PSYCHOPHYSIOLOGICAL MEASURES OF AGGRESSION AND VICTIMIZATION IN EARLY ADOLESCENCE

by

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This thesis was prepared under the direction of the candidate's thesis advisor, Dr. Nancy Jones, Department of Psychology, and has been approved by the members of his supervisory committee. It was submitted to the faculty of the Charles E. Schmidt College of Science and was accepted in partial fulfillment of the requirements for the degree of Master of Arts.

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ABSTRACT

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Many cardiovascular psychophysiological studies have found evidence of lower arousal states in aggressive individuals and hyper-arousal states in individuals exposed to chronic stress. However, most of these studies have relied on clinical diagnoses or self-reports to identify aggressive and victimized individuals. The present study used peer nominations to identify aggressive, victimized, and non-aggressive or victimized adolescents (mean age = 12.09 yrs.) to examine if any psychophysiological differences exist during resting and startle conditions. ANOVAs revealed that high aggressive/low victimized adolescents had a lower resting heart period/rate compared to high victimized/low aggressive adolescents. Further analyses revealed a statistical trend of lower resting heart period variability in high victimized/low aggressive individuals compared to non-aggressive non-victimized controls. Due to evidence suggesting that individuals with high self-reported empathy display less aggression, empathy as a

moderator for aggression was investigated. Although gender differences were found across measures, empathy was not found to moderate aggression.

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CHAPTER I

INTRODUCTION

Middle-school can be a tumultuous time for many individuals. Despite the myriad of changes that are occurring physically in the body, evolving social environments plunge adolescents into novel situations that influence a new way of thinking about themselves and their peers. This time period makes investigation into emotional, social, personality, and cognitive development rife with questions and possibilities underlying and influencing psychological phenomena. Furthermore, it is my guess that almost everyone who has experienced middle-school could label it as a stressful and trying experience at one time or another.

Alongside the pressures that schools place on academic achievement today, i.e., standardized tests and placement exams, the transitional period between elementary school to high school can be just as stressful socially. In some cases, sixth graders are just beginning classes for the first time in a new school. This adjustment to new teachers, curriculum, and classmates can cause emotional instability and anxiety during the socialization process. Seventh graders are inundated with new demands in extracurricular and academic responsibilities as they increase their need for personal freedom at home and with friends.

Perhaps, eighth graders have it the worst. With a major transition just completed a few semesters back, they are inherently confronted with yet another transitional period as they prepare for high school and future social ventures. Thus, proper psychosocial development is extremely sensitive to the middle-school years and life course trajectories in our social and mental lives can be influenced by this time period. Since peer relationships and social situations are so dynamic and influential at this time period, these factors will be of utmost importance to this study. These relationships, along with cognitive, affective, and physiological measures will be investigated to gain insight into various substrates, influences, determinants, and behaviors associated with aggression and victimization. Specifically, the goal of this study is to examine the physiological foundations and repercussions of peer aggression and victimization, create a psychophysiological profile of these individuals based on these measures, and investigate the cognitive and affective components of empathy and its relation to these behaviors.

Aggression

Many studies over the years have focused on the topic of aggression in adolescence. A wide range of topics stemming from bullying, (Hamilton, Newman, Delville, & Delville 2008; Meyer-Adams & Conner, 2008) empathic deficits (Mayberry & Espelage, 2007; Warden & Mackinnon, 2003) criminality (Anderson & Huesmann, 2003; Moffitt, 1993), externalizing and internalizing problems, (Loeber & Burke, 2011), physiological differences (Kempes, Matthys, de Vries, & van Engeland, 2005; Mawson, 2008; Raine, 2002), and even psychopathy (Fung, Raine, Lynam, Venables, Loeber, Steinhauer, & Stouthamer-Loeber, 2005; Raine, Dodge, Loeber, Gatzke-Kopp, Lynam,

Reynolds, Stouthamer-Loeber, & Liu, 2006) has been investigated with differing levels and types of aggression as a core component. The consensus within many of these studies is that aggression is a problem and depending on the nature of the aggressive behavior, these problems can be severe and hinder the quality of life within and around the aggressor.

To create a profile of these individuals, aggression will be analyzed in three main ways. First, psychophysiological factors that underlie aggressive behavior will be investigated by using cardiovascular measures at baseline and during specific stress related conditions. Second, the psychological aspects of aggressive individuals will be investigated by examining self reported thoughts about empathy. Lastly, the specific type of aggressive behavior, reactive or proactive, will be investigated to determine the etiology of the behavior. Together, these aspects will be used to gain insight into the roles physiology and emotional processing play in peer aggression during adolescence.

Physiological Underpinnings of Aggression. Since the goal of any psychophysiological research is to link physiological aspects of psychological phenomena together, both physiological and psychological components that underlie aggression will be reviewed in the subsequent pages to add to the hypothesis that psychophysiological differences between aggressive and non-aggressive individuals may exist.

A wide range of methods and techniques for recording physiological data are used within the field of psychophysiology. The three main branches of investigation are the

central nervous system, which utilizes EEG and ERP measurements of brain activity, the autonomic and peripheral nervous systems, which collects information from cardiovascular, electrodermal, and electromyographic responses to stimuli, and the neuroendocrine system which measures hormonal changes in the blood, has provided interesting results throughout many age groups and settings. For the purposes of this study, the autonomic nervous system will be evaluated via cardiovascular readings before and after induced stressors are placed on the participants. With sufficient data that show there may be biological markers that predispose an individual to be aggressive, this study will try to replicate and extend those findings in a sample of middle-school adolescents.

Specifically, cardiovascular psychophysiology focuses on the autonomic nervous system (ANS) which houses both the sympathetic and parasympathetic branches and the efferent and afferent pathways derived from the medulla oblongata located in the brain stem. Traditionally, the sympathetic nervous system has been associated with the "fight or flight" mechanism and primarily dominates while in a state of arousal (Huffman, 2002). Increases in heart rate (HR) due to the release of norepinephrine is caused by increases in the rate of depolarization in the pacemaker cells located within the sinoatrial node (SA node). This increased depolarization in the SA node shortens the inter-beat interval (IBI), which makes the heart beat faster (Reynolds & Richards, 2008).

Contrarily, the parasympathetic branch of the autonomic nervous system, often referred to as the "rest and digest" phase, relies on acetylcholine to decrease HR. Axons involved in the sympathetic innervation of the heart originate in the spinal cord while parasympathetic innervation of the heart originates from neurons in the vagus nerve

(Reynolds & Richards, 2008). The bi-directional influence from both branches is crucial for survival in the physiological sense, but also in the cognitive sense, by way of processing sensory information absorbed from the environment. Therefore, it has been proposed that the cerebral cortex plays a mediating role in governing autonomic responses due to environmental stimuli (Porges, 1995). This biofeedback system is germane to proper social interactions and a wide range of individual differences within this system leads to various types of behavior.

The functionality of the ANS is a core tenet in the polyvagal theory championed by Porges (1995). The polyvagal theory proposes that the vagus nerve, the tenth cranial nerve, plays numerous and specific roles in regulating social behavior (Porges, 1995, 2001, 2007, 2009). Over time, the evolution of the autonomic nervous system, from the primitive unmyelinated visceral vagus to the more advanced sympathetic control over the myelinated vagus, which is unique to mammals, has promoted the development of social behavior due to the neuroanatomical interconnections that regulate facial expressions and vocalizations (Porges, 2001, 2009). This adaptation, referred to as the social engagement system, is essential for advanced forms of social interaction due to the conscious control over the muscles that control the head and face (Porges, 2001).

Another component of the polyvagal theory states that neuroception, the neural process that gives us the ability to regulate the physiological state in response to environmental cues, enables us to engage in proper social behavior when certain situations are deemed non-life threatening or dangerous. Thus, Porges concludes that neuroception is a mechanism that mediates "both the expression and the disruption of

positive social behavior, emotion regulation, and visceral homeostasis" (Porges, 2009, pg. S89).

Applications for experimental work based on the polyvagal theory are largely carried out by analyzing the normal variability in heart rate in conjunction with the respiration cycle. Together, respiratory sinus arrhythmia (RSA) is an index of autonomic reactivity that is primarily related to the parasympathetic branch. For individuals with typical parasympathetic functioning, sufficient suppression from the myelinated vagus, termed the "vagal break" inhibits sympathetic influence on the heart and creates a calm or relaxed state from which social engagement behaviors can be executed (Hastings, Nuselovici, Utendale, Coutya, McShane, & Sullivan, 2008; Porges, 2001). Conversely, when environmental conditions are threatening, the "vagal brake" is removed and the sympathetic system kicks in to increase arousal (Hastings et al., 2008; Porges, 2001). Thus, it is proposed, that poor self-regulation, maladaptive emotional regulation, and internal and externalizing problems may exist if an individual has poor vagal regulation or low vagal tone (Hasting et al., 2008; Porges, 1995, 2001).

The polyvagal theory is one of many theories that provide evidence for biological bases of social behavior. Due to the fact that the heart is intimately involved during autonomic functioning, specific measures of cardiovascular reactivity can be examined during differing psychological contexts. The variability in heart rate due to changes in psychological state is one way psychophysiological research examines this bidirectional influence and many metrics can be applied in multiple settings (Allen, Chambers, & Towers, 2007). Although variability in heart rate can be measured in multiple ways,

resting heart rate alone can also be employed as a measure of autonomic functioning and differences are found in many personality types (Raine, 2002; Scarpa, Fikretoglu, & Luscher, 2000; Scarpa & Ollendick, 2003).

Lower resting heart rate is one of the strongest and most often replicated physiological correlate of antisocial/aggressive behavior in childhood and adolescence (Armstrong, Keller, Franklin, & Macmillan, 2009; Baker, Tuvblad, Reynolds, Zheng, Lozano, & Raine, 2009; Mawson, 2008; Patrick, 2008; Raine, 1996, 2002; Sijtsema, Veenstra, Lindenberg, van Roon, Verhulst, Ormel, & Riese, 2010). In a meta-analysis of 29 independent studies, Raine (1996) calculated an average effect size between low resting heart rate and antisocial behavior at .56 suggesting a moderate influence by a single physiological variable. The findings also indicate that the effect size did not differ significantly between males and females and that the different methods used to collect the physiological data did not negatively affect the outcomes (Armstrong et al., 2009; Raine, 1996, 2002). Furthermore, similar studies have been able to parcel out many confounding variables that may lead to erroneous conclusions about the link between low resting heart rate and aggressive behavior. Raine (2002) sums up that many of these variables including height, weight, IQ, drug and alcohol abuse, social class, divorce, family size, engagement in physical exercise, sports participation, teenage pregnancy, physical development, and cultural contexts do not confound the results. What is more interesting is that, besides conduct and disruptive disorders, low resting heart rate is diagnostically specific in that no other psychiatric conditions, such as alcoholism or schizophrenia, appear to be linked to the physiological measure (Raine, 2002).

Moreover, although other biological factors associated with aggression, such as low cortisol and serotonin levels, are found in many other disorders, low resting heart rate appears to be a unique biological characteristic of aggressive behavior (Farrington, 1997; Raine, 2002).

The robust relationship between low resting heart rate and aggression has lead many researchers to suggest that lower arousal levels may predispose an individual to antisocial/aggressive behaviors (Kempes et al., 2005; Patrick, 2008; Raine, 2002). Due to lower levels of arousal, aggression may be an adaptive behavioral strategy that individuals use to raise their physiological levels to an acceptable state. This false perception of homeostasis may make aggression an attractive behavior therefore leading individuals to seek out situations that will increase their arousal to optimal levels (Raine, 2002). This reasoning, first described by Quay (1965), has been termed the stimulation-seeking theory. According to this theory, any antisocial or aggressive behavior is ultimately a stimulation-seeking endeavor used by the individual to raise his or her "unpleasant" lower arousal state to a higher arousal state. It has been hypothesized that stimulation seeking makes the individual feel "normal" and any destructive behavior is perceived to be justified (Raine, 2002).

Another separate, but related characteristic in individuals with a low resting heart rate, is evidence that these individuals possess a fearlessness quality as a result of their low autonomic functioning. Termed the fearlessness theory, it is suggested that low levels of arousal during a mildly stressful testing event, like viewing violent images or startling noises, are markers of low levels of fear (Fung, et al., 2005; Raine, 1993, 2002).

