Violent video game exposure and physical aggression in adolescence: Tests of the General Aggression Model

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VIOLENT VIDEO GAME EXPOSURE AND PHYSICAL AGGRESSION IN ADOLESCENCE: TESTS OF THE GENERAL AGGRESSION MODEL

BY

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Dissertation

Submitted to the University of New Hampshire
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In

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DEDICATION

This dissertation is dedicated to my family. Their love and devotion made this dissertation possible. To my parents, Richard and Carolyn Bucolo, who have supported all my academic endeavors. For my entire life they let me follow my passions, wherever they would take me. To my brother Richard, who was always there to lend a hand or provide a much needed smile. Finally, I dedicate this dissertation to my wife, Heidi. Thank you for always being by my side and supporting me over these two, long years.
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ABSTRACT

VIOLENT VIDEO GAME EXPOSURE AND PHYSICAL AGGRESSION IN ADOLESCENCE: TESTS OF THE GENERAL AGGRESSION MODEL

by

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University of New Hampshire, May, 2010

The General Aggression Model indicates that long term exposure to violent video games increases aggression by altering players' aggressive personality (Anderson & Bushman, 2002). In this dissertation, cross-sectional and longitudinal tests of this mediated relation were conducted to determine if violent video game exposure had a direct effect on physical aggression as well as a direct effect via pathways through trait aggression (Buss & Perry, 1992) and normative status (Cohn & White, 1990). A category-based scale assessing violent video game exposure (Trinkner, Bucolo, Cohn, Rebellon, & Van Gundy, 2009) was used as the independent variable and a self-report measure of physical aggression (Wolpin, 1983) was used for the dependent variable. Cross-sectional analyses found that violent video game exposure directly predicted physical aggression. Further, both trait aggression and normative status were partial mediators of this relationship. Moderator analyses found that these associations were similar for both middle school and high school students.

Longitudinal tests of this mediated relation provided different results. Over an 18 month period, violent video game exposure directly predicted increased physical aggression. Neither trait aggression nor normative status mediated this association.
Further, moderator analyses revealed that exposure to violent video games was a significant predictor of future physical aggression among middle school students, but this variable did not predict future physical aggression for high school students.

While these findings did not support all the predictions of the General Aggression Model (Anderson & Bushman, 2002), they indicate that violent video game exposure is associated with increased physical aggression in the real world. Further, exposure to violent video games appears only to have serious long term effects on younger players when compared to older players. These findings suggest that regulation aimed at reducing the negative effects of violent video games should be targeted toward younger players. Creating laws requiring personal identification to purchase violent video games and increased parental involvement in adolescents’ video game exposure may reduce some of these negative effects.
"The tendency of aggression... constitutes the most powerful obstacle to culture."

Sigmund Freud (1946) Civilization and its discontents, p. 102

Most human beings witness acts of physical aggression on a regular basis (Gentile & Anderson, 2006). The intensity and duration of such acts can vary from witnessing a few moments of a physical altercation on television to spending hours viewing graphic, intense acts of murder and torture from popular movies like Silence of the Lambs. Although individuals exposed to violent media are not themselves engaging in any physical aggression, exposure to violent images has a lasting effect on viewers' behavior (Huesmann, Moise-Titus, Podolski, & Eron, 2003; Johnson et al., 2002).

Concern regarding viewing violent media has been a focus of social psychology researchers since Bandura, Ross and Ross (1963), in their seminal work, established an association between viewing violent television and being physically aggressive. Later studies, summarized in Bandura (1973), revealed that children and adults come to imitate the behaviors to which they have been exposed via violent television shows and films through social learning (i.e., individuals learn to become physically aggressive by being exposed to others being rewarded for such behavior). Since Bandura (1973, 1986) proposed his theories of social learning and aggression, other social psychologists have demonstrated that exposure to violent television and films increases the likelihood that viewers will be aggressive (for a review see Huesmann & Taylor, 2006).

