476 for a small effect.

Participants ($N= 545$) were Iowa State University undergraduate students recruited through the psychology department research pool. Data collection occurred over five months. Participants received course credit for participation in this study. All participants were required to be emerging adults aged 18-29 ($M=19.19$, $SD= 1.47$). Nine participants were excluded for not being within the required age range and one participant was excluded after being given the incorrect survey, so 535 participants remained following these exclusions. Participants' gender identity was male ($N= 172$, 32.1%), female ($N= 357$, 66.6%), transgender ($N=1$, 0.2%), or non-binary ($N= 3$, 0.6%). Participants' biological sex was either male ($N= 172$, 32.1 %) or female ($N= 361$, 67.4%). Racial and ethnic identities and socioeconomic status (SES) are presented in Table 1. Percentages for racial/ethnic identity do not add up to 100 as some participants identified with multiple racial/ethnic identities ($N=28$, 5.22%) and some participants provided their own description of their racial / ethnic identity or did not disclose this information ($N=10$, 1.9%).

Table 1

Demographics

	<i>n</i>	%
Race/Ethnicity		
American Indian / Alaska Native / Native American	2	0.4
Asian / Asian American	46	8.6
African American / Black	19	3.5
Latinx / Hispanic / Latinx or Hispanic American	45	8.4
Native Hawaiian / Pacific Islander	1	0.2
European American / Caucasian	442	82.5
Selected Multiple of Above Categories	28	5.2
SES		
Upper Class	9	1.7
Upper Middle Class	156	29.1
Middle Class	301	56.2
Lower Middle Class	56	10.4
Lower Class	11	2.0

Measures

Demographics. Participants were asked to report their demographics (age, sex, gender, race/ethnicity, and SES).

Anxious Symptoms. In order to account for multiple types of anxiety, two measures were utilized to assess anxious symptoms. Generalized Anxiety Disorder was assessed using the Generalized Anxiety-7 Scale (Spitzer, Kroenke, Williams, & Lowe, 2006), while social interaction anxiety was measured by the Social Interaction Anxiety Scale (Mattick & Clarke, 1989).

The Generalized Anxiety Disorder (GAD-7) scale is a 7-item scale assessing Generalized Anxiety Disorder. Participants were asked how often they had been “bothered” by various symptoms of anxiety in the last two weeks, including nervousness, worrying, restlessness, and more. Participants rated each symptom on a 4-point Likert scale from “Not at all” to “Nearly every day.” Participants are then asked if they reported any of these symptoms to rate how difficult these had made other things (e.g. working, housework, socializing) on a 4-point Likert scale ranging from “not difficult at all” to “extremely difficult.” Prior literature suggests strong internal consistency ($\alpha = .92$), as well as good test-retest reliability ($r=0.83$) among patients in 15 primary care sites (Spitzer et al., 2006). Within the present sample, strong internal consistency was demonstrated ($\alpha = .90$).

The Social Interaction Anxiety Scale (SIAS) is a 20-item scale assessing social anxiousness. Participants are asked to indicate to what degree a statement is characteristic of them. Each symptom is rated on a 5-point Likert scale ranging from “not at all characteristic or true of me” to “extremely characteristic or true of me.” Previous literature suggests differences are found on this measure between various types of anxiety (e.g. general and social anxiety) and

non-anxious individuals (Brown et al., 1997). Within the current sample, moderate internal consistency was demonstrated ($\alpha = .60$).

Aggression. Participants completed the Peer Conflict Scale-40 (PCS-40), which is a 40-item self-report measure for aggression assessing forms (relational or physical) and functions (proactive or reactive) of aggression (Marsee et al., 2008). Participants read the statements provided and then rated how well each statement described them on a four-point Likert scale (ranging from “Not at All True” to “Definitely True”). Total scores were summed for the twenty items related to each function of aggression (proactive and reactive). Prior literature suggests the PCS-40 has good internal consistency for adolescents ($\alpha = .94-.96$) (Barry, Kauten, & Lui, 2014; Guelker, Barry, Barry, & Malkin, 2014; Kauten, Lui, Doucette, & Barry, 2015). Additionally, the PCS-40 has shown good internal consistency for each function (Proactive $\alpha = .93$, Reactive $\alpha = .89$) within a sample of adolescents (Barry & Kauten, 2014). Additionally, the brief version of this measure (Peer Conflict Scale-20) has shown strong internal consistency within a sample of college students for both forms of aggression (Physical $\alpha = 0.92$, Relational $\alpha = 0.89$). Both the physical and relational subscales have been found to be correlated with delinquency, narcissism, and maladaptive narcissism (Barry, Grafeman, Adler, & Pickard, 2007). Within this sample, moderately strong internal consistency was demonstrated (Proactive $\alpha = .71$, Reactive $\alpha = .74$, Total $\alpha = .83$).