Some previous research has expanded on this theory and used such psychophysiological measures as heart rate, skin conductance, and the startle response to provide evidence for the claim (Fung et al., 2005; Raine, 1993, 2002; Van Goozen, Snoek, Matthys, Van Rossum, & Van Engeland 2004).

A recent study by Van Goozen et al. (2004) examined the startle response by measuring eye blinks in children diagnosed with disruptive behavior disorder (DBD) and normal healthy children while viewing positive, neutral, and negative images on colored slides. Disruptive behavior disorder is a diagnosis given to children who show persistent noncompliant antisocial and aggressive behavior (Van Goozen et al., 2004). Results of the study showed that compared to non DBD children, DBD children had fewer eye blinks for all categories of slides. Furthermore, DBD children who were considered more delinquent displayed fewer eye blinks for the more unpleasant and most negative images (Van Goozen et al., 2004). These data suggest that antisocial children share a deficit in their neurophysiological fear modulation that affords them the ability to remain fearless or differentially affected by unpleasant stimuli (Van Goozen et al., 2004).

A similar study by Fung et al. (2005) used electro-dermal skin conductance to measure levels of electro-dermal activity during an anticipatory anxiety stressor in psychopathy-prone adolescents. In this study, individuals who scored high on a psychopathy scale underwent different physiological measures while participating in a countdown stressor task. The countdown task was comprised of having the participant view a computer monitor while a numerical countdown from 12 to 0 over one second intervals appeared on the screen. The anxiety producing stressor in this experiment was

the introduction of a blast of white noise through a pair of headphones that the participant was wearing when the countdown reached zero. What the researchers found was that psychopathy-prone individuals, compared to controls, showed a reduced anticipatory skin conductance responding during the task (Fung et al., 2005). These data suggest that psychopathy-prone individuals, due to low autonomic activity, remain calm during an event that would normally produce anxiety. This "coolness under pressure" characteristic is a unique quality that develops at a young age, and this same quality is observed later on in incarcerated adults diagnosed with psychopathy (Raine, 1993).

Although recent research has provided evidence of lower autonomic reactivity to stressful events in certain highly aggressive individuals, these individuals may only represent the extreme end of the aggression spectrum reserved only for the most deviant offenders. Even though the Fung et al (2005) study used psychopathy prone adolescents as the focus of their research design, the startle response is an excepted means to introduce a mildly stressful event in a non-invasive way with virtually little to no side effects. With this in mind, the countdown stressor task will be used in this study on the middle school population to induce changes in heart rate caused by a stressful event.

While lower resting heart rate may be present in aggressive individuals throughout development, autonomic reactivity, measured by heart period variability (HPV), has been shown to increase in times of stress (Patrick, 2008; Scarpa, Fikretoglu, & Luscher, 2000). Heart period variability is a general term that refers to the variability in beat to beat intervals in a given time domain. The increase in HPV during a stressor is thought to imply that deficits in the ability to self-regulate emotions are present in

aggressive individuals (Patrick, 2008). Aggressive actions resulting from the inability to properly regulate emotions may have global impacts on adjustment and proper social development.

The stimulation-seeking and fearlessness theories may be one way to inspect aggressive behavior through a psychophysiological perspective. The consistent and repeated acts of violence towards other peers may simply be an attempt to stimulate the physiological state, and callous and antisocial behaviors may not resonate with the individual as being wrong or out of context because it feels socially "normal." By viewing aggression through a psychophysiological lens, we may begin to speculate that many psychological aspects are rooted in physiological phenomenon. Although burgeoning evidence supports this view (Armstrong et al., 2009; Baker et al., 2009), the variability in definitions of aggression must also be examined via cognitive and affective components to paint a better picture in determining the etiology of these behaviors.

Psychological Correlates of Aggression. The multifaceted social domain is complex and many lines of evidence point to the bi-directional interaction between cognitive processes and social experiences. Starting early in development, the way in which we think and interpret the world around us provides a constant undulating force that shapes our behavior. Bussey and Bandura (1999) champion the occurrence of a bi-directional nature of social development by stating "human development and functioning are highly socially interdependent, richly contextualized, and conditionally manifested" (pg. 704). Therefore, if negative experiences are endured, cognitive processes may become faulty and skew the perception of social situations making adjustment difficult

for future social relationships. Thus, socio-cognitive and social learning theories are appropriate ways to investigate correlates of aggression because they stress an experience dependent, life-course perspective.

Much evidence suggests that early risk factors for aggression are highly predictive of later aggressive behaviors (Anderson & Huesmann, 2003; Baker et al., 2009; Crick & Dodge, 1994; Crick, Ostrov, & Werner, 2006; Dodge & Pettit, 2003; Loeber & Burke 2011; Mischel & Shoda, 1995; Moffitt, 1993; Tremblay, 2003; Weinfield, Sroufe, Egeland, & Carlson, 2008). Studies examining genetics reveal that aggression is moderately heritable. Many twin and adoptions studies that have examined monozygotic and dyzygotic twins have provided evidence of a genetic link for aggressive tendencies. On average, most of the evidence supporting this claim report that monozygotic twins have higher correlational scores of aggression, around .69, than do dyzygotic twins, around .40 (Anderson & Huesmann, 2003).

Although these correlations are moderate in scale, the prenatal environment can have just as much influence on the developing fetus as their genetic predispositions. Many prenatal risk factors such as exposure to opiates, alcohol, marijuana, lead, and cigarette by-products have been shown to influence aggression later on in development (Dodge & Pettit, 2003; Raine, 2002). Higher levels of testosterone have been implicated in higher rates of aggression as well. Evidence has shown that pregnant women treated with androgens during their terms had more aggressive children at age five than non-treated mothers (Anderson & Huesmann, 2003). Thus, the manifestation of aggressive tendencies appear to originate very early in development, and in some cases, these early

bi-directional interactions likely have life-long repercussions responsible for a variety of aggressive behaviors.

Most research in developmental science suggests that genetic predispositions open the individual up to be sensitive to certain environmental cues. This biological enervation puts individuals at high risk for certain problems if they interact with situations atypical of normal development. Since critical periods in development happen fast and often early on, the exact scope of this bidirectional mixture varies with each individual.

Within Bussey and Bandura's (1999) definition of social cognitive theory, the majority of human development is based on socially interdependent mechanisms such as learning and enculturation. As we age, our cognitive machinery is confronted with new input, mainly from same-aged peers, in novel situations including school and school-related activities. A new form of cognitive processing takes place within this new social realm dubbed social information processing (Crick & Dodge, 1994).

Crick and Dodge (1994) sum up social information processing by stating that "children come to a social situation with a set of biologically limited capabilities and a database of memories of past experiences" (pg. 76). Ultimately, the processing of an array of social cues will lead to a behavioral response based on past experiences (Crick & Dodge, 1994). Thus, social information processing is a continuous cognitive mechanism that individuals progress through to generate a behavior. The reformulated social information-processing mechanism presented by Crick and Dodge (1994) includes six

steps that lead children towards appropriate social behaviors. The first five mental steps will be reviewed here, with the sixth step being behavioral enactment, to introduce how two main subtypes of aggressive behavior, reactive and proactive, may arise due to deficits in certain stages of social information processing.

Aggression Subtypes: Reactive and Proactive. The differentiation between reactive and proactive styles of aggression are used mainly in this study to determine what sub-type of behavior highly aggressive individuals are engaging in based on peer ratings. A modification of the peer nomination inventory, (Wiggins and Winder 1961, PNI), used in this study focuses on three main aggression items: "He-She hits and pushes others around," "He-She makes fun of people," and "He-She is just plain mean." An individual is rated by other peers if they display these overt characteristics. Yet, in essence, these items are rather ambiguous, and sub-type classifications, reactive/proactive via the reactive/proactive questionnaire developed by Raine et al 2006, (RPQ) will be used to clarify the manner of aggressive tendencies.

The terms reactive and proactive are mainly used in describing aggressive tendencies in children and have been found to have distinct characteristics. Although disparate in quality, quantitatively most aggressive children exhibit both types of aggression and only small groups of individuals are characterized as reactive or proactive exclusively (Kempes et al., 2005). Reactive aggression is an aggressive behavioral response to a perceived threat or provocation, usually accompanied by increased arousal levels, and proactive aggression is usually associated with behaviors that anticipate a reward, and is usually accompanied by lower levels of arousal (Kempes et al., 2005). A

convenient way to differentiate between the two sub-types in psychophysiological terms is “hot-blooded” for reactive and “cold-blooded” for proactive.

In relation to social information processing, researchers have determined that specific sub-types of aggression may be associated with deficiencies in different stages of the model. Specifically, the first two stages, encoding and interpretation of environmental cues, have been linked to reactive aggression. The first steps in the process are based largely on memories of past experiences. The database of memories that Crick and Dodge (1994) refer to, also called schemata or scripts, are integrated over time into generalized knowledge structures that are used as a guide for interpreting and understanding present social situations. Schemata are cognitively efficient in that they let individuals sort information quickly (Crick & Dodge, 1994). However, reliance on aggressive schemata can be deleterious in non-aggressive situations when inappropriate social responses are enacted. Moreover, an accumulation of inappropriate social responses may lead to social adjustment problems or peer rejection. Evidence for this was found in a study by Dodge and colleagues in whom children were asked to analyze a vignette of children playing non-violent sports on playground. Results showed that rejected children made more aggressive interpretations of the ongoing play activity than non-rejected peers (Dodge & Coie 1987). Similarly in a different study, boys rated as reactively aggressive reacted with aggression when faced with non-threatening situations and tended to interpret their peer’s behavior as hostile when it was not (Crick & Dodge, 1996; Kempes et al., 2005).

A child's inability to make accurate inferences or attributions about social events can lead to a whole host of social predicaments. In turn, hostile attribution biases may color a child's belief that all goals and intentions of others are hostile in nature. The child may be motivated to act in a reactive way with aggressive behavior serving as a defense or retaliation against an act by a peer that is deemed harmful (Crick & Dodge, 1994, 1996). Hostile attribution biases may also lead to the generation of ineffective, irrelevant, or vague strategies for achieving a particular goal (Crick & Dodge, 1994, 1996).

In contrast with reactive aggression, children who act in a proactively aggressive manner have been shown to have less hostile attribution biases and a lower prevalence in problems related with the first two steps, but posses larger deficits in the last three steps (Crick & Dodge, 1996; Kemps et al., 2005). The last three mental steps of social information processing: clarification of goals, response access, and response decision, house important cognitive mechanisms before the enactment of behavior. Constructing goals via arousal regulation, evaluating previous goals or creating new ones, and the degree of confidence felt to act on these responses, are essential components for not only immediate behavioral responses but for future responses in differing contexts.

Specifically, the degree of confidence in the ability to enact a behavioral response, or self-efficacy, is of particular interest when it comes to proactive aggression. As witnessed in reactive aggression, while performing a mental search for possible responses to a social situation, a reactive aggressive individual may feel inadequate towards a prosocial response and shut down or lash out aggressively in some non-directed way. In the case of proactive aggression, an individual may feel overly confident about the

situation and then act inappropriately for that given scenario based on the idea that aggression is positive and that it achieves a certain goal. In fact, evidence has been found to support the later, in that aggressive individuals feel more efficacious than others about performing physically and verbally aggressive behaviors (Crick & Dodge 1996; Perry, Perry, & Rasmussen, 1986).

In a study with fourth through seventh graders, Perry et al. (1986) demonstrated that certain aggressive children reported it was easier to perform aggression against others and more difficult to inhibit aggressive impulses. The authors' included that "aggressive children also were more confident that aggression would produce tangible rewards and reduce aversive treatment by others" (Perry et al., 1986, pg. 700).

These findings have been advanced and replicated 25 years later in research done by Barchia and Bussey with seventh through tenth graders. The author's examined the longitudinal contribution of collective efficacy, moral disengagement, and aggression self-efficacy beliefs on self-reported changes in aggressive behavior over time (Barchia & Bussey, 2011). Results showed that children with high aggression self-efficacy beliefs and high moral disengagement scores reported higher rates of aggression over time (Barchia & Bussey, 2011). These data suggest that, along with previous findings, that not only do the beliefs that children posses drive aggressive behavior, but that these beliefs are perpetuated due to the feeling that these actions are justified in some way. This characteristic is a hallmark of proactive aggression.