More recently, researchers have begun to focus on the violence portrayed in video and computer games, another form of social media (e.g., Anderson, Gentile, & Buckley,
Recent surveys indicate that almost all teenagers report playing video games and being exposed to various types of games, including games with violent content (Lenhart et al., 2008). For instance, Trinkner, Bucolo, Cohn, Rebellon, and Van Gundy (2010) used Entertainment Software Association (2009) sales data and found that approximately 40% of video games sold contain violent images, violent graphics, and violent themes and content. Therefore, it should not be surprising that some researchers confidently claim that exposure to violent video games leads to increased aggressive behavior, aggressive emotions, and aggressive cognitions in both experimental contexts and correlational studies (see Anderson et al., 2010).

The General Aggression Model (GAM: Anderson & Bushman, 2002; Anderson & Dill, 2000) is often used as a theoretical framework to describe why exposure to violent video games would lead to increases in aggression. According to this framework, repeated exposure to violent video games leads to the learning, rehearsal and reinforcement of violence which in turns increases aggressive cognition, aggressive attitudes, and physiological functioning associated with aggression. Changes in these outcomes lead to increased aggressive personality, which mediates the relation between violent video game exposure and physical aggression in the real world.

Although many researchers cite this framework when examining the effect of violent video games on aggression, currently only Ferguson et al. (2008) have tested the fully mediated model described by the GAM. Ferguson and colleagues' (2008) analysis indicated that violent video game exposure did not predict future physical aggression directly, nor was there an indirect association between such exposure and physical aggression via aggressive personality.
In this dissertation, I examined the relation between violent video game exposure and physical aggression among a group of adolescents from the New Hampshire Youth Survey (Cohn, Rebellon, & Van Gundy, 2005). Methodologically, this dissertation was designed to overcome some of the measurement issues of previous research in this domain. As Scott (1995) pointed out, aggression is often measured using multiple scales including attitudes, cognitions, and behaviors. Some researchers (e.g., Ferguson, 2007; Olson, 2004; Savage & Yancey, 2008) claim that correlational studies and laboratory experiments examining violent video game exposure and physical aggression lack external validity. These critics suggest that violent video game exposure is not a significant predictor of physical aggression in the real world. In this dissertation, I provided a clear definition of physical aggression, differentiating this behavior from other aggressive outcomes. To measure physical aggression, I used a self-report scale which has been shown to be a reliable and valid measure of adolescents' reports of physical aggression in the real world (see Elliott, Huizinga, & Menard, 1989; Huizinga & Elliott, 1986).

Further, other researchers have suggested that the measurement of violent video game exposure in previous studies has been problematic, because this measure (see Anderson & Dill, 2000) relies on participants' ratings of violent content in video games (Bucolo, 2009). Möller (2006) suggested that a category-based measure of violent video game exposure would be a more reliable measure of said exposure, because it provides a standardized measure of exposure to violent content for all participants. In this dissertation, I used a category-based measure of violent video game exposure (see
Trinkner, Bucolo, Cohn, Rebellon, & Van Gundy, 2009) to determine if measuring violent video game exposure in this way would predict physical aggression.

Theoretically, this dissertation was designed to test predictions based on the General Aggression Model (Anderson & Bushman, 2002). To date, only Ferguson et al. (2008) have tested whether aggressive personality mediates the association between violent video game exposure and physical aggression. Some researchers have found that violent video game exposure predicts physical aggression when aggressive personality is included in prediction models (e.g., Anderson & Dill, 2000; Trinkner et al., 2009), but these researchers have not tested these associations using mediated models. At the cross-sectional level, I tested a mediated model, based on the GAM (Anderson & Bushman, 2002) that aggressive personality, measured using trait physical aggression (Buss & Perry, 1992) and aggressive attitudes (Cohn & White, 1990), would mediate the association between violent video game exposure and physical aggression.