Hostile Intent and Negative Emotional Response. Hostile attribution bias was assessed using Coccaro et al.’s (2009) Social Information Processing—Attribution and Emotional Response Questionnaire (SIP-AEQ). This measure provided eight vignettes, and participants answered four questions for each vignette to rate the intent. Each story had participants rate on a four-point Likert scale (ranging from “Not at all Likely” to “Very Likely”) how likely it was that

the person in the vignette acted based on a direct hostile intent, indirect hostile intent, instrumental non-hostile intent, or neutral intent. The scores for direct and indirect hostile intent were combined to create a single HAB variable, as previous research suggested multicollinearity issues when using the two as separate variables (Coccaro et al, 2009). The mean of all HAB responses, indirect or direct, were taken for this variable. Coccaro et al. (2009) suggests good internal consistency of each subscale within an adult sample across three studies (Hostile Intent $\alpha = 0.82-0.90$). Within two of their three studies, Coccaro et al. (2009) examined test-retest reliability of HAB within a subset of their participants ($r=0.75$, $p<.001$ and $r=0.74$, $p<.001$, respectively). Within this study, this measure demonstrated strong internal consistency (Hostile Intent $\alpha =.88$).

Following each vignette, this measure presented two questions assessing negative emotional response (NER). These questions aimed to measure if an individual had an emotional reaction to the vignette by asking the participants to rate on a 4-point Likert scale how angry/upset/embarrassed they would be if the situation presented in the vignette happened to them (ranging from “Not at All Likely” to “Very Likely”). These items were not used in the analyses of the present study, but were used to determine if the vignettes were able to generate an emotional reaction in the participant, in order to assess if the vignettes are functioning well. The NER items demonstrated good internal consistency in three studies in an adult sample (NER $\alpha = 0.85-0.91$) (Coccaro et al., 2009). Test-retest reliability was also demonstrated for NER ($r=0.71$, $p<.001$ and $r=0.94$, $p<.001$ respectively) (Coccaro et al., 2009). Within this sample, strong internal consistency was demonstrated ($\alpha =.80$).

This measure also has convergent validity, as it has been shown that Coccaro et al.’s (2009) hostile intent scale is correlated negatively with emotion regulation and positively with

the Hostile Automatic Thoughts Questionnaire, as well as childhood trauma (Childhood Trauma Questionnaire) and several aggression measures (Buss-Perry Aggression Questionnaire, Life History of Aggression) (Coccaro et al., 2009). Meanwhile, NER has been shown to be correlated positively with neuroticism (Eysenck Personality Questionnaire-Neuroticism Subscale) and negatively with repair/strategies of emotion regulation and clarity of emotional perception (two subscales of the Trait Meta-Mood Scale) (Coccaro et al., 2009).

Emotion Dysregulation. Emotion dysregulation was assessed using the Abbreviated Dysregulation Inventory (ADI), which is a 30-item self-report measure assessing emotional and affective dysregulation, behavioral dysregulation, and cognitive dysregulation (Mezzich et al., 2001). Within the present study, the 10-item emotional dysregulation subscale was used. This scale is a four-point Likert scale (ranging from “never true” to “always true”) assessing how often the provided statements are true for the individual. Prior research suggests decent internal consistency for this subscale within an adolescent and young adult population ($\alpha = .75$) (Marsee & Frick, 2007). Concurrent validity has been explored for each form of dysregulation (affective, behavioral, and cognitive). Affective dysregulation was correlated with anxiety and depression, behavioral dysregulation with aggression, and cognitive dysregulation with latent executive cognitive functions (Mezzich et al., 2001). Within this sample, strong internal consistency was demonstrated for affective dysregulation ($\alpha = .85$).

Social Threat Bias. Social threat bias was assessed using Schippell et al.’s (2003) probe detection task (PDT), which is a computerized task which was run through the E-Prime computer program on PC computers (Psychology Software Tools, 2001). While Schippell et al.’s (2003) task was used predominantly with children, this task was originally developed to study allocation of attention for anxious and non-anxious adults (Mac-Leod et al., 1986). Additionally, social

threat bias has been measured using threat-word dot probe tasks with undergraduate samples in other previous studies (Helfritz-Sinville & Stanford, 2015; Keogh, 2001). Social threat bias has been found to be correlated with anxiety (Schippell et al., 2003).

This task assesses if there are differences in attention allocated to a word based on if it is a threatening or a neutral word. When an individual has a faster response time when the probe replaces a threat word, they were allocating more attention towards the threatening word (i.e. facilitation to threat). If it is the opposite, and they respond faster when the probe replaces a neutral word, this may represent a suppression occurring in response to the threat word (disengagement from the threat word).

Participants used a laboratory computer for the task. During the computer task, participants saw word pairs appear on the screen (one word on the top half of the screen and one word on the bottom). These words were spaced approximately three centimeters apart. Each of the words could be a neutral word, a social evaluative threat word, or a physical provocation threat word. The words could be a pair of two neutral words (neutral-neutral condition) or one neutral word and one threat (neutral-threat condition). Participants were asked to read the top word out loud, which was monitored using baby monitors. During the task, words were presented on the screen for 500 ms. Following this, a fixation cross appeared on the screen in the place of one of the words (where either the top or bottom word originally were placed) for 500ms. At this time, participants pressed a key on the keyboard to indicate if the probe replaced the bottom word (“0”) or the top word (“1”). After their response, there was 500 ms until the next word pair appeared. Participants had a practice trial at the beginning of this task.

The output from this computerized task was a data file with information on accuracy, response time, response, and correct response for each item. Three threat scores were created:

social threat bias, heightened/facilitation to threat, and suppression/disengagement from threat. These scores were created through aggregating accurate trials for each participant and each threat location / probe location combination utilizing the following equations.