The repeated use of aggression, whether it is reactive or proactive, does not only affect the perpetrator of the behavior, but also the recipients. The continuous exposure to violence can have wide-spread biobehavioral impacts and the following section is dedicated to exploring the effects chronic exposure to peer aggression has on development.

Victimization

Physiological Underpinnings of Victimization. Victimization of children and the deleterious effects on development is a major public health issue. With the repeated acts of violence experienced at the hands of aggressors or bullies, victims are of particular interest due to the psychological damage incurred during the process. Long term exposure to stress has a well documented history and has been shown to lead to such psychological disorders such as post-traumatic stress disorder (PTSD), depression, anxiety disorders, and suicidal ideation (Sapolsky, 2004).

Not much research has been done on the physiological characteristics of adolescent peer victimization, but the majority of the related existing work has focused on the stress response of adults due to chronic social anxiety and individuals diagnosed with PTSD. Hamilton, Newman, Delville, and Delville (2008) examined bullied and non-bullied adult males and found that during times of stress, bullied males exhibited blunted blood pressure readings compared to the non-bullied males. Furthermore, salivary cortisol levels and blood pressure were lower in bullied males who reported

having no feelings of anger about the stressful conditions they were exposed to during the experiment, i.e., public speaking (Hamilton et al., 2008).

In clinical studies investigating autonomic nervous system functioning, evidence has shown that individuals who experience chronic stress display heightened cardiovascular reactivity and delayed cardiovascular recovery during acute stressors (Hamilton et al., 2008). Contrarily, other studies have reported that chronically stressed individuals actually have a suppressed cardiovascular response to acute stressors (Hamilton et al., 2008). Even though differences are varied in these studies, all of the short-term data came from adult samples with some of the participants displaying symptoms of cardiovascular disease.

In advanced clinical research investigating long-term exposure to stress, studies have also found elevated baseline heart-rate readings for combat veterans diagnosed with PTSD (Jovanovic, Norrholm, Sakoman, Esterajher, & Kozaric-Kovacic, 2009), increased heart rate acceleration during exposure to trauma-related material in non-combat individuals with PTSD (Elsesser, Sartory, & Tackenberg, 2004), and increased heart rate and aberrations in rodents in response to repeated social stressors (Hamilton et al., 2008).

Some researchers have found that patients diagnosed with PTSD have impaired habituation to a startle stimulus, i.e., random noise blasts, compared to controls (Jovanovic et al., 2009) while other studies have failed to find differences in modulated startle responses (Elsesser et al., 2004). Thus, considerable differences in findings make it difficult to adequately gauge the physiological characteristics of victimization. Although the DSM-IV lists a hyper-arousal state as a component of PTSD, this criterion

may be reserved only for exposure to extreme chronic stress in adults (APA, 1994; Jovanovic et al, 2009). Therefore, new heart-rate data on younger victims could shed some light on the underlying physiological mechanisms and the repercussions of chronic peer victimization during development.

High Victimization and High Aggression. Additional confounds in generating a physiological profile of victimization lies in the fact that most highly victimized children are also highly aggressive (Perry et al., 1988; Scarpa & Ollendick, 2003). If certain psychophysiological measures are observed in victimized children, researchers need to be cognizant of the fact that the individuals in question may also have aggressive tendencies that should be taken into consideration.

Several studies have reported this phenomenon in different experimental designs and across age groups. Studies with young adults have shown that victims often report higher levels of aggression than non-victims (Scarpa & Ollendick, 2003). In children, highly peer-rated victimized children in grade school were also found to be highly peer-rated as aggressive (Perry et al., 1988). Additionally, younger children with higher levels of reactive aggression also had higher occurrences of victimization and reported social rejection (Kempes et al., 2005). It is interesting to note that although reactively aggressive children are sometimes reported as victims and unpopular, proactively aggressive children are usually not victimized even though they may be deemed unpopular by peers (Kempes et al., 2005; Raine et al., 2006).

Autonomic nervous system (ANS) measures on the high aggression, high victimized subset, should provide interesting data on the psychophysiological effects of chronic stress and aggression in children. If low resting heart rate is an indication of the cardiovascular-aggression link, and if hyper-arousal states are associated with the resting state in individuals exposed to chronic stress, how will the resting state ANS activity appear within these individuals? Furthermore, as witnessed in aggression, if lower resting heart-rate at baseline and increased heart-rate variability during stress indicates a predominance of the parasympathetic over the sympathetic enervation of the heart, how will these individuals respond? Will high levels of victimization experience cause these individuals to be highly reactive or non-affected by stress?

This study attempts to clarify some of these questions by uncovering the psychophysiological profiles of these highly aggressive, highly victimized individuals. A study by Scarpa and Ollendick (2003) investigated similar ANS functioning in young adults exposed to community violence and found that aggression was related to lower baseline heart-rate and higher heart-rate variability (high-vagal-tone), but also lower resting heart-rate was found in victims who were also and aggressive.

In addition to the ANS measures, cortisol levels extracted from victims revealed an increase in cortisol levels after exposure to stress (Scarpa & Ollendick, 2003). The authors concluded that the increase in cortisol was a response to previous experiences with stress and attempts to cope with psychologically damaging situations (Scarpa & Ollendick, 2003). These findings, in conjunction with social information processing deficits, point to a bio-social bi-directional interaction that couples past experiences and

physiological responses that open the door towards future aggressive behaviors (Crick & Dodge, 1996; Raine, 1996; Scarpa & Ollendick, 2003).

These findings bring up an interesting caveat relevant to the present study. The cardiovascular-aggression link supports the notion that aggressive behavior is in large part due to specific ANS characteristics, while the hyper-arousal state associated with chronic stress exposure may be present in victimized individuals. The majority of the research discussed in the preceding pages have investigated young adults exposed to community violence, children diagnosed with behavioral disorders, adults diagnosed with PTSD, psychopathy-prone adolescents, and adult-bullied males. The main question relevant to this study is: will these ANS characteristics be found in a relatively benign middle-school population entirely based on peer nominations of aggression and victimization? Also, what role does social-cognitive and emotional processing play in the aggression-victimization cycle?

Before the first question can be answered, the second question will be analyzed by investigating the role empathy plays in the aggression-victimization cycle. Empathy is chosen for this study because of the multidimensional qualities inherent in the construction of empathy formation. Together with psychophysiological measures, the cognitive and affective components of empathy will be investigated to understand interpersonal causes and effects in the aggression-victimization cycle.

Empathy

Empathy as a multidimensional construct can provide substantial contributions to studies investigating social and emotional development. As a set of related but distinct constructs, cognitive and emotional components interact over the course of development and change in response to parental psychopathology (Jones, Field, & Davalos, 2000; Jones, 2012), social problem-solving strategies (Warden & Mackinnon, 2003), and maturation of the individual (Barr & Higgins-D'Alessandro, 2007). In this regard, it is believed that by late adolescence, empathy formation will be closest to its adult level, and the ability to consider multiple perspectives will guide an individual's behavior in differing social contexts (Barr & Higgins-D'Alessandro, 2007). Moreover, investigating empathy at the transitional period between late childhood and early adolescence should provide a unique glimpse into an individual's somewhat stable cognitive and affective constructs of their personality as a result of past experiences.

Baron-Cohen and colleagues (2005; Baron-Cohen & Chakrabarti, 2008) describe empathy as an essential social skill set that needs to be exercised to master social communication. The malleable quality of empathy during development is decidedly dependent on experiences and properly assessing and processing social information. In turn, adequate social information processing can lead to successful interpersonal relationships, proper adjustment, prosocial behaviors, and long-term friendships or romantic relationships. As mentioned earlier, breakdowns in the normative steps of social information processing can lead to differing types of aggressive tendencies. Additional research in the field has suggested that certain aspects of empathy in

aggression and victimization patterns are also atypical, signifying that emotional influences are intrinsic in the cycle (Crick & Dodge, 1994; Gini, Albiero, Benelli, & Altoe, 2007; Lovett & Sheffield, 2007). Thus, measuring cognitive and affective components in the aggression-victimization cycle will shed light on more psychological underpinnings of the behavior with an emphasis on interpersonal emotional content.

Although a specific definition of empathy may be ambiguous, it broadly encompasses the idea that in order for an individual to empathize, they must possess a specific skill set that enables them to understand the emotional state of another with or without directly experiencing the situation (Aults, 2012; Baron-Cohen & Chakrabarti, 2008; Decety & Jackson, 2004). Evidence suggests that empathic abilities are near universal in our species and that early affective components are measurable at birth (Preston & de Waal, 2002; Jones, 2012). These early affective components gradually shift from self-oriented reactions to the distress of others to developmentally more advanced cognitive mechanisms such as a theory of mind starting around age 3 (Baron-Cohen & Chakrabarti, 2008; Hoffman, 1984). The interaction of cognitive and affective components set the stage for empathic responding in differing social contexts throughout development.

Cognitive and affective elements have been investigated in many studies focusing on empathy. In studies involving typically developing individuals, a mix of cognitive components, such as perspective taking, altruism, and thoughtfulness, and affective components, such as empathetic concern and lower levels of personal distress have been associated with prosocial behaviors (Barr & Higgins-D'Alessandro, 2007), higher levels

of empathic communication (Hatcher, Nadeau, Walsh, Reynolds, Galea, & Marz, 1994), and defender status among peers (Gini et al., 2007). A myriad of evidence suggests that higher levels of empathy leads to socially competent behaviors, and that individuals with superior empathic skills are less often aggressive, victimized, or rejected (Gini et al., 2007; Hoffman, 2000; Lovett & Sheffield, 2007; Warden & Mackinnon, 2003).

In studies involving aggressive individuals, many empathic deficits have been reported compared to non-aggressive individuals. A study by Gini et al (2007) found a negative relationship between affective empathetic concern and cognitive perspective taking empathy in adolescent male bullies who are aggressive toward peers. The study also found that non-aggressive adolescents who defend victims of bullying had higher scores on these measures which led the researchers to hypothesize that empathy may play a moderating role in aggressive and prosocial behaviors, especially in males (Gini et al., 2007).

The concept of empathy as a moderating factor is a vital one because it encompasses the cognitive and affective interactions of empathic responding while focusing on self-regulation. Hoffman (2000) explains empathy as a moderating factor to aggressive behavior in that empathetic responsiveness affords the individual the ability to emotionally anticipate negative outcomes produced by his or her own conduct towards other people. For the cognitive aspects, the higher the levels of perspective-taking abilities the individual has, the more likely that individual is to appreciate and understand the position of others (Davis, 1994). Thus, aggressive behaviors are less likely in individuals with high perspective and role-taking abilities (Davis, 1994). The affective

components of empathy such as experiencing someone else's pain and suffering, moderates aggressive behavior by way of avoiding any behavior that may put another individual through situations involving emotional stress (Gini et al., 2007). Therefore, the ability to regulate emotions is paramount for socially competent behavior. Moreover, aggressive individuals have been found to be deficient in self-regulation via measures of personal distress, a core construct of affective empathy (Davis, 1980, 1983, 1994; Lovett & Sheffield, 2007).

The moderating role empathy plays in curbing aggressive tendencies has also been elucidated by Crick and Dodge's (1994) social information processing model. By integrating cognition and affect in social information processing, Crick and Dodge (1994) state that emotions play an integral part in each social information processing step. In the first three steps of the model, emotions influence internal cues and interpretations of situations while enhancing or inhibiting motivation to formulate or pursue particular goals (Crick & Dodge, 1994). Self-regulation is essentially what the goal clarification step posits, in that goals are focused arousal states that are geared toward producing or wanting to produce particular outcomes (Crick & Dodge, 1994). Thus, ineptness to self-regulate emotions may lead to ambiguity in goal formation and an inability to decrease emotional arousal (Crick & Dodge, 1994).