Few longitudinal researchers have examined the long term effects of violent video game exposure on physical aggression (e.g., Anderson et al., 2007). More recent longitudinal analyses have found that violent video game exposure predicts future aggressive personality and physical aggression (Anderson et al., 2008; Gentile & Gentile, 2008). These analyses have not examined if changes in aggressive personality mediate the association between violent video game exposure and future physical aggression, as the General Aggression Model (Anderson & Bushman, 2002) depicts. In this dissertation, I tested a longitudinal model based on the GAM, to determine if violent video game exposure was a direct predictor of physical aggression as well as an indirect predictor via changes in aggressive personality and aggressive attitudes.
Finally, this dissertation assessed whether violent video game exposure has differential effects on players at different stages of development. Kirsh (2003) indicated that researchers should focus on how violent video game exposure affects players of all ages. Anderson et al. (2007) suggested that exposure to violent video games is going to have a greater effect on younger players than older players, leading to greater increased physical aggression among the former. However, the results of previous research have been inconsistent, with some researchers finding the effect of violent video game exposure is stronger among older players (Sherry, 2001) and other researchers reporting no differences among players of various ages (Anderson, 2004). More recently, Anderson et al. (2010) reported a trend for correlational studies of the violent video game exposure and aggression with the association between these variables being stronger among younger than older players. In this dissertation, direct comparisons were made between middle school and high school students to determine if stage of development moderated the association between violent video game exposure and physical aggression.
CHAPTER I

PHYSICAL AGGRESSION

Defining Physical Aggression

Although individuals regularly experience acts considered to be aggression, operationally defining such behavior has not been simple for researchers. In one of the more widely cited definitions of aggression, Buss (1961) defined aggression as “a response that delivers noxious stimuli to another organism” (p. 1). Although this definition focuses on harmful effects of the behavior being labeled aggression, there are instances in which an actor causes harm to a target that was unintended, such as an accident. Other researchers have included intent as a prerequisite for labeling aggression (e.g., Dollard, Doob, Miller, Mower, & Sears, 1939) and it is commonly accepted that both intention and attempted acts should be included in definitions of aggression (Geen, 1990).

As Bushman and Huesmann (in press) indicated, aggression can take many “forms” including physical aggression (in which the actor uses bodily force or weapons to harm a target) and verbal aggression (where abusive language is used to harm another individual). Identifying what behaviors are labeled aggression is crucial when attempting to explain differences in reports of aggression. For example, researchers have typically reported that girls and women are more likely to use verbal aggression; whereas boys and men are more likely to use physical aggression (e.g., Crick & Grotpeter, 1995). The proposed dissertation will examine the association between physical aggression,
violent video game exposure, and personality traits.

Researchers have offered different conceptualizations of physical aggression. For example, Geen (1990) suggested that physical aggression can be further differentiated depending on the goal of the behavior (for similar distinctions see Dodge & Coie, 1987; Feshbach, 1964). In one form of aggression, labeled affective aggression (also termed hostile or expressive aggression, see Berkowitz, 1993), the goal of the aggression is to simply harm a target. It is labeled affective aggression because the aggressive acts occur while the actor is in the state of anger, an emotional state elicited by the target. The other form of behavior that Geen (1990) described was labeled instrumental aggression. Where the goal of affective aggression is to harm the target, instrumental aggression occurs when the actor uses aggression for some other means; the actor acts aggressively toward the target to reach some alternative goal, such as obtaining an object.

Therefore, utilizing components of the research cited above, I define physical aggression in this dissertation as the actual or attempted use of bodily force or a weapon directed at a target intended to cause physical harm to the target for the purposes of physically hurting the target or obtaining some other goal. This definition encompasses actor intent, motivation to act aggressively and the perception that his/her actions will harm the target with the goal of that behavior being either affective or instrumental (Geen, 1990). The definition of physical aggression also focuses on bodily behaviors in which the actor is motivated to complete, but does not include verbalizations, emotional responses, or cognitions.

It should also be noted that the definition above is similar to the everyday use of the term violence. Physical aggression is often referred to as violence/antisocial behavior.
in the criminological and sociological literature (Flannery, Vazsonyi, & Waldman, 2007). However, the major difference between the current definition of physical aggression and violence is legal status (Tolan, 2007). Many of the behaviors defined as physical aggression in the current review could be considered violent, as they are illegal, but not all behaviors identified as physical aggression are violent (i.e., illegal).