Social Threat Bias: $((\text{upper probe}/\text{lower threat}) - (\text{upper probe}/\text{upper threat}) + (\text{lower probe}/\text{upper threat}) - (\text{lower probe}/\text{lower threat}))/2$

Social Facilitation: $((\text{neutral probe up}) - (\text{upper threat}/\text{upper probe}) + (\text{neutral probe down}) - (\text{lower threat}/\text{lower probe}))/2$

Social Disengagement: $((\text{lower threat}/\text{upper probe}) - (\text{neutral probe up}) + (\text{upper threat}/\text{upper probe}) - (\text{neutral probe down}))/2$

These equations allow for location of the threat word and location of the probe, and their potential impact on reaction time, to be accounted for as well.

Procedure

All procedures were approved by Iowa State University's Institutional Review Board (IRB) prior to data collection (See Appendix). Participants completed this study within a laboratory setting on campus. Before proceeding with the study, participants read an informed consent statement, which explained the research topic, discussed any possible risks, and reminded participants that they could voluntarily withdraw from the study at any time. Each participant completed the study at a PC computer located in a separate room within the laboratory, and multiple participants were not in the same room during the study. A white noise machine was also located outside this room. The researcher (or a research assistant) was located outside of the room in case participants had questions at any time during the study. Participants completed the measures and computerized task and the order of these (whether they began with the task or the measures) was counterbalanced. Following the study, the participants were given

a statement thanking them, explaining the topic being studied, and were provided with information on the campus counseling center in case any part of the study caused any distress.

CHAPTER 4. RESULTS

Data Preparation and Cleaning

Data was screened prior to analyses. For the surveys, two items were in place to assess if the participants were paying attention to the items (an item asking if they had won a Nobel Peace Prize and an item asking if they attend Paris University). One participant was eliminated for failing these checks. As mentioned previously, nine participants were excluded due to being outside the desired age range (18-29) and one participant was excluded as they were given an incorrect survey. One participant was also excluded for having the incorrect participant number recorded, as their survey and computer task data were unable to be matched. On the PDT, 50 participants did not have data due to participants running out of time while taking the study. On this task, data was not usable for 16 participants due to missing data due to accuracy checks. Data was only used if trials were accurate and if the response time was between 100ms-1500ms. These reaction times are chosen based on prior literature, which suggests that participants responding slower may have shown a lapse in attention, while participants responding quicker may have been holding the button from the prior trial or have hit the button early (Schippell et al., 2003). Lastly, four participants' data on the PDT was excluded due to reporting confusion to research assistants mid/post-trial on what their instructions had been or admitting to research assistants they were intoxicated. Further, individuals that had more than 20% missing data on the surveys were excluded from future analyses. If under 20% of data on a measure was missing, the mean was computed to replace any missing item. Following these exclusions and data cleaning, 530 participants' data remained on the SIP-AEQ, 533 for the PCS, 532 for each anxiety measure (GAD-7 and SIAS), 524 for ADI, and 467 for the PDT.

For each measure, z-scores were calculated to examine data for univariate outliers. A z-score greater than 3 or less than -3 would indicate a univariate outlier. Within this data, there were outliers for aggression (N=6), reactive aggression (N=6), proactive aggression (N=7), emotion dysregulation (N=5), social interaction anxiety (N=10), hostile attribution bias (N=4). For some of these measures, the same participants showed outliers on multiple measures. Additionally, Mahalanobis distance was examined for each variable (Tabachnick & Fidell, 2001). Fourteen variables were excluded from future analyses due to Mahalanobis distances ranging from 28.4 to 36.7 ($p < .001$). Following the removal of all outliers, 440 participants had data on each measure for models examining SIAS and 449 participants had data on each measure for models examining GAD. Multicollinearity diagnostics were examined for model variables and multicollinearity was not found to be a concern with model variables.

Descriptive Statistics

Means, standard deviations, ranges, and alpha coefficients can be found in Table 2. Bivariate correlations were run in SPSS to determine if there were significant relationships between the main variables (anxiety, aggression, attentional bias to social threat, hostile attribution bias, and emotion dysregulation). During the PDT computer task, some participants reported confusion with the instructions, specifically involving reading the top word aloud. Therefore, correlations were run both with and without these participants to assess if this confusion impacted findings. Excluding participants that showed confusion on the task did not impact correlations, and therefore, these participants remain in further analyses (See Table 3).

Table 2

Descriptive Statistics of Main Variables

	M (SD)	Range	Alpha Coefficient
GAD-7	6.59 (5.09)	0-21	0.90
SIAS	10.38 (2.27)	5-18	0.60
SIP-AEQ	28.51 (6.38)	16-55	0.88
PDT	1.20 (46.81)	-309.75-206.42	N/A
Facilitation	3.70 (57.32)	-338.06 – 568.70	N/A
Disengagement	-8.65 (58.95)	-568.70- 332.69	N/A
PCS-40	0.92 (2.79)	0-9	0.84
Proactive	0.14 (0.45)	0-3	0.75
Reactive	0.75 (1.18)	0-6	0.74
ADI	17.11 (4.98)	10-36	0.85

Note. GAD= Generalized Anxiety Disorder, SIAS= Social Interaction Anxiety Scale, SIP-AEQ= Social Information Processing-Attribution and Emotional Response Questionnaire, NER= Negative Emotional Response, PDT= Probe Detection Task, PCS= Peer Conflict Scale, ADI= Abbreviated Dysregulation Inventory.