In the last three steps of the model, emotion plays a moderating role in response access and decision by influencing behavioral responses to emotionally charged situations in positive or negative ways. These responses are then evaluated to select behaviors based on outcome expectations by varying levels of self-efficacy and the

appropriateness of each response (Crick & Dodge, 1994). Consequently, emotions are hypothesized to play a large role in each step of the model via experience and self-regulation abilities.

As mentioned earlier, reactive and proactive subtypes of aggression have been associated with deficits in certain stages of the social information processing model. Based on the model, reactive aggressors are hypothesized to have difficulty regulating emotion in many settings whereas proactive aggressors may use emotional regulation as a strategy to achieve goals bases on positive outcome expectancies that aggression is useful. Relatively few studies have examined empathy in relation to reactive and proactive aggressive subtypes, and new studies may clarify some of these theoretical views.

Empathy in Reactive and Proactive Aggression. It would appear on the outset that aggressive children would score lower in questionnaires assessing empathy in relation to non-aggressive children. A study by Mayberry and Espelage (2006) confirmed this hypothesis in a sample of sixth, seventh, and eighth grade males and females. Overall, males scored higher than females on proactive and reactive aggression scales and lower than females and non-aggressive males on empathy measures (Mayberry & Espelage, 2006). However, the researchers did not find any significant differences in cognitive or affective empathy measures between reactive and proactive aggressors (Mayberry & Espelage, 2006). Additionally, though global differences were found between aggressive and non-aggressive children, participants who scored high on both reactive and proactive aggression reported the lowest levels of empathy (Mayberry &

Espelage, 2006). Based on the data, the researchers concluded that empathy skill levels are similar in reactive and proactive aggressors and that self-report measures of empathy are lowest for highly aggressive middle-school children (Mayberry & Espelage, 2006).

One main limitation in this study was the reliance on self-report measures to determine aggressive behavior. Since the majority of the aggression-victimization cycle happens during peer interactions, peer nominations of aggressive behavior would be more suitable for this paradigm. Additionally, although behavioral measures of reactive and proactive aggression had high inter-rater reliability, a questionnaire specifically designed to measure reactive and proactive aggression qualities would create a more encompassing definition of aggression by specifically targeting both subtypes.

Measuring Empathy. Not only has defining empathy been a long and ongoing process, so too is the debate on how to measure it properly. According to recent analyses, measuring empathy via questionnaires in adolescence has been found to provide a substantial advantage over other methods such as vignettes or interviews, due to evidence of substantial test-retest and internal reliabilities (Davis, 1980; Lovett & Sheffield, 2007). A review of 17 studies on aggression and empathy by Lovett and Sheffield (2007) found that self-report measures of empathy used with children and adolescent populations revealed the most robust relationship with aggression, especially in adolescence. Self-report measures where compared against behavioral measures such as laboratory empathy-eliciting situations and emotional and cognitive responses to vignettes (Lovett & Sheffield, 2007).

One of the self-report measures reviewed in the Lovett & Sheffield paper was the Interpersonal Reactivity Index (IRI; Davis 1980, 1983). The questionnaire created by Davis (1980) first described empathy as a multidimensional construct after exploring cognitive and affective aspects that all dealt with responsivity to others but had discrete qualities of their own. The cognitive component of perspective taking alongside the affective components of empathic concern, fantasy, and personal distress can all be measured separately but can all be related to empathy in unique ways. The IRI was selected to be used in this study because it is geared towards children and adolescents and has been shown to accurately assess cognitive and affective components of empathy unlike Bryant's Empathy Index (BEI; Bryant, 1982), which has been found to have questionable psychometric properties (Lovett & Sheffield, 2007).

The aforementioned review has led to several hypotheses that will be explored. With emphases on replicating and extending previous findings, strengths and weaknesses in current theories will be delineated. Also, by elucidating novel ways to collect data, contradictions found in previous research will be modified.

Questions posed by this study and hypotheses

H1: Are there baseline physiological differences between high aggressive/low victimized, high victimized/low aggressive, high victimized/high aggressive, and non-aggressive/ non-victimized control youth?

Based on previous studies indicating lower autonomic arousal as a biological correlate to aggressive behavior (Patrick, 2008; Raine, 2002), resting heart period (IBI)

was expected to differ between groups of high aggressive/low victimized and control youth. Furthermore, based on clinical studies indicating victimized participants display a resting condition characterized as a hyper-arousal state (Jovanovic et al., 2009; Elsesser et al., 2004; Hamilton et al., 2008), higher resting heart period (IBI) was expected in high victimized/low aggressive youth compared to high aggressive/low victimized and non-aggressive/ non victimized control youth. Additionally, previous studies have reported that high aggressive/high victimized adolescents also display lower resting arousal states (Scarpa & Ollendick, 2003). Thus, in comparison to high aggressive/low victimized youth, lower resting heart period (IBI) was also expected in high aggressive/high victimized youth.

H2: Within these four groups, does heart-period-variability (HPV) differ in response to stress related stimuli? Also, will changes in physiological measures be associated with peer nominated aggression and victimization?

Based on previous research, HPV in aggressive adolescents has been shown to increase in times of stress (Patrick, 2008; Scarpa et al., 2000). Since an increase in HPV (high vagal-tone) during stress is thought to imply deficits in the ability to self-regulate emotions in aggressive individuals (Patrick, 2008), high aggression/low victimized and high aggressive/high victimized youth were expected to show increases in HPV during stressful conditions (i.e. startle) compared to control youth. No studies to date have examined HPV via peer rated victimization in early adolescence. Based on previous research indicating blunted or attenuated responses to stressful stimuli, a decrease in HPV (low vagal-tone), was expected in peer rated victimized early adolescents. Implications

for a discussion into stimulation seeking and fearlessness theories are expected to be illuminated by new findings.

H3: Will cognitive and affective components of empathy scales be associated with self-reported aggression or peer nominated aggression and victimization? Also, will there be gender differences between aggressive, victimized, and control group participants?

Based on previous findings that aggression is linked with low empathy (Mayberry & Espelage, 2006), the high aggression/low victimized and high aggression/high victimized groups were expected to report lower empathy scores than the control group. No studies to date have reported scores on empathy questionnaires for high victimized/ low aggression youth, and differences in both cognitive and affective constructs compared to aggressive and control youth are expected. Additionally, based on findings indicating that empathy skill levels are similar in reactive and proactive aggressors (Mayberry & Espelage, 2006), no differences in cognitive and affective constructs are expected across groups. Gender differences are consistently found in studies across cultures (Gini et al., 2007) and across different assessment instruments (Eisenberg, 2006; Lovett & Sheffield, 2007). Based on previous findings, significant gender differences are expected in that females should score higher on most of the empathy measures than males across groups.

CHAPTER II

METHOD

Participants

As part of a larger study, a total of 234 middle school students, sixth, seventh, and eighth grade, were administered a modified peer nomination inventory (PNI; Wiggins & Winder, 1961). The questionnaires were administered throughout normal school hours during study breaks under the supervision of trained researchers. Per school requests, special needs and honors level students were excluded from the study. All participants were sent home with a parental consent form explaining the details of the study, with instructions to indentify the age, ethnicity, and sex of their children.

Out of the initial 234 participants, (N = 82) participants were selected based on certain criteria derived from the PNI. The mean age of participants was 12.09 (SD = .85) years with 44% Caucasian, 21% Hispanic, 17% African American, 6% Haitian, 1% Asian, and 11% mixed racial groups. Of the participants, 54% were female.

Procedure

Peer Assessment of Aggression and Victimization. Four experimental groups, high aggression/low victimization, high victimization/low aggression, high

aggression/high victimization, and a non-aggressive/non-victimized control, was determined based on a modified version of the Peer Nomination Inventory (PNI; Wiggins and Winder, 1961). The PNI requires participants to nominate classmates who display certain behavioral descriptors. From the PNI six items, three aggression and three victimization, were ambiguous in nature but represented a clear distinction between aggressive and victimized behaviors. The three aggression descriptors were: "He-She hits and pushes others around," "He-She makes fun of people," and "He-She is just plain mean." The three victimization descriptors were: "He-She gets picked on by other kids," He-She gets hit and pushed by other kids," and "Kids make fun of Him-Her." Each participant was asked to rate the males and females in their respective classes but were instructed not to rate themselves. Check marks designated a rating and victimization and aggression tallies for each participant were calculated as proportions based on his or her class size. The proportions were summed and divided by three to create an aggression and a victimization score. Aggression and victimization scores ranged from 0 to 3.0 with a 3.0 meaning that all class mates in a given class rated an individual on all three descriptors. Zeros indicate no ratings by any classmates on any item and these individuals represented the control group. The PNIs were administered in small group settings during normal class hours with trained researchers overseeing the testing period. Nominations were coded and recoded by different trained researchers to reduce error.

Thirty participants were placed in the control group of which fifteen were female. Twenty-five participants were placed in the high aggression/low victimization group of which thirteen were female. Twenty participants were placed in the high

victimization/low aggression group of which ten were female. Finally, twenty participants were placed in the high aggression/high victimization group of which eleven were female. After group designations were determined, a second round of parental consents were sent home with the students outlining the details to the second part of study that dealt with physiological measures. Only participants whom returned parental consents to their respective social studies teachers were asked to join the study (N = 82).

The control group was reduced to twenty-three with twelve females. The high aggression/ low victimization group was reduced to twenty-three with thirteen females. All twenty participants in the high victimization/low aggression group returned consents. Finally, the high aggression/low victimized group was reduced to sixteen with nine females. Four of the participants placed in the high aggression/high victimized group did not return consents because they had dropped out or transferred schools.

Psychophysiological Measures. Psychophysiological measures were taken in a quiet, designated classroom provided to the researchers by the middle-school. The room was solely used for this study, and no interruptions were permitted during testing hours. During baseline recordings, heart period and heart period variability were obtained using an electrocardiogram (ECG). Three disposable self-adhesive electrodes (Lead-Lok, Inc.) were placed evenly on the upper right and left arms with a ground lead placed on the right wrist proximal to the right lead. Due to anticipated levels of pre-testing anxiety, the lead positioning was determined to be less provocative and easier to administer than chest lead positioning. Participants were instructed to relax and sit comfortably during the baseline condition which lasted three minutes. Participants were also instructed to

minimize motor activity in an attempt to reduce artifact during recording. The testing room remained quiet and lights were dimmed to create a relaxing atmosphere.

After the baseline period ended, the countdown startle task was administered. A visual and a non-visual stimulus were randomly assigned to each participant in a continuous manner. The visual stimulus totaling 2 minutes was comprised of five countdown events starting from 13 and ending in zero, followed by a blast of white noise after every countdown reached zero. The repetitive nature of the visual and audio loop creates anticipation due to the fact that the inevitable noise blast is coming when the countdown ends. The white noise blast was heard through Audio-Technica Professional head-phones (ATH-PROV5) at 85 decibels for 2 seconds.

A second, non-visual stimulus was administered totaling 2 minutes. The non-visual stimulus utilized the same 2-second noise blast, but was not accompanied by a visual countdown. Thus, participants were provided no visual cues as to when the random white-noise blasts would occur. Therefore, without a countdown, the participants could not anticipate the white-noise blast or the end of the stimulus condition.

Heart Rate Analysis. The ECG signal was collected using a laptop PC with Snap-Master Data Acquisition System from HEM Data Corp software (Southfield, MI) and amplified by a SAI Bioamplifier (James Long Company, Caroga Lake, NY). Continuous recordings were made at a sampling rate of 1000 Hz. Data were transferred and quantified using inter-beat interval (IBI) analysis software (James Long Company, Caroga lake, NY) to calculate basal cardiac activity (during the 3 minute baseline

condition) as well as cardiac activity during each visual and non-visual stimulus conditions (2 minutes each). The IBI analysis software uses a 4-pass self-scaling peak detection algorithm that has been used in previous studies (Jones, 2012) and creates a data file containing the onset time of R-spikes in a given epoch. Identifying R-spikes, the most identifiable upward deflection in the QRS complex graphically representing the depolarization of the left and right ventricle of the heart, is essential in deriving all heart period measures. ECG files were manually edited for artifact to identify undetected R-spikes or to remove unwanted artifact due to movement or other anomalies. Properly edited files were exported to batch files where heart period and heart period variability were quantified using 180 and 120 second epochs respectively. IBIs and the corresponding standard deviations from the baseline and stimulus conditions were calculated to the nearest millisecond. The standard deviations of the IBIs represent heart period/rate variability.