**Social Learning Theories of Physical Aggression**

Several theoretical accounts have concentrated on evolutionary (Buss, 1991), biological and genetic (Archer, 1988; Book, Starzyk, & Quinsey, 2001; Nelson, 2006; Rhee & Waldman, 2007), personality (Blonigen & Krueger, 2007), behavioral (Burgess & Akers, 1966; Skinner, 1938, 1965; Sutherland, 1947), and parental/familial (Amato & Keith, 1991; Patterson, DeBaryshe, & Ramsey, 1989) explanations for why human beings act aggressively. These varied theoretical contributions emphasize the dynamic nature and multiple factors that influence an actor to be aggressive; however, many researchers investigating violent video games and aggression have used different social learning theories to account for how this exposure may affect aggressive behavior (for reviews see Anderson et al., 2007; Kutner & Olson, 2008).

**Social Learning Theory in Psychology**

Social learning theories in psychology begin with general learning theories, most notably the theory of *operant conditioning*. In his theory of *operant conditioning*, Skinner (1938, 1965) indicated that all behavior was acquired based on environmental contingencies placed on that behavior. If the consequences of a behavior were positive, that behavior was said to be reinforced, increasing the likelihood that the particular behavior would be repeated in the future. Conversely, if the consequences of a behavior
were negative, that behavior is said to be punished and the likelihood of the behavior being repeated in the future was decreased. Psychologists using operant conditioning paradigms during the 1960s demonstrated that the likelihood of aggression increased when individuals were rewarded for engaging in such behavior (see Bushman & Huesmann, in press).

The difficulty in applying operant conditioning to all aggressive responding was that the theory stated that all behavior must be directly rewarded or punished. In contrast to this paradigm, other paradigms used during the 1960s were beginning to demonstrate that direct reinforcement was not necessary to acquire aggressive behaviors. In particular, researchers examining aggression in children (Bandura et al., 1961, 1963) demonstrated that children could acquire aggressive behaviors via observational learning. In Bandura's studies, children watched adult models act aggressively toward a target (the famous “Bobo doll”) and were either rewarded or punished for such behavior. After watching adults perform the behavior, children given the opportunity to interact with the doll were more likely to act aggressively toward the doll when they watched an adult being rewarded for similar behavior. Bandura et al. (1961) suggested that the increase in aggressive responding in children was the result of vicarious reinforcement. When children viewed adults being rewarded for engaging in a behavior, this would lead children to believe they would be rewarded for engaging in that behavior when in a similar situation.

Incorporating subsequent research examining the nature of vicarious reinforcement, Bandura (1973) established his influential social learning theory. According to his theory, aggressive behavior was learned through viewing others behave
aggressively. Distinct from Skinner's (1938, 1965) learning theory, Bandura argued that learning could occur without the individual ever engaging in a particular behavior; individuals could learn behavior by viewing others and then reproducing the behavior later. Witnessing others perform a particular behavior and be rewarded, individuals later placed in a similar situation would be more likely to reproduce the modeled behavior. Researchers interested in the effects of violent media, in general, have found that social learning processes described by Bandura (1973) can explain why viewing violent media would lead to increased aggression (see Huesmann & Kirwil, 2007).

When applied to violent video game exposure, Bandura's (1973) theory would stipulate that violent video game exposure leads to physical aggression because players will model the aggressive acts viewed while interacting with these games. Further, because players in video games are rewarded for being violent (as the goal of these games is often to be aggressive), players would be more likely to be influenced by violent video game exposure than other forms of violent media (Carnagey & Anderson, 2004; Gentile & Anderson, 2003)