Table 3

Zero-Order Correlations for Main Variables

	GAD-7	SIAS	SIP-AEQ	PDT-T	PDT-F	PDT-D	PCS-40	PCS-P	PCS-R	ADI
GAD-7	----									
SIAS	.226**	----								
SIP-AEQ	.231**	.071	----							
PDT-T	-.113*	-.004	-.058	----						
PDT-F	-.077	.049	.009	.563**	----					
PDT-D	-.009	-.016	-.041	-.021	-.576**	----				
PCS-40	.228**	.104	.039	-.049	-.050	-.001	----			
PCS-P	.104*	.031	.061	-.048	-.026	-.008	.500**	----		
PCS-R	.224**	.097*	.025	-.025	-.036	-.011	.963**	.320**	----	
ADI	.695**	.252**	.228**	-.134*	-.079	-.039	.345**	.191**	.340**	----

Note. SIP-AEQ=Social Information Processing-Attribution and Emotional Response Questionnaire, PDT-T= Probe Detection Task-Total, PDT-F= Probe Detection Task-Facilitation, PDT-D= Probe Detection Task- Disengagement, PCS-P= Peer Conflict Scale-Proactive, PCS-R= Peer Conflict Scale-Reactive. * $p < .05$, ** $p < .01$

Moderated Serial Mediation Model

In order to assess whether the data fit a moderated serial mediation model, as predicted, data was analyzed using a statistical software called PROCESS, which is an add-on for SPSS used to examine mediation and moderation models (Hayes, 2013). This program allows for the examination of indirect effects and whether the mediators account for significant variance between the predictor and outcome variable by analyzing how the addition of each mediator/moderator variable changes the pathways between anxiety and aggression. For these analyses, Model 83 in PROCESS was used, which is a moderated serial mediator model where the order of the variables entered matters (Hayes, 2017). Bias-corrected bootstrap procedures were also utilized, as this allowed the researcher to examine many bootstrap data samples, which are randomly sampled by entering replacements into the original data set, in order to determine significance without normality assumptions (Efron & Tibshirani, 1993).

Generalized Anxiety Model. As two types of anxiety were measured within this study, the model was analyzed with each type of anxiety entered as the IV. All models use emotion dysregulation as the moderator, HAB as mediator 2, and reactive aggression as the DV. The first model run examined GAD as the IV and PDT-T as mediator 1. The overall model was significant, $F(3, 445) = 6.64, P=.018, R^2 = .043$. Therefore, 4.3% of the variance was accounted for by this model. When examining the model with PDT-F or PDT-D, model fit is similar.

Within this model, the interaction between anxiety and emotion dysregulation was not significant [$B = 1.05, 95\% \text{ C.I. } (-0.0002, 0.0004), p=0.62$]. For low, medium, and high moderation, indirect effects were similarly insignificant. Therefore, the serial mediation model analyses were run without the moderation for the remainder of this section. These analyses were

also conducted using the PROCESS SPSS add-on; however, model 6 was used for these analyses, as this model allows for examination of a serial mediation model where order of variables is taken into consideration (Hayes, 2013). Once the moderator was removed, the number of participants with full data for these models increased to 457 participants. Model fit was then re-examined and the overall model was significant, $F(3, 453) = 22.24, P < .01, R^2 = .051$. Therefore, 5.1% of the variance was accounted for by this model.

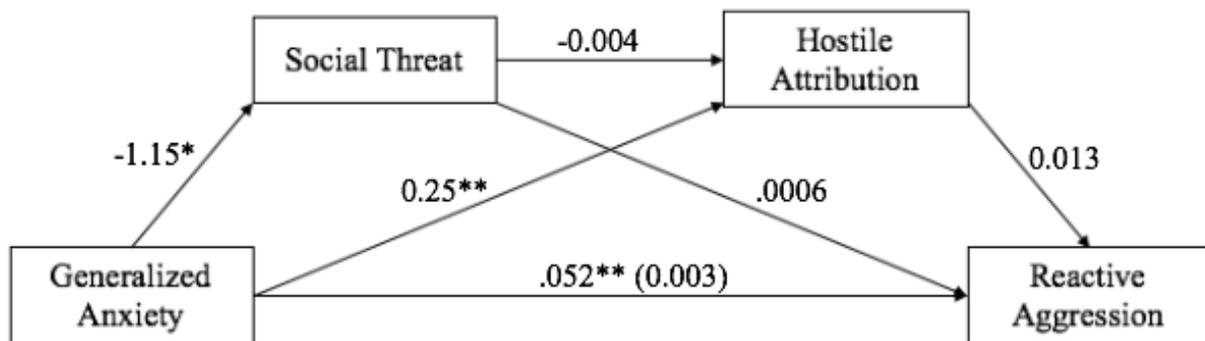


Figure 3. *Serial Mediation Model for General Anxiety and Reactive Aggression.*

Several pathways were found to be significant in this model (See Figure 3). However, none of the indirect effects were found to be significant (See Table 4). For the mediation between anxiety and reactive aggression through social threat, no significant indirect effects were found [Effect=-0.0006, 95% C.I. (-0.004, 0.01)]. For the mediation between anxiety and reactive aggression through hostile attribution bias, no significant indirect effects were found [Effect=0.003, 95% C.I. (-0.002, 0.01)]. For the full serial mediation model, no significant indirect effects were found [Effect=0.00006, 95% C.I. (-0.0002, 0.0004)]. Additionally, total indirect effects for the model were determined to be insignificant [Effect= 0.003, 95% C.I. (-0.004, 0.10)]. As each of these confidence intervals overlaps zero, it can be assumed that all indirect effects are insignificant. Hayes (2013) describes the total indirect effect as the difference

between the total effect of X on Y and the direct effect of X on Y. So, while the pathway from anxiety to aggression was significant initially, the total indirect effect was insignificant, suggesting the relationship is mostly explained by anxiety and aggression, rather than by the mediators. When this model was run with the social threat facilitation or disengagement scores, rather than the social threat total score, as mediator 1, results were similar. However, when this change was entered into the model analyses, the coefficient between anxiety and social threat was no longer significant.