Reactive and Proactive Aggression Assessments. The Reactive-Proactive Aggression Questionnaire (RPQ; Raine, et al., 2006) is a self-report instrument that is used to assess reactive and proactive aggression in child and adolescent samples. The RPQ provides a two-factor proactive-reactive model that distinguishes both subtypes of aggressive behavior in a 23-item questionnaire (12 proactive, 11 reactive). Each item is rated as 0 (never), 1 (sometimes), or 2 (often) for frequency of occurrence (Raine et al., 2006). Values are summed to create reactive and proactive scales, and both scales are summed to obtain total aggression scores. Scales range between 0 to 24 for proactive and 0 to 22 for reactive aggression. Total aggression scores range from 0 to 46 with 46

representing the highest report of both sub-types. All participants were administered the RPQ regardless of group designation. The RPQ was administered during the same testing period as the ECG measures and coded by trained researchers.

Empathy Assessments Across Groups. Self-reported measures of dispositional empathy were employed using the Interpersonal Reactivity Index (IRI; Davis, 1980, 1983). Comprised of a total of 28 questions, the four subscales in the IRI, empathic concern, personal distress, perspective taking, and fantasy, consists of seven items each presented in randomized order. The Likert-type scoring of the items ranged on a five-point scale from 0 to 4 with 0 representing that the item "does not describe me well" increasing to 4 representing the item "describes me very well." Each participant received scores on each of the four subscales summed independently, each measuring a different component of empathy. The IRI was administered in a group setting during normal class time with teachers and researchers available for help if participants had questions. The IRI's were administered to all participants and the results were scored independently by two trained researchers to ensure accuracy. The following sections break-down the four subscales in the IRI. Perspective taking represents a cognitive component of empathy and empathic concern, fantasy, and personal distress represent affective components of empathy.

Perspective taking. The perspective taking (PT) scale in the IRI assesses the tendency to spontaneously adopt the psychological view point of others or to "step outside the self" while processing social information (Davis, 1980, 1983). Due to the high correlation with desirable interpersonal functioning, individuals whom score high on

the PT scale have been found to report less social dysfunction, higher levels of social competence and higher levels of self-esteem (Davis, 1983). Thus, PT can be considered as an advanced cognitive aspect of empathy and has been shown to increase with age, especially in females (Hatcher et al., 1994).

Empathic concern. The empathic concern (EC) scale assesses other, not self-oriented, feelings of sympathy and concerns for unfortunate others (Davis, 1983). As one of the key advanced affective aspects of empathy, high scores on the EC scale relate to less loneliness, desirable interpersonal style, selflessness, and concern for others (Davis, 1983). Even though high scores on the EC scale are associated with positive social qualities, some levels of anxiety and shyness are related to this measure. Davis (1983) chalks this finding up to the fact that high scorers on the EC scale may show tendencies towards emotional vulnerability. Similar gender effects can be found for this measure as well. Females generally score higher than males on empathic concern throughout development (Barr & D'Alessandro, 2007; Hatcher et al., 1994).

Fantasy. The fantasy scale (FS) is a unique module in the IRI. As a mix between cognitive and affective aspects, the FS assesses the tendency to imaginatively transpose oneself into the feelings and actions of fictitious characters in books, movies, and other media (Davis, 1983). High scorers on the FS have been found to be more sensitive to others, have higher levels of verbal intelligence, and yet display moderate levels of social dysfunction, specifically males (Davis, 1983). It is argued that the FS simply measures broader psychological processes that may or may not be related to empathy and other

instruments that measure empathy, such as the empathy quotient, does not include fantasy measures (Baron-Cohen & Wheelwright, 2004).

Personal distress. Perhaps most fitting for this study, the personal distress (PD) scale assesses self-oriented feelings of personal distress, such as fear, discomfort and anxiety in tense interpersonal settings such as emergencies or arguments (Davis, 1983). The PD scale is considered a developmentally less advanced affective construct of empathy in relation to the more advanced cognitive PT and affective EC scales (Davis, 1980; Hatcher et al., 1994). PD scores are strongly associated with low self-esteem, shyness, social anxiety, poor interpersonal functioning, emotional vulnerability, uncertainty, and fearfulness (Davis, 1983). Gender differences have also been found in PD with females scoring higher than males (Barr & D'Alessandro, 2007; Hatcher et al., 1994).

CHAPTER III

RESULTS

Aggression and Victimization Group Designations

In order to assess group designations from the original sample of 234, proportions from three aggression items and three victimization items on the PNI were added and divided by three to obtain aggression and victimization scores. The overall mean aggression score for the original sample was .15 with a standard deviation (SD) of .24. The overall mean victimization score was also .15 with an SD of .31.

To create the aggressive, victimized, and aggressive/victimized groups, participants scoring at least .33 SD above the mean were selected from the original sample. Control group participants were selected if they were not rated a single time in any of the aggression or victimized items.

Of the original sample of 234, 82 participants were selected to form the high aggressive/ low victimized, high victimized/low aggressive, high aggressive/high victimized, and control groups. Gender, age, grade level, ethnicity, and mean aggression and victimization scores were tabulated for all four groups (see Table 1).

Statistical Analyses

Reactive and proactive aggression sub-types were examined using an ANOVA to evaluate differences in self-reported aggression across groups. The ANOVA revealed no significant differences for reactive aggression, F (3,78) = 1.37, *n.s.* or proactive aggression, F (3,78) = 1.45, *n.s.* The ANOVA also revealed that total aggression, reactive plus proactive, was not significant, F (3,78) = 1.73, *n.s.*

H1: Are there baseline physiological differences between high aggressive/low victimized, high victimized/low aggressive, high victimized/high aggressive, and control youths?

One-way ANOVAs were conducted to evaluate the hypotheses that baseline physiological differences are present between groups. The ANOVAs revealed the following (Table 2): 1) For resting IBI (heart period), the results showed a statistical trend for resting IBI between the four groups F (3,78) = 2.56, p = .06. Although a statistical trend was found by the ANOVA examining four groups, the exclusion of the small high aggression/high victimized group (N = 16), yielded significance for the model across the high aggression/low victimized (M = 770.97 = SD = 104.54), high victimized/low aggression (M = 688.48, SD = 97.37), and non aggressive or victimized control groups (M = 722.17, SD = 86.10), F (2,63) = 4.02, p < .05. Post hoc tests indicated that resting IBIs were significantly larger in the high aggression/low victimized group (M = 770.97, SD = 104.54) in comparison to the high victimized/low aggression

group (M = 688.48, SD = 97.37; *t* (41) = -2.66, p < .01). Larger IBIs indicate a lower resting heart period.

2) A one-way ANOVA revealed another statistical trend F (2,63) = 2.55, p = .086 for heart-period variability (HPV) across the high aggression/low victimized (M = 66.07, SD = 33.02), high victimized/low aggression (M = 53.91, SD = 18.46), and non aggressive or victimized control (M = 83.24, SD = 62.37) groups. Although the high victimized/low aggression group had the lowest HPV of any group, it was not statistically different, albeit approaching, from the control group. Lower HPV is associated with a reduced vagal tone.

3) A one-way ANOVA was conducted to test rates for "real-time" differences in heart rate (HR) during the resting condition. The ANOVA was significant including all four groups F (3,78) = 2.75, p < .05. Post hoc tests indicated that HR was significantly lower in the high aggression/ low victimized group (M = 79.15, SD = 10.33) compared to the high victimized/ low aggressive group (M = 88.73, SD = 11.94) (see Figure 1.)

4) A one-way ANOVA was conducted to test for differences in heart rate variability (HRV) across groups. The ANOVA was not significant across all four groups F (3,77) = 1.23, *n.s.*, and also not significant when excluding the high aggression/high victimized group F (2,62) = 1.77, *n.s.*

IBI and HPV are differentiated from HR and HRV because IBI and HPV are considered as cardiac time (heart period), whereas HR and HRV are considered as rates in "real-time." In other words, IBI and HPV, measured in milliseconds, provides a more

accurate depiction of ANS influences on the heart while HR and HRV, measured in seconds, are mainly used as recognizable ratings of what the heart rates are doing in real-time. Both measures are presented to clarify some of the definitions that are sometimes not clearly represented in many psychophysiological studies involving aggression and victimization in early adolescence.

Table 1

Group Demographics

	High Aggressive/ Low Victimized (N = 23)	High Victimized/ Low Aggressive (N = 20)	High Aggressive/High Victimized (N = 16)	Control (N = 23)
% Male	43	50	43	49
% Female	57	50	57	51
Mean PNI Aggression score	.43	.02	.47	0
Mean PNI Victimization score	.04	.64	.47	0
Mean Age (yrs.)	12	12.25	12.19	12
Grade				
6th	8	5	4	8
7th	8	10	8	7
8th	7	5	4	8
Ethnicity				
Caucasian	8	12	6	10
African American	6	2	3	3
Haitian	2	1	0	2
Hispanic	4	3	4	6
Asian	0	0	1	0
Mixed*	3	2	2	2

Note. *Mixed ethnicity participants include Caucasian/African American, Caucasian/Hispanic, Cuban/African American, and African American/Haitian*

Table 2

Means (SD) for Baseline Heart Period Measures

Measure	1. High Aggression/ Low Victimized	2. High Victimized/ Low Aggression	3. High Victimized/ High Aggression	4. Control
IBI	770.97(104.54) *	688.48(97.37)	751.03(125.04)	722.17(86.10)
HPV	66.07(33.02)	53.91(18.46)	70.82(31.06)	83.24(62.37)
HR	79.15(10.33) *	88.73(11.94)	81.82(12.84)	84.24(10.17)
HRV	8.20(.83)	7.87(.67)	8.32(.99)	8.36(1.03)

Note. IBI(inter-beat interval) and HPV(heart-period variability) are measured in milliseconds, while HR (heart rate) is measured in beats per minute. HRV(heart-rate variability) is measured as the natural log of the variance of the IBI series.
** = 1 > 2, p < .05.*

Table 3

Correlations between physiological measures and aggression and victimization scores

Variables	1	2	3	4	5	6
1.Baseline IBI	--	.29*	.32*	.08	.23*	-.24*
2.Baseline HPV		--	.93**	.83**	.06	-.19
3.Visual HPV			--	.79**	.07	-.24*
4.Non-Visual HPV				--	-.04	-.22*
5.PNI Aggression					--	-.05
6.PNI Victimization						--

Note. (IBI) Inter-beat interval. (HPV) Heart period variability. Visual HPV represents anticipation of a startle event with visual cues and Non-Visual HPV represents anticipation of a startle event without visual cues.