In updating his social learning model, Bandura (1986) indicated that cognitions played a crucial role in acquiring and maintaining behaviors via social learning. This social-cognitive model suggested that social learning was more complex than mere imitation; the environment and individuals interacted and were reciprocal (see also Bandura, 1999). Thus, when examining determinants of behavior, including aggressive behavior, one's expectations, goals, and attitudes affect how he/she perceive elements of the environment; these perceptions then affect how the individual chooses to interact with the environment. Social learning then encompasses a triad of factors (the individual, the
behavior, and the environment) that interact with each other to alter not only behaviors, but the thoughts, emotions, and feelings of all individuals in the social encounter. In this socio-cognitive model, violent video games can lead to physical aggression as repeated exposure to games alters the expectations and perceptions of players. Playing more and more violent video games, players are more likely to perceive that physical aggression is appropriate in certain situations. By repeatedly engaging in violent acts in these games, players come to associate violence with other beliefs about how one responds in certain situations. Beyond learning behaviors, playing violent video games also leads to more positive attitudes about violence.

Social-Information Processing Theories of Aggression

Following Bandura’s (1986) social-cognitive model, other researchers developed similar models to explain the development of aggressive behavior from social encounters. These models tended to be more complex, as they included detailed accounts of processes leading to aggressive behavior. For example, Huesmann (1988) suggested that the decision to engage in aggressive behavior was the result of social scripts, i.e., the rules guiding the sequence of expected behaviors in a social situation. When individuals enter an environment, they evaluate the situational cues and retrieve associated social scripts they have acquired over time. These scripts are developed from repeated social encounters and contain the associated behaviors deemed appropriate for the situation as well as related attitudes and beliefs. The network of cognitions and emotions contained in these social scripts differ for all individuals; aggressive individuals are more likely to have social scripts that include aggressive behavior as a solution to social problems and negative, hostile emotions (Huesmann & Kirwil, 2007). These scripts can be developed
and strengthened by playing violent video games; players develop scripts of when and where violence is appropriate by viewing violence in multiple contexts via video games. As Gentile and Anderson (2003) discuss, playing violent video games has the potential for developing detailed aggressive scripts as these games depict graphic and comprehensive violent scenes. Often players are involved in highly complex aggressive acts which include fighting, shooting, and coordinated violent acts by multiple on-screen characters. These experiences lead to aggressive scripts that are more easily activated and more likely to be acted upon by players in everyday life.

Other socio-cognitive aggression models emphasize different cognitive components deemed essential for making decisions in complex environments. For example, Crick and Dodge (1994) offered a developmental cognitive model with behavior as the result of social-information processing (SIP) in which adolescents engage in five processes in a systematic manner. Later, Crick and Dodge (1996) revealed that the following two processes were most relevant to the development of aggressive behavior in the SIP: hostile attributions which occur in the encoding and representation phases and approval of aggressive behavior. First, aggressive individuals tend to attribute aggressive and hostile intentions from social cues that others view as neutral or not aggressive. By attributing hostile intent when one does not exist, aggressive individuals perceive that aggressive behavior is necessary. Second, individuals who view aggression favorably and believe aggressive behavior is appropriate in many social contexts are more likely to respond with aggression when compared to others who do not believe aggression is an appropriate response. Similar to Bandura’s (1986) socio-cognitive model, the SIP suggests that exposure to violent video games increases the likelihood that
players will be aggressive in real-life because exposure to these games leads players to alter attributions and attitudes. More specifically, Crick and Dodge (1996) indicated that this form of exposure led players to attribute hostile intent to others' behavior because of repeated exposure to violence in video games. Further, players were more likely to believe aggression was appropriate in multiple contexts because they often engaged in aggressive acts in multiple scenarios while playing violent games. Aggression in violent video games was also often rewarded, leading to greater approval of the behavior as a necessary and favorable solution to conflicts that occur in real life.