Table 4
Mediation Model Summary for GAD and Reactive Aggression

	β	<i>se</i>	<i>t</i>	<i>p</i>	95% CI
Direct paths					
Anxiety to Threat (path a)	-1.15	0.45	-2.57	0.01	-2.03, -0.27
Threat to HAB (path b)	-0.004	0.006	-0.70	0.48	-0.02, 0.008
Anxiety to Aggression (path c')	0.05	0.01	4.36	0.00	0.03, 0.08
Anxiety to HAB (path d)	0.25	0.06	4.33	0.00	0.14, 0.36
Threat to Aggression (path e)	0.0006	0.001	0.46	0.65	-0.002, 0.003
HAB to Aggression (path f)	0.013	0.010	1.40	0.16	-0.005, 0.03
Anxiety to Aggression (path c)	0.05	0.01	4.72	0.00	0.03, 0.08
Indirect paths					
Mediation thru Threat (a*e)	-0.0006	0.002	---	---	-0.004, 0.003
Mediation thru HAB (b*e)	0.003	0.003	---	---	-0.002, 0.01
Mediation thru Threat & HAB (a*b*f)	0.00006	0.0001	---	---	-0.0002, 0.0004
Total indirect effect	0.003	0.003	---	---	-0.004, 0.10

Notes. Path C refers to total effect and path c' refers to the direct effect. Results are based on 1000 bootstrap samples.

Social Interaction Anxiety Model. This model was run with social interaction anxiety as the IV. This model examined SIAS as the IV and PDT-T as mediator 1. The overall model was significant, $F(3, 436) = 2.98, P=.031, R^2 = .020$. Therefore, 2.0% of the variance was accounted for by this model. When examining the model with PDT-F or PDT-D, model fit is similar.

Within this model, the interaction between anxiety and emotion dysregulation was not significant [$B = -0.38, 95\% \text{ C.I. } (-0.79, 0.02), p=0.06$]. For low, medium, and high moderation, indirect effects were similarly insignificant. Therefore, these analyses were also run as serial mediation analyses through model 6 of the PROCESS SPSS add-on (Hayes, 2013). Once the moderator was removed, the number of participants with full data for these models increased to 448 participants. Model fit was then re-examined and the overall model was significant, $F(3, 444) = 4.50, P<.01, R^2 = .030$. Therefore, 3.0 % of the variance was accounted for by this model.

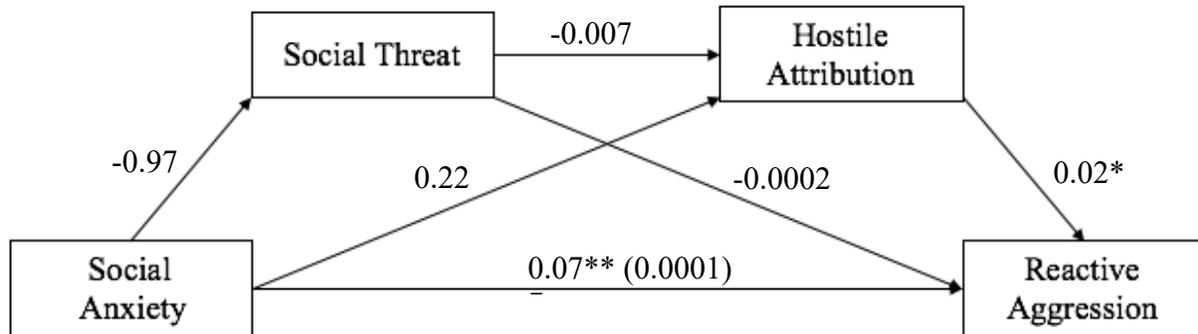


Figure 4. *Serial Mediation Model for Social Anxiety and Reactive Aggression.*

Most pathways on this model were not found to be significant (See Figure 4; See Table 5). The pathway between anxiety and aggression, as well as the pathway between hostile attribution bias and aggression, were the only significant pathways. These results are consistent

with the correlations previously run. Additionally, none of the indirect pathways had significant indirect effects (See Table 5). Therefore, while the path between anxiety and aggression was again significant in this model, the results suggest that there is an insignificant total indirect effect, and the difference between the total effect and the direct effect of anxiety on aggression is small. When this model was run with the social threat facilitation or disengagement scores, rather than the social threat total score, as mediator 1, results were similar.