***p < .01 level (2-tailed); *p < .05 level (2-tailed)*

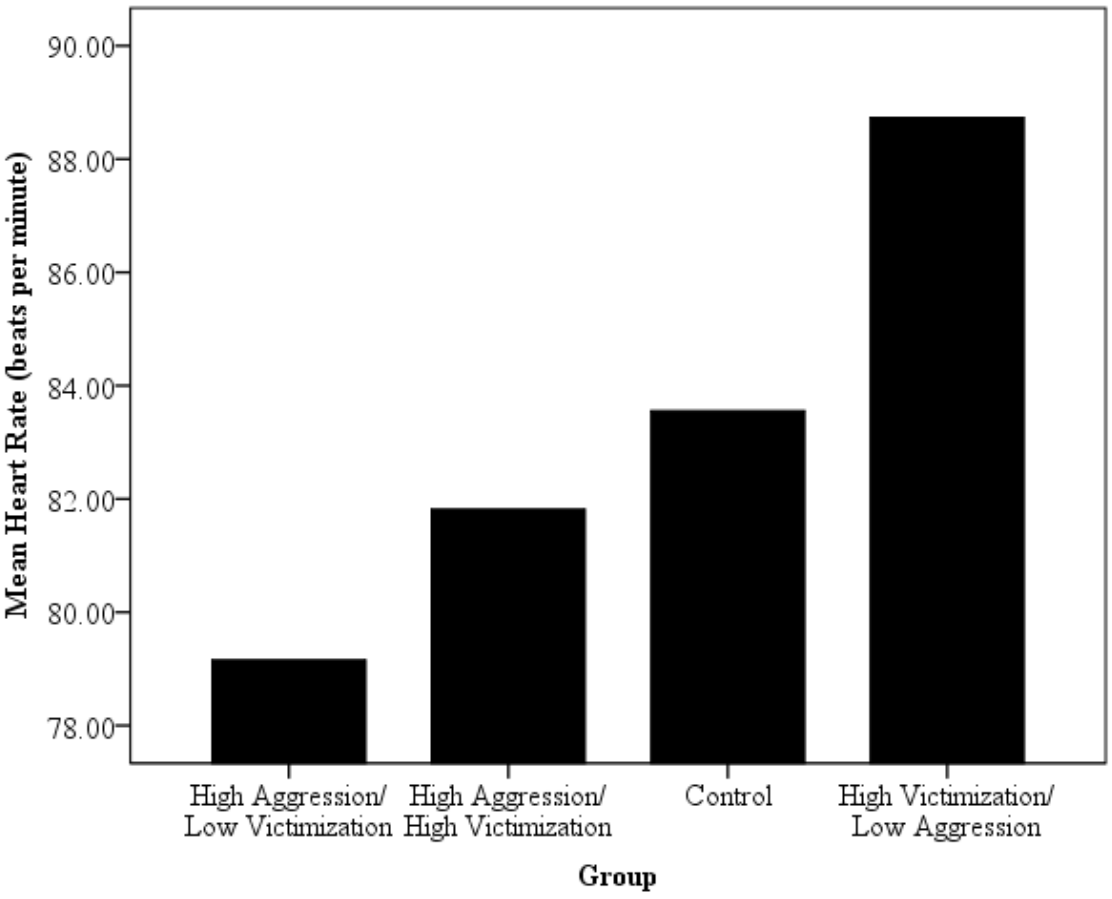
Table 4

Correlations among empathy measures and aggression and victimization scores

Variables	1	2	3	4	5	6	7	8	9
1. Empathetic Concern	--	.53**	.34**	.39**	-.12	-.04	-.10	.02	.09
2.Perspective Taking		--	.09	.37**	-.02	-.04	-.04	.12	.06
3.Personal Distress			--	.20	.14	.06	.12	.10	-.05
4.Fantasy				--	-.02	-.14	-.09	-.07	.13
5.Reactive Aggression					--	.47**	.88**	.26*	.19
6.Proactive Aggression						--	.84**	.14	.06
7.Reactive/Proactive Sum							--	.24*	.15
8.PNI Aggression								--	-.05
9.PNI Victimization									--

***p < .01 level (2-tailed); * p < .05 level (2-tailed)*

Figure 1. Resting Heart Rate Across Peer Nominated Groups



H2: Within these four groups, does heart-period-variability (HPV) differ in response to stress related stimuli? Also, will changes in physiological measures be associated with peer nominated aggression and victimization?

The startle response was used as the stress stimuli and consisted of three conditions; a baseline, a visual cue and a non-visual cue. A 3 within subjects (condition: baseline, visual cue, and non-visual cue) X 4 between subjects (group) repeated measures ANOVA was conducted to examine changes in HPV over conditions. The repeated measures ANOVA revealed a significant main effect for condition, (Λ (Wilks' Lambda) = .767, $F(2, 76) = 11.53$, $p < .001$), indicating that the variability at the baseline condition was lower ($M = 66.61$, $SE = 4.07$) than the visual cue condition ($M = 74.55$, $SE = 3.88$) and the non-visual cue condition ($M = 70.77$, $SE = 3.73$).

However, the ANOVA was not significant for group, $F(3,77) = 1.40$, *n.s.*, indicating that uniform changes in HPV across conditions were similar in all groups. Moreover, the interaction between condition and group was not significant ($\Lambda = .979$, $F(2, 76) = .264$, *n.s.*)

Pearson correlations computed on physiological measures between aggression and victimization scores revealed the following (Table 3); 1) Baseline IBI was positively significantly related to HPV in the visual stimulus condition and PNI aggression score, but was inversely and significantly related to PNI victimization scores; 2) the HPV in the visual stimulus condition was positively related to the non-visual stimulus condition and

inversely related to PNI victimization scores; 3) the HPV in the non-visual stimulus condition was also inversely related to PNI victimization scores.

H3: Will cognitive and affective components of empathy scales be associated with self-reported aggression or peer nominated aggression and victimization? Also, will there be gender differences between aggressive, victimized, and control group participants?

Pearson correlations computed on empathy components, self-reported and peer nominated aggression, and peer nominated victimization scores revealed the following (Table 4): 1) Empathetic concern was positively related to perspective taking, personal distress, and fantasy scales; 2) perspective taking was positively related to the fantasy scale; 3) self-reported reactive aggression was positively related to self-reported proactive aggression, summed self-reported reactive/proactive aggression, and peer nominated aggression.

Multiple regression analyses conducted to asses cognitive and affective components of empathy as a moderator of self-reported and peer nominated aggression and victimization were not significant. Furthermore, a between-subjects MANOVA conducted to evaluate differences in cognitive and affective components of empathy in reactive and proactive aggressors was also not significant.

All four components of empathy were examined along with gender and group designations separately to determine main effects and interactions. Four separate 4 (group) X 2 (gender) ANOVA's revealed the following (Figures.2-5):

1) For personal distress, the ANOVA showed significant main effects for gender $F(1,81) = 4.56$, $p < .05$, $\eta_p^2 = .058$, indicating that females ($M = 13.76$, $SE = .78$) scored significantly higher than males ($M = 11.32$, $SE = .84$). However, no main effects for group were significant $F(3,81) = 1.07$, *n.s.*, $\eta_p^2 = .042$. The ANOVA also revealed a significant interaction effect $F(3,81) = 2.86$, $p < .05$, $\eta_p^2 = .104$, between males ($M = 13.57$, $SE = 1.93$) and females ($M = 10.11$, $SE = 1.70$) in the high aggression/high victimization group. The interaction effect indicated a reversal in self-reported personal distress for males and females in the high aggression/high victimized group. In this group, males score at female levels in personal distress, whereas females score at male levels compared to the other three groups in which females score significantly higher than males.

2) For empathic concern, the ANOVA showed significant main effects for gender $F(1,81) = 6.78$, $p < .05$, $\eta_p^2 = .084$, indicating females ($M = 20.32$, $SE = .66$) score significantly higher than males ($M = 17.79$, $SE = .71$) across groups. However, main effects for group was not significant $F(3,81) = 0.26$, *n.s.*, $\eta_p^2 = .010$. The interaction effect was also not significant $F(3,81) = .306$, *n.s.*, $\eta_p^2 = .012$.

3) For fantasy, the ANOVA showed significant main effects for gender $F(1,81) = 7.68$, $p < .01$, $\eta_p^2 = .094$, indicating that females ($M = 16.57$, $SE = .87$) score significantly higher than males ($M = 13.03$, $SE = .94$) across groups. However, main effects for group was not significant $F(3,81) = .237$, *n.s.*, $\eta_p^2 = .010$). The interaction effect was also not significant $F(3,81) = .789$, *n.s.*, $\eta_p^2 = .031$.

4) For perspective taking, the ANOVA revealed no significant main effects for gender F (1,81) = 2.310, *n.s.*, η_p^2 = .030, nor for group F (3,81) = .853, *n.s.*, η_p^2 = .033. The interaction effect was also not significant F (3,81) = .802, *n.s.*, η_p^2 = .032.