Table 5
Mediation Model Summary for SIAS and Reactive Aggression

	β	<i>se</i>	<i>t</i>	<i>p</i>	95% CI
Direct paths					
Anxiety to Threat (path a)	-0.97	1.01	-0.97	0.33	-2.95, 1.00
Anxiety to HAB (path b)	0.22	0.13	1.74	0.08	-0.03, 0.47
Anxiety to Aggression (path c')	0.07	0.03	2.77	0.005	0.02, 0.12
Threat to HAB (path d)	-0.007	0.006	-1.16	0.25	-0.02, 0.005
Threat to Aggression (path e)	-0.0002	0.001	-0.19	0.85	-0.003, 0.002
HAB to Aggression (path f)	0.02	0.01	2.14	0.03	0.002, 0.04
Anxiety to Aggression (path c)	0.08	0.03	2.96	0.003	0.03, 0.13
Indirect paths					
Mediation thru Threat (a*e)	0.0002	0.002	---	---	-0.004, 0.005
Mediation thru HAB (b*f)	0.005	0.004	---	---	-0.0007, 0.01
Mediation thru Threat & HAB (a*d*f)	0.0001	0.0003	---	---	-0.0004, 0.0008
Total indirect effect	0.005	0.004	---	---	-0.002, 0.01

Notes. Path C refers to total effect and path c' refers to the direct effect. Results are based on 1000 bootstrap samples.

Regression Analyses. As many of the hypothesized mediation models were determined to be insignificant, following the serial mediation model analyses a simple regression was also conducted to examine if each main variable (anxiety, emotion dysregulation, social threat bias, and HAB) were predictive of reactive aggression $F(7, 430) = 6.62, p < .01, R^2 = .097$. Emotion dysregulation added statistical significance to the prediction, $p < .01$. Meanwhile, all other variables were not significant predictors within this model. Semipartial correlations were calculated for each emotion dysregulation ($r = 0.23, p < .01$), social anxiety ($r = 0.02, n.s.$), general anxiety ($r = -0.01, n.s.$), HAB ($r = 0.02, n.s.$), PDT total ($r = -0.11, n.s.$), and each PDT facilitation and disengagement ($r = 0.3, n.s.$) to assess if each individual variable is predictive of reactive aggression.

CHAPTER 5. DISCUSSION

Research has consistently supported the relationship between anxiety and aggression (Bubier & Drabick, 2009; Costello et al., 2004; Crick et al., 2006; Fite et al., 2010; Kunimatsu & Marsee, 2012; Marsee et al., 2008). Additionally, both anxiety and aggression may have shared risk factors and create negative outcomes for an individual (Chen et al., 2008; Fanti & Henrich, 2010). For that reason, this study aimed to increase understanding of underlying factors that may explain the relationship between anxiety and aggression, specifically within an emerging adult sample. Within this study, two social-cognitive biases (attention to social threat and hostile attribution bias) were examined as factors within this relationship. Based on a Social Information Processing (SIP) model, two of the steps an individual makes when determining how to respond to an ambiguous situation are to pay attention to (and encode) stimuli and to make interpretations of the situation (Crick & Dodge, 1994). Using this framework, it was hypothesized that biases in these two areas could impact an individual's decision making and their likelihood of responding aggressively. Attention to social threat and HAB were expected to function as mediators between anxiety and reactive aggression, specifically forming a serial mediation model. Further, an individual's ability to regulate their emotions was expected to moderate this model.

Both generalized anxiety (GAD) and social anxiety (SIAS) were examined within these models as independent variables within these models, with attention to social threat acting as mediator one, HAB as mediator two, and reactive aggression as the outcome. However, neither of these models were supported by the results of this study. Within the GAD model, some select pathways were found to be significant (e.g. GAD to social threat, GAD to HAB, GAD to reactive aggression), there were no significant mediations. These significant pathways in the results were similar to the zero-order correlations completed within this study, as GAD was found to be

significant with each attention to social threat, HAB, emotion regulation, and aggression.

However, these variables were not found to have relationships between each other. Overall, this model suggested that there is a relationship between anxiety and aggression, but that the indirect effect of the mediators did not play a significant role in that relationship. Rather, it was a direct relationship between anxiety and reactive aggression that could not be better explained by indirect effects.

This finding was contradictory to what was expected, as prior research has suggested that these social-cognitive biases might impact the relationship. Specifically, HAB has been suggested to mediate anxiety and aggression in past studies (Marsee et al., 2008) and studies focusing on social information processing have suggested the interconnectivity of the steps where these biases occur (Crick & Dodge, 1994). However, within this study, HAB did not mediate the relationship between anxiety and reactive aggression even when it was run as a simple mediator model. As much of the prior literature has been examined predominantly in youth and adolescents, and the present study aimed to apply that research to emerging adults, it is possible that significant findings occur more frequently at a younger age and are based on developmental time periods in an individual's life. HAB has been frequently associated with aggression and anxiety (Bubier & Drabick, 2009; Dodge & Coie, 1987; Dodge, 1980; Marsee et al., 2008; Kunimatsu et al., 2012). Yet, most of these studies look at individuals through age 18 and the present study had aimed to apply these findings to an alternate age group. Additionally, while this has been examined more commonly in youth or adolescence, it has also been studied some with adult samples as well (Coccaro et al., 2009). So, there may also be differences due to the fact that this study examined a college student population. While college students are a part of emerging adults and who this study aimed to examine, they do not represent emerging adults

overall, and it is possible that in this sample, these relationships present differently, as it is a very specific group of people.

Additionally, while many studies find significant relationships between anxiety, HAB, and aggression, only a select number of them have examined this as a mediator model. Further, attention to social threat, while also examined with these variables, has not been included in these mediator models in the past. While there is research to support the relationship between attention to social threat and HAB (White et al., 2011), aggression (Karos et al., 2017; Reid et al., 2006), and anxiety (Vasey et al., 1995; Vasey et al., 1996), it has not previously been placed in a mediator model. So, this bias may not have been a significant mediator in the model, but it could still play a significant role in the relationship between anxiety and aggression.