Figure 2. IRI Personal Distress Scores as a Function of Group and Gender

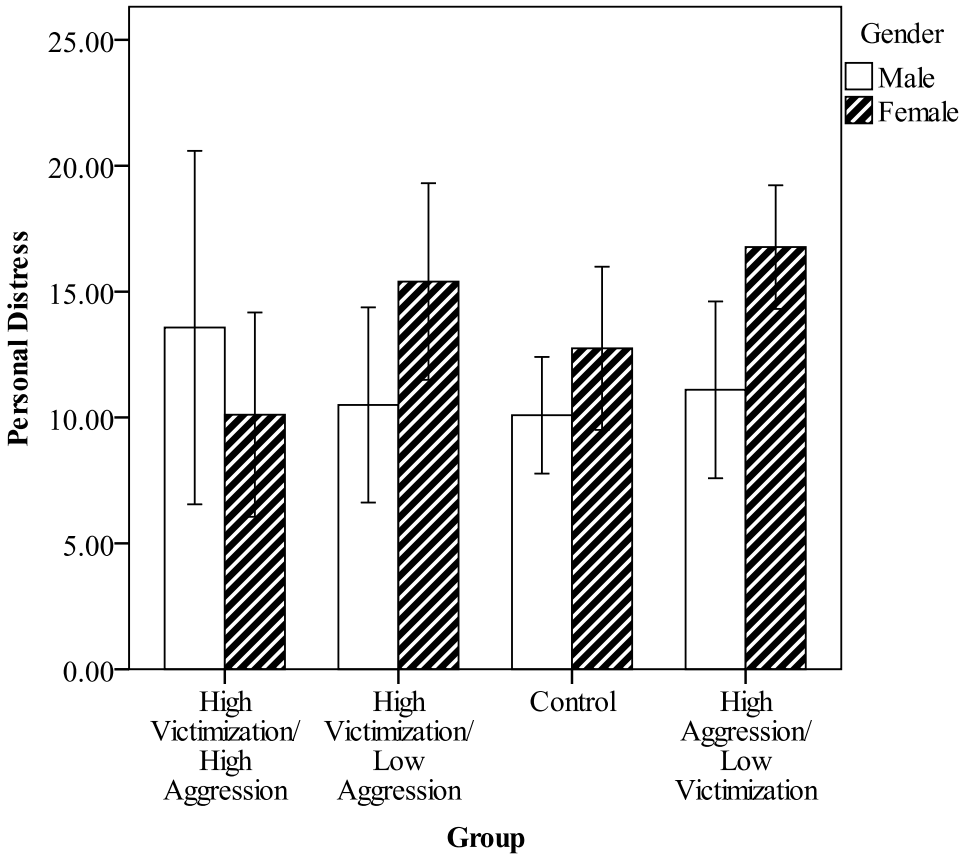


Figure 3. IRI Empathic Concern Scores as a Function of Group and Gender

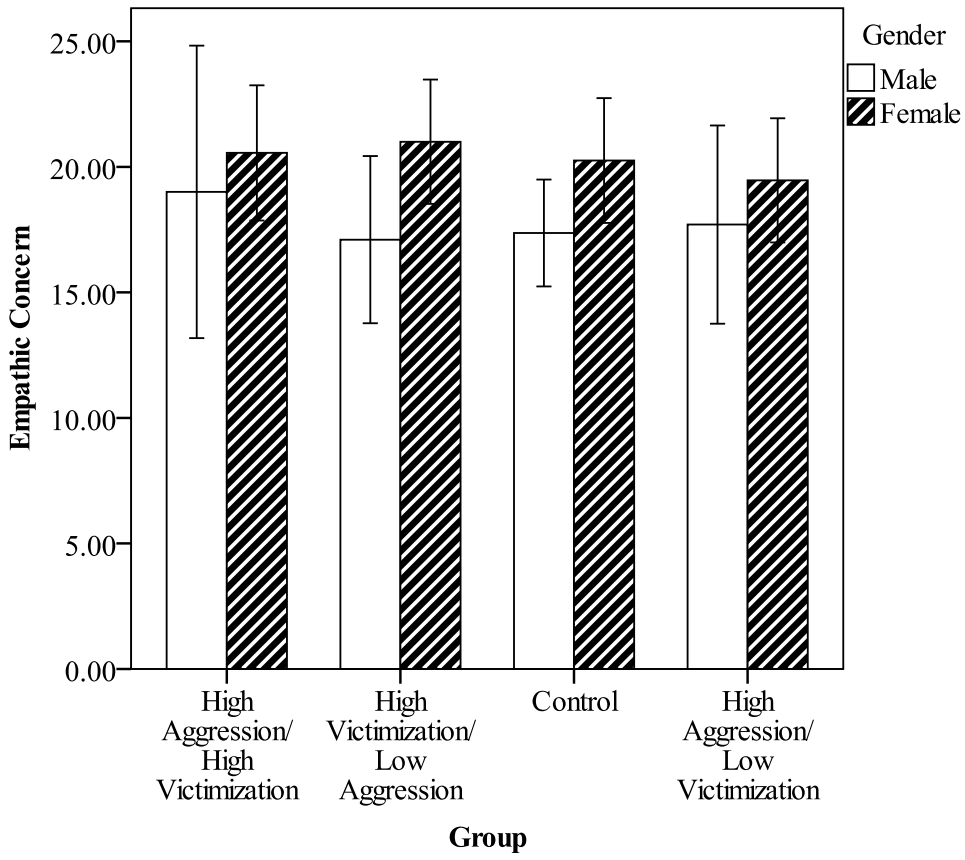


Figure 4. IRI Fantasy Scores as a Function of Group and Gender

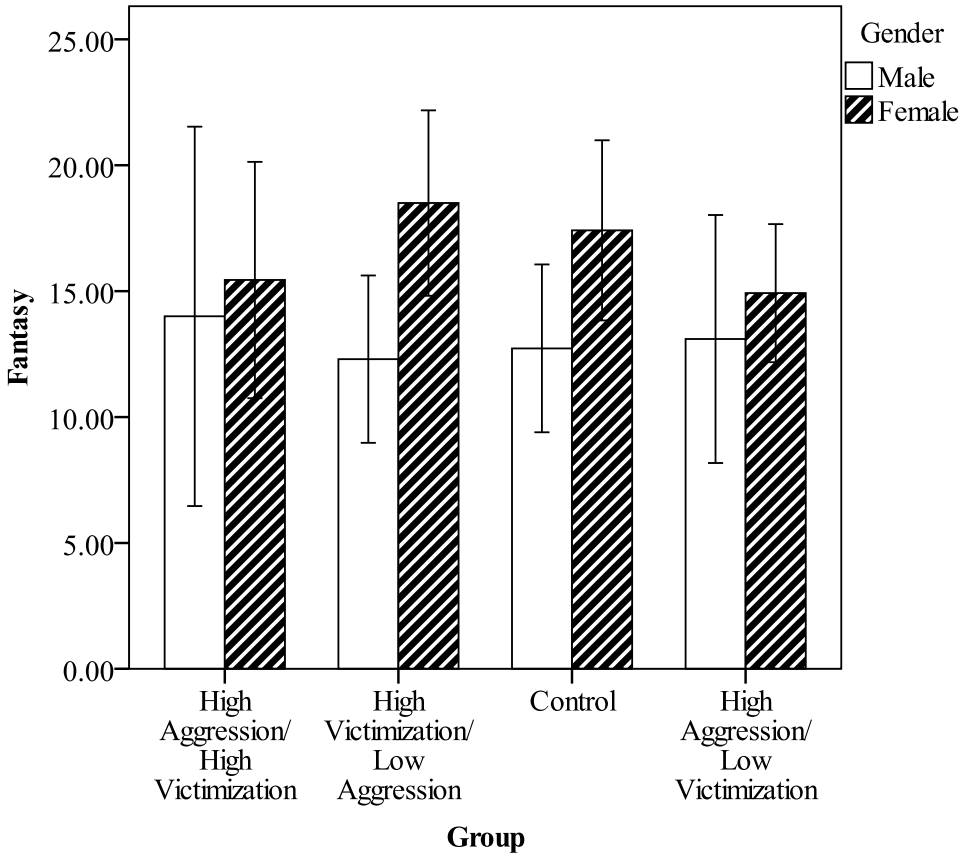
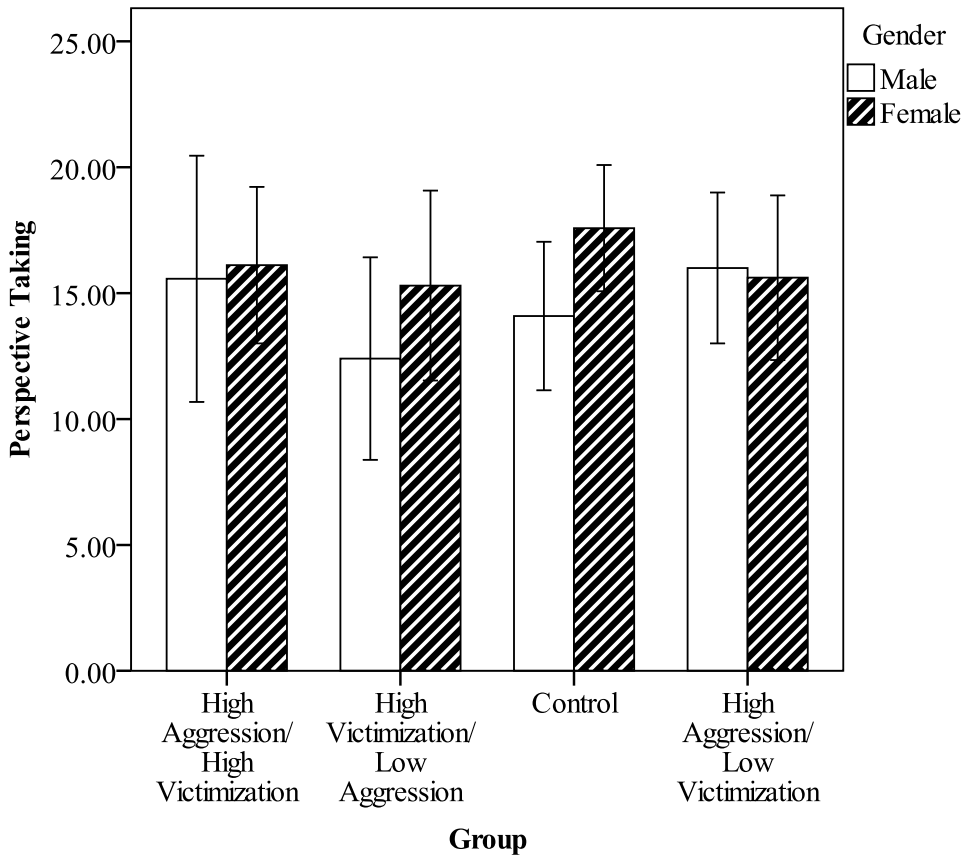


Figure 5. IRI Perspective Taking Scores as a Function of Group and Gender



CHAPTER IV

DISCUSSION

Differences in ANS functioning have been found in clinical and non-clinical populations of aggressive and victimized youths and adults across many studies employing multiple psychophysiological measures (Armstrong et al., 2009; Jovanovic et al., 2009; Raine, 2002; Scarpa & Ollendick, 2003). Although the cardiovascular-aggression link has been replicated numerous times based on self-reported aggression, no studies to date have examined non-clinical samples of peer nominated aggressive youth. Furthermore, no psychophysiological studies to date have applied peer nominations as a method to categorize victimized non-aggressive and victimized aggressive individuals into distinct groups for further analyses.

The present study examined psychophysiological differences in aggressive, victimized, and aggressive and victimized adolescents, along with non-aggressive or victimized controls. Based on previous findings we hypothesized that participants peer rated as highly aggressive would have lower resting baseline heart measures and higher heart period variability than the victim and control groups. Additionally, we hypothesized that youth peer rated as highly aggressive and highly victimized would also display the same cardiac phenotype as the high aggressive group.

Animal studies have associated increases in heart rate aberrations in response to repeated social stressors (Hamilton et al., 2008) and human studies on clinical patients with PTSD have found elevated baseline heart-rate readings for combat veterans (Jovanovic et al., 2009) and increased heart rate acceleration during exposure to trauma related material in trauma victims (Elsesser et al., 2004). Based on previous findings, we hypothesized that participants peer rated as highly victimized only would display a hyper-arousal state characterized by a higher resting heart rate at baseline and lower heart period variability during stress (i.e. startle).

We also hypothesized that the aggressive groups would score lower on self-reported cognitive and affective components of empathy, and that females would generally score higher than males on all components. We had hoped to add to the relatively scant literature on emotional processing in distinct aggressive sub-types, but could not split reactive and proactive aggressors into two categories for analysis due to the relatively small number of highly reactive and proactive respondents.

H1: There are baseline physiological differences between high aggressive/low victimized and high victimized/low aggressive participants.

Average resting IBI was significantly larger for the high aggressive/low victimized group compared to the high victimized/low aggressive group. Larger IBI's indicate greater distances between R-spikes. In real time, greater IBI distances compute to a lower heart period and slower heart rate. Thus, peer rated aggression was significantly related to larger resting IBI's and lower resting heart rate ($r = .23$).

Peer nominated victimization was significantly related to shorter IBI's and higher resting heart period and heart rate (r = -.24). Peer rated victims displayed the shortest IBI differences, indicating a high resting average heart rate. Furthermore, a small subset (N = 3) of the participants in the high victimized/low aggression group also displayed signs of tachycardia with resting heart rate measures above 102 beats per minute and reaching as high as 114 beats per minute. Tachycardia was not present in any members of any other group.

Resting differences in HPV were approaching significance between the high victimized/low aggressive group and the control group. Perhaps the addition of more participants in these groups would shift the model to significance. Nonetheless, the trending low HPV in the high victimized/low aggression group is interesting due to the fact that low HPV indicates a reduced vagal-tone which has been associated with poor self-regulation and maladaptive emotional regulation (Hasting et al., 2008; Porges, 1995, 2001).

These findings are consistent with research indicating that low resting heart rate is a biological marker of aggressive behavior (Raine, 2002) and research showing hyper-arousal states in victims of abuse (Elsesser et al., 2004; Hamilton et al., 2008; Jovanovic et al., 2009). However, unlike previous work in the field, self-reports were not sufficient enough to define high and low levels of aggression. Although self- reported reactive aggression and summed total aggression, reactive plus proactive, was significantly related to peer nominated aggression (r = .26 and r = .24) all participants reported similar

aggression scores. Thus, peer nominations were key in defining groups based on peer perceptions of victimization and aggressive behavior.

H2: Heart-period-variability (HPV) does not differ in response to stress related stimuli across groups. Although physiological measures are associated with peer nominated aggression and victimization, the associations across conditions do not change.

As with other psychophysiological studies using an auditory startle stimulus to measure changes in autonomic functioning (Fung et al., 2005; Holand, Girard, Laude, Meyer-Bisch, & Elghozi, 1999), we predicted increases in HPV for aggressive youth and decreases in HPV for victimized youth. Although changes in HPV were significantly related to changes over conditions, no average group changes in HPV or were significant. In other words, all four groups maintained relative HPV from baseline throughout the visual and non-visual stimulus conditions. Consequently, low HPV remained associated with peer victimization in the visual and non-visual stimulus conditions, $r = .24$ and $r = .22$, respectively. Although the correlations were small, the data does suggest that low vagal tone may be associated with peer rated victims and not peer rated aggressors.

Due to the fact that no average group differences were found across conditions, the data suggest two possible explanations. First, the auditory startle stimulus did not effectively produce a stressful event for all participants. The visual stimulus condition was meant to induce anticipation of a stressful event by incorporating a numerical countdown followed by a white noise blast in a consecutive loop. The numerical

countdown was meant to serve as a guide to when the noise blast would occur. On the other hand, the non-visual stimulus condition was essentially the same but no numerical countdown was present and the white noise blasts occurred at random. Although changes in HPV were found across conditions, perhaps the length of time within each condition was not long enough to sufficiently assess cardiac responsivity to the startle event or that the stimulus in question did little to cause a response reflected by cardiac rate or epoch.

Second, fearlessness qualities may only be reserved for individuals diagnosed with mental disorders such as antisocial personality disorder, disruptive behavior disorder, or psychopathy. Truncated physiological responses to anxiety or fear may have not been present in this study due to the relatively benign sample tested. None of the participants were diagnosed with any clinical psychological disorders and group designations were attributed by peer nominations only. Thus, deficits in neurophysiological fear modulation processes may be indicative of psychopathologies involving brain or peripheral abnormalities that cause the ANS to malfunction.

H3: Cognitive and affective components of empathy scales are associated with one another, but not with self-reported aggression or peer nominated aggression and victimization. Moreover, there are gender differences between aggressive, victimized, and control group participants in affective components of empathy.

Empathic concern, a core affective component of empathy, was significantly related to perspective taking ($r = .53$), personal distress ($r = .34$), and fantasy ($r = .39$). These findings are consistent with research indicating that empathic concern and

perspective taking, a core cognitive component of empathy, are correlated moderately with one another (Davis, 1983), and individuals scoring high in both measures have reported less loneliness, desirable interpersonal style, higher self esteem, selflessness, and general concern for others (Davis, 1983).

On the other hand, previous studies have indicated that empathic concern and personal distress are often inversely related to one another (Davis, 1983, 1994). While empathic concern is associated with a general concern for others, personal distress is often associated with fearfulness, social dysfunction, shyness, and introversion (Davis, 1983, 1994). While both components measure affect globally, Davis (1983) added that younger participants scoring high in empathic concern also show higher levels of emotional vulnerability and that only by late adolescence, an inverse relationship between personal distress and empathic concern can be discerned. Davis and Franzoi (1991) elaborates that by late adolescence, perspective taking and empathic concern increases, while personal distress decreases, due to experience and gains in the ability to consider multiple perspectives of others.

In our study, the mean age of participants was 12.09 years which is considered early adolescence. In this young of a sample, differences between empathic concern and personal distress may have not occurred yet and perhaps and older sample would provide evidence of the inverse relationship. However, the sample did indicate that perspective taking was significantly related to fantasy ($r = .37$) but not personal distress. It could be the case that the cognitive component of empathy matures earlier than the affective

components and that by age 12, personal distress and perspective taking are not related but empathic concern and personal distress still are.

Contrary to previous studies finding a link between aggression and low empathy (Mayberry & Espelage, 2007), no components of empathy were found to be lower in aggressive participants. The high aggressive/low victimized group did not differ on any empathy measure compared to the high victimized/low aggressive, high aggressive/high victimized, and control group as hypothesized. Furthermore, empathy as a moderator for peer rated and self-reported aggression was also not significant, and no components of empathy differed between reactive and proactive aggression sub-types.

However, significant differences were found when controlling for gender. As expected, females scored significantly higher in empathic concern, personal distress, and fantasy compared to males. There were no significant group or gender differences in perspective taking. Although females scored significantly higher on most measures and across groups, a gender X group interaction effect was found for personal distress. Males in the high aggressive/ high victimized group scored significantly higher than females in the same group. Thus, as personal distress decreases for females, males of the same age report higher levels of emotionally vulnerability, social anxiety, and fearfulness if they are peer rated as victimized and aggressive. This finding could partially explain why personal distress and empathic concern are still positively related and not inversely related across groups and as witnessed in older populations.

Conclusions

The present study supports psychophysiological evidence of lower resting arousal in high aggressive/low victimized youth while extending clinical findings of hyper-arousal into a non-clinical sample of high victimized/low aggressive youth. Peer reports of aggression and victimization were essential in separating groups for analysis due to relatively inconclusive data on self-reported aggression. High empathy scores did not moderate aggression, and females scored higher than males on all affective empathy components across groups suggesting females have greater emotional regulation skills at this age. Only males who were peer rated as highly aggressive and highly victimized showed higher levels of personal distress than female cohorts suggesting that males may have greater social anxiety and difficulties in regulating emotions in stressful interpersonal settings compared to their female cohorts.

These findings contribute to our understanding of the roles physiology and emotional processing play in peer aggression and victimization during adolescence. Our findings support the stimulation seeking theory in that aggressive behavior may result as an attempt to raise lower arousal states to make the individual feel balanced. More importantly, this study replicates and extends previous findings into a relatively mildly aggressive sample. Although major differences in resting heart period were not found between peer rated aggressive and non-aggressive non-victimized individuals, significant differences were found between high aggressive/low victimized and high victimized/low aggressive individuals. This evidence suggests that outcomes and expectations of certain

behaviors can be viewed through a psychophysiological lens, and that aggressive and victimized adolescents have unique cardiac phenotypes.

In the case for victims, constant exposure to aggression appears to be associated with ANS activity classified as "high alert" by way of a higher average resting heart period/rate and lower heart period/rate variability. Moreover, this hyper-arousal state is not witnessed in adolescents who are victimized and also aggressive, leaning towards the notion that aggressive behavior may have specific ANS characteristics.

However, this study cannot determine whether or not aggressive behavior causes lower arousal states, or that lower arousal states predispose and individual to become aggressive. This study does support the stimulation seeking theory in that lower arousal states may contribute to aggressive behavior, but many other contributions not examined in the present study may also have significant influences. Consequently, this study cannot determine whether or not being victimized by aggression causes hyper-arousal states. A great deal of research has been undertaken in recent years to determine what causes individuals to be repeatedly chosen as victims of aggression or bullying. The psychophysiological measures taken in the present study, only convey a snap shot of biological activity in a very small window of time. A myriad of other contributing factors associated with being selected as a victim may also contribute to hyper-arousal states.

The purpose of this study was to examine the physiological foundations and repercussions of peer aggression and victimization, create psychophysiological profiles of

these individuals based on these measures, and investigate the cognitive and affective components of empathy and its relation to these behaviors. Ultimately, better assessments of the etiology of these behaviors may lead to optimal intervention strategies that will help prevent violence in schools.

APPENDIX 1

Peer Nominated Aggressive Group

Group	**Aggression Ratings** (M = .15, S.D. = .24)	**Victimization Ratings** (M = .15, S.D. = .31)
Aggressive (N = 23)	1.07	.06
	.86	.12
	.80	.10
	.72	0
	.60	0
	.50	0
	.46	.12
	.41	0
	.40	0
	.40	0
	.38	0
	.38	.12
	.36	0
	.31	0
	.31	.14
	.30	.07
	.27	0
	.26	0
	.25	.06
	.25	0
	.24	.08
	.23	0
	.22*	0*

Peer Nominated Aggressive Group. Total aggression scores tallied from three peer nominated inventory items. All participants scored at least 0.33 standard deviations above the mean on aggression items and below the mean on victimization items. *Participant scored at least the mean on aggression items and below the mean on victimization items.

APPENDIX 2

Peer Nominated Victimized Group

Group	**Aggression Ratings** (M = .15, S.D. = .24)	**Victimization Ratings** (M = .15, S.D. = .31)
Victimized (n = 20)	0	1.75
	0	1.38
	0	1.32
	0	1.08
	0	.74
	.14	.66
	.09	.63
	0	.60
	0	.59
	0	.56
	0	.51
	0	.46
	0	.46
	0	.44
	0	.41
	.06	.26
	0	.25
	0	.24
	0*	.20*
	.09*	.18*

Peer Nominated Victimized Group. Total victimization scores tallied from three peer nominated inventory items. All participants scored at least 0.33 standard deviations above the mean on the victimization items and below the mean on aggression items.
*Participants that scored at least the mean on victimization items and below the mean on aggression items.

APPENDIX 3

Peer Nominated Aggressive/Victimized Group

Group	**Aggression Ratings** (M = .15, S.D. = .24)	**Victimization Ratings** (M = .15, S.D. = .31)
Aggressive/Victimized (n = 16)	.46	.84
	.15	.77
	.31	.75
	.30	.70
	.83	.66
	.63	.63
	1.25	.50
	.68	.38
	.25	.38
	.49	.32
	.33	.32
	.28	.28
	.46	.25
	.25	.25
	.25	.24
	.23	.31

Peer Nominated Aggressive/Victimized Group. Total aggression/victimization scores tallied from three peer nominated inventory items. All participants scored at least the mean on the aggression and victimization items.

APPENDIX 4

Interpersonal Reactivity Index

The following statements inquire about your thoughts and feelings in a variety of situations. For each item, indicate how well it describes you by choosing the appropriate letter on the scale at the top of the page: A, B, C, D, or E. When you have decided on your answer, fill in the letter on the answer sheet next to the item number. READ EACH ITEM CAREFULLY BEFORE RESPONDING. Answer as honestly as you can. Thank you.

ANSWER SCALE:

A B C D E

DOES NOT DESCRIBES ME

DESCRIBE ME VERY WELL

WELL

1. I daydream and fantasize, with some regularity, about things that might happen to me. (FS)

2. I often have tender, concerned feelings for people less fortunate than me. (EC)

3. I sometimes find it difficult to see things from the "other guy's" point of view. (PT) (-)

4. Sometimes I don't feel very sorry for other people when they are having problems. (EC) (-)

5. I really get involved with the feelings of the characters in a novel. (FS)

6. In emergency situations, I feel apprehensive and ill-at-ease. (PD)

7. I am usually objective when I watch a movie or play, and I don't often get completely caught up in it. (FS) (-)

8. I try to look at everybody's side of a disagreement before I make a decision. (PT)

9. When I see someone being taken advantage of, I feel kind of protective towards them. (EC)

10. I sometimes feel helpless when I am in the middle of a very emotional situation. (PD)

11. I sometimes try to understand my friends better by imagining how things look from their perspective. (PT)

12. Becoming extremely involved in a good book or movie is somewhat rare for me. (FS) (-)

13. When I see someone get hurt, I tend to remain calm. (PD) (-)

14. Other people's misfortunes do not usually disturb me a great deal. (EC) (-)

15. If I'm sure I'm right about something, I don't waste much time listening to other people's arguments. (PT) (-)

16. After seeing a play or movie, I have felt as though I were one of the characters. (FS)

17. Being in a tense emotional situation scares me. (PD)

18. When I see someone being treated unfairly, I sometimes don't feel very much pity for them. (EC) (-)

19. I am usually pretty effective in dealing with emergencies. (PD) (-)

20. I am often quite touched by things that I see happen. (EC)

21. I believe that there are two sides to every question and try to look at them both. (PT)

22. I would describe myself as a pretty soft-hearted person. (EC)

23. When I watch a good movie, I can very easily put myself in the place of a leading character. (FS)

24. I tend to lose control during emergencies. (PD)

25. When I'm upset at someone, I usually try to "put myself in his shoes" for a while. (PT)

26. When I am reading an interesting story or novel, I imagine how I would feel if the events in the story were happening to me. (FS)

27. When I see someone who badly needs help in an emergency, I go to pieces. (PD)

28. Before criticizing somebody, I try to imagine how I would feel if I were in their place. (PT)

NOTE: (-) denotes item to be scored in reverse fashion

PT = perspective-taking scale EC = empathic concern scale

FS = fantasy scale PD = personal distress scale

APPENDIX 5

The Reactive–Proactive Questionnaire

The Reactive–Proactive Questionnaire (RPQ) scores (0, 1 or 2) for proactive aggression items (2, 4, 6, 9, 10, 12, 15, 17, 18, 20, 21, 23) and reactive items (1, 3, 5, 7, 8, 11, 13, 14, 16, 19,22) are summed to form proactive and reactive scales. Proactive and reactive scale scores are summed to obtain total aggression scores.

Instructions

There are times when most of us feel angry, or have done things we should not have done. Rate each of the items below by putting a circle around 0 (never), 1 (sometimes), or 2 (often). Do not spend a lot of time thinking about the items—just give your first response. Make sure you answer all the items (see below).

How often have you…

1. Yelled at others when they have annoyed you **(R)**
2. Had fights with others to show who was on top **(P)**
3. Reacted angrily when provoked by others **(R)**
4. Taken things from other students**(P)**
5. Gotten angry when frustrated**(R)**
6. Vandalized something for fun **(P)**
7. Had temper tantrums **(R)**
8. Damaged things because you felt mad **(R)**
9. Had a gang fight to be cool **(P)**
10. Hurt others to win a game **(P)**
11. Become angry or mad when you don't get your way **(R)**
12. Used physical force to get others to do what you want **(P)**
13. Gotten angry or mad when you lost a game **(R)**
14. Gotten angry when others threatened you **(R)**
15. Used force to obtain money or things from others **(P)**
16. Felt better after hitting or yelling at someone **(R)**
17. Threatened and bullied someone **(P)**
18. Made obscene phone calls for fun **(P)**
19. Hit others to defend yourself **(R)**
20. Gotten others to gang up on someone else **(P)**
21. Carried a weapon to use in a fight **(P)**
22. Gotten angry or mad or hit others when teased **(R)**
23. Yelled at others so they would do things for you **(P)**

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