While the model has not been supported by the present results, prior research has suggested that examining pieces of the SIP model may miss important elements in the model, as it functions as a stage model (Kunimatsu, 2013). While the present study attempted to address this by including multiple factors of this model, a possible explanation for the surprising results is that other stages within the model need to also be considered in order to get a full understanding of the relationship between anxiety and aggression.

Further, the model with social anxiety was similarly found to be an insignificant model within this study. Within this model, indirect effects again did not better explain the relationship between anxiety and aggression, but this relationship was a direct effect between these two variables. As previous research has focused on generalized anxiety, few studies have also examined social anxiety in this context. Within the present study, social anxiety had been included due to the possible connections between symptoms of social anxiety and difficulty in an ambiguous social situation. However, it is possible that those same symptoms protect individuals

from choosing an aggressive response. While it was initially hypothesized that this model would also be significant, if an individual is experiencing social anxiety symptoms such as concern about scrutiny from others, they may be less compelled to choose an aggressive response due to concerns of how others would react (American Psychiatric Association, 2013). It is also notable that, despite having an insignificant model, GAD still correlated with each of the other main variables while Social Anxiety did not. However, in each model, anxiety and reactive aggression had a direct effect. As multiple forms of anxiety have rarely been examined in this way, these findings suggest that the relationship between anxiety and aggression may exist between multiple types of anxiety diagnoses, but that there may be different presentations, risk factors, or outcomes between different types of anxiety. On the other hand, methodological concerns may have impacted these findings as well. Within the present study, the SIAS measure was used to measure social anxiety, but this measure only had moderate reliability within this sample ($\alpha = .60$). Therefore, the social anxiety findings may be impacted by this reliability as well.

Additionally, the present study had hypothesized that emotion regulation would play an important role, specifically moderating the serial mediations, especially as the additions to the SIP model by Lemerise & Arsenio (2000) emphasized the necessity of emotion at each step of the model and difficulty managing high emotion can be connected to how one navigates their own cognitive resources (Conway et al., 2005). However, as a moderator this was not found to be significant. Yet, in the regression predicting reactive aggression, only emotion dysregulation was found to be significant. These findings suggest that emotion regulation plays a significant role, but that it may not have been functioning as a moderator in the way that was predicted. One possibility is that the moderator was placed in the incorrect place within the model. The present study assumed that it would moderate between anxiety and attention to social threat, suggesting

that an anxious person could self-regulate and reduce the biases they may experience. However, as excessive worrying, difficulty controlling worries, and difficulty concentrating are all various symptoms of anxiety (American Psychiatric Association, 2013), perhaps it is more likely that if it functions as a moderator, it occurs between HAB and aggression, as that would suggest the individual might experience anxiety and social-cognitive biases, regulate their emotions after the fact, and then choose a less aggressive response.

Implications

While the suggested model was not supported, there are still important implications of this research. Since anxiety and aggression are so commonly associated, it is essential to understand this relationship and other factors that may contribute to the relationship. When we increase understanding regarding the factors that contribute to this relationship, it becomes easier to develop intervention programs to address externalizing behaviors (e.g. aggression). Addressing these aggressive behaviors (and reducing them) can help individuals who are experiencing bullying as well as the aggressors. Aggressors tend to experience many difficulties as well, such as increased difficulties in peer relationships, delinquency, or substance abuse (Chen et al., 2008; Fanti & Henrich, 2010).

Within this study, hostile attribution bias and attention to social threat were not found to significantly mediate the relationship between anxiety and aggression. However, eliminating potential risk factors is an essential step towards determining the best fit intervention programs. Additionally, these variables may still connect to the relationship between anxiety and aggression in alternative ways, as generalized anxiety was still found to be significantly related with each of these variables, and therefore they may all play an important role in the experience

of anxiety. This study can help provide directions that this research should (or should not) consider for the future.

Limitations and Future Directions

While this study addresses important gaps in previous literature, there are also some limitations to the present study. One main area of limitation is measurement. Each variable, besides the attentional bias, were measured by self-report surveys, and therefore, much of this study relies on a singular method of data collection, which can impact construct validity within the study. Additionally, self-report can be biased, especially when asking individuals to report on topics like mood and aggression.

Beyond that, there are some limitations to some of the specific types of measures used. For instance, while the PDT is the most common measurement system for attention to threat biases, there are some limitations with this task. Participants found the instructions confusing at times and many participants had either missing data due to inaccuracy in their responses or reported confusion to the research assistants. This task is also measuring participant's reactions to words, which may not generate the same emotional response as experiencing the stimuli in everyday life. Some researchers have been looking at making improvements to this task through use of pictures instead of words (Staugaard, 2009).

Additionally, while multiple measures assessing HAB take the same vignette approach, the current trend of written vignettes have limitations. First, there are concerns once again about if participants are going to be as engaged in a written statement and if they will have an emotional response. For this reason, many measures, such as the measure used in this study, include the item assessing negative emotional response. However, presenting these vignettes through different medias, such as images or videos, would be an improvement to the current

form of measurement. These measures are also limited in their generalizability between individuals with different identities (Leff et al., 2006). With the current style of vignettes, the identity of both the participant and the aggressor are left as unknowns, but that does not mean that participants are not imagining a specific person or that they would respond equally in the situation to aggressors of different demographics.

One other notable piece of the data that may have contributed to the surprising results is the low range in aggression responses. For reactive aggression, the range of scores received was from zero-six, while the maximum possible score was 20. It is possible the low range of scores on aggression may have impacted results, as this shows there was low variance in the outcome variable. It is possible that the hypothesized results were not found within an emerging-adult, college-student sample due to the lack of range in those aggressive responses within that sample. If this were the case, then one could expect this model may be supported in alternative samples.

Generalizability may also be a limitation in the present study. This study aimed to apply research that had been studied frequently with youth / adolescence to an emerging adult population. However, as this was done on a college sample at a predominantly white institution, and therefore, the results could only reach individuals of a narrow age, a specific educational background, and there was a lack of diversity in race/ethnicity. These results are therefore not generalizable to all emerging adults and research should continue to be done on other emerging adults.

Lastly, the chosen study design does not allow for causality to be determined. In future studies, either a longitudinal design should be considered in order to increase understanding of temporal links or an experimental designs to allow for more information regarding causality (Weems & Stickle, 2012). Future research may also consider examining these potential

underlying factors (and additional potential underlying factors) through alternative models entirely, as this moderated serial mediation model was not supported. Additional information on what role these variables actually play and if other factors contribute can be gained by continuing to research this topic.

Conclusion

Prior research suggests that anxiety and reactive aggression have a strong relationship. Some of this may be due to underlying factors they have in common, as they both share relationships with other factors, such as attention to social threat or hostile attribution bias. While the hypothesized model was unsupported, there may be underlying factors that help explain this relationship, and the biases examined within this study may still play a significant role. Future research should continue examining underlying factors, including attention to social threat, HAB, and others, in order to determine which factors might contribute to this relationship and should continue exploring alternative models to explain how these factors may contribute. While the model within this study was insignificant, the factors may still play a role in the relationship in a different way than suggested by this model. Additionally, future research should consider applying this study to a non-college sample of emerging adults with updated measures in order to get the best understanding of these factors.

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APPENDIX. INSTITUTIONAL REVIEW BOARD MEMO

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Institutional Review Board
Office for Responsible Research
Vice President for Research
2420 Lincoln Way, Suite 202
Ames, Iowa 50014
515 294-4566

Date: 02/07/2020

To: Anna Wehde Monica Marsee

From: Office for Responsible Research

Title: **Attention, Mood, and Behavior**

IRB ID: 19-427

Submission Type: Modification **Review Type:** Expedited

Approval Date: 02/07/2020 **Approval Expiration Date:** N/A

The project referenced above has received approval from the Institutional Review Board (IRB) at Iowa State University according to the dates shown above. Please refer to the IRB ID number shown above in all correspondence regarding this study.

To ensure compliance with federal regulations (45 CFR 46 & 21 CFR 56), please be sure to:

- **Use only the approved study materials** in your research, including the **recruitment materials and informed consent documents that have the IRB approval stamp.**
- **[Retain signed informed consent documents](#) for 3 years after the close of the study**, when documented consent is required.
- **Obtain IRB approval prior to implementing any changes** to the study or study materials.
- **Promptly inform the IRB of any addition of or change in federal funding for this study.** Approval of the protocol referenced above applies only to funding sources that are specifically identified in the corresponding IRB application.
- **Inform the IRB if the Principal Investigator and/or Supervising Investigator end their role or involvement with the project** with sufficient time to allow an alternate PI/Supervising Investigator to assume oversight responsibility. Projects must have an [eligible PI](#) to remain open.
- **Immediately inform the IRB of (1) all serious and/or unexpected [adverse experiences](#) involving risks to subjects or others; and (2) any other [unanticipated problems](#) involving risks to subjects or others.**
- IRB approval means that you have met the requirements of federal regulations and ISU policies governing human subjects research. **Approval from other entities may also be needed.** For example, access to data from private records (e.g., student, medical, or employment records, etc.) that are protected by FERPA, HIPAA, or other confidentiality policies requires permission from the holders of

IRB 01/2019

those records. Similarly, for research conducted in institutions other than ISU (e.g., schools, other colleges or universities, medical facilities, companies, etc.), investigators must obtain permission from the institution(s) as required by their policies. **IRB approval in no way implies or guarantees that permission from these other entities will be granted.**

- Your research study may be subject to [post-approval monitoring](#) by Iowa State University's Office for **Responsible Research**. In some cases, it may also be subject to formal audit or inspection by federal agencies and study sponsors.
- Upon completion of the project, transfer of IRB oversight to another IRB, or departure of the PI and/or Supervising Investigator, please initiate a Project Closure to officially close the project. For information on instances when a study may be closed, please refer to the [IRB Study Closure Policy](#).

If your study requires continuing review, indicated by a specific Approval Expiration Date above, you should:

- **Stop all human subjects research activity if IRB approval lapses**, unless continuation is necessary to prevent harm to research participants. Human subjects research activity can resume once IRB approval is re-established.
- **Submit an application for Continuing Review** at least three to four weeks prior to the **Approval Expiration Date** as noted above to provide sufficient time for the IRB to review and approve continuation of the study. We will send a courtesy reminder as this date approaches.

Please don't hesitate to contact us if you have questions or concerns at 515-294-4566 or IRB@iastate.edu.