**The General Aggression Model**

Although these social-learning and socio-cognitive models have all been applied to explain why exposure to violent video games leads to greater physical aggression (see Anderson et al., 2007), the most dominant theory in the video game literature is the General Aggression Model (GAM). The GAM (Anderson & Bushman, 2002; Anderson et al., 2007) was created to provide a parsimonious model of aggression that incorporated previous theories and models including social learning theory, cognitive models, affective models, and developmental theories of aggression (see also Bushman & Anderson, 2002). Central to the model is the understanding that behavior, including aggressive behavior, is developed and maintained by alterations in individuals' cognitive systems. These systems contain "knowledge structures" which are created through experience in the world, influence perception and guide behavior in the environment, are linked to each other and emotional states, and through repeated use become automatized (also see Fiske & Taylor, 1991).

To explain aggressive behavior, the GAM model focuses on what is termed an
“episode”. Each episode is said to consist of three distinct features, the inputs (i.e., the attributes of the person and the situation), routes (i.e., the individual’s knowledge structures and emotional states), and outcomes (i.e., the individual’s interpretation of the situation and subsequent behavior) (see Anderson & Bushman, 2002, p. 34). The GAM is meant to explain the development and maintenance of aggressive behavior in general; however, some researchers have used this framework to explain the link between violent video game exposure and aggression (e.g., Anderson & Bushman, 2001; Carnagey & Anderson, 2004). Recently, Anderson and colleagues (2007) used the GAM to describe how repeated exposure to such games can lead to long term increases in aggressive behavior by permanently altering players’ aggressive personality. These researchers argued that playing violent video games over time alters the cognitive components that comprise aggressive personality in the GAM (see Anderson & Bushman 2002, p. 42).

Through repeated exposure to violent video games, players are more likely to attribute hostile intentions in others’ behavior and more likely to perceive ambiguous stimuli as hostile or aggressive. Over time, this repeated viewing of aggressive acts being rewarded via violent video games leads the avid player to be hyper vigilant to situational cues that may trigger aggressive thoughts, feelings, and behaviors (Carnagey & Anderson, 2004). Thus, playing violent video games primes players to perceive aggressive intents when those intentions may not exist. Multiple violent video game exposures also lead to greater approval and acceptance of aggression. Whereas individuals who do not play violent games would believe that aggression is not acceptable behavior, frequent players of violent video games would believe that aggression is appropriate in many circumstances. Other long-term effects of violent
video games can be found through the development of aggressive scripts. Repeated exposure to violent video games can lead to the development of detailed aggressive scripts that players may utilize when they enter different situations (e.g., Huesmann, 1988; Gentile & Anderson, 2003). The culminating effects of these long-term mechanisms are theorized to lead to the development of an aggressive personality. By developing an aggressive personality, violent video game players are more likely to mimic the aggressive acts they witness on the screen in real life.

While early socio-psychological theories directly examined the learning of behavior via observation (Bandura, 1973), later theories have focused on the development of aggressive beliefs and cognitions that are acquired through observation and are believed to be predictive of later aggression (e.g., Crick & Dodge, 1996). The most recent conceptualization of social learning suggests that repeated exposure to models in the environment leads to the development of a personality that is more likely to use aggression under certain situations (Anderson et al., 2007). All of these social learning theories predict that exposure to violent video games leads to later aggression as constant exposure to violent behavior will lead to various cognitive, emotional and even behavioral tendencies endorsing and utilizing such behavior.

The Development of Physical Aggression and Violence in Adolescence

One of the strongest predictors of future physical aggression and violent behavior is the extent to which an individual is aggressive when he/she is younger (Coie & Dodge, 1998; Juon, Doherty, & Ensminger, 2006; Loeber, 1982; Olweus, 1979). In childhood, the extent to which a child engages in different forms of aggression remains relative consistent as he/she grows and matures. Longitudinal researchers find that displays of
aggression during early childhood predict reports of such behavior later in adolescence (Loeber et al., 1993).

Similar results have been found when assessing the stability of aggressive behavior from childhood into adulthood, indicating that expressions of aggression during childhood predict later physical aggression in adulthood (for a review see Farrington, 2007). Although the consistency of aggression is relatively stable through the life-course, researchers do report that such behavior tends to increase in mid to late adolescence with the onset of increased physical aggression and violent behavior beginning early in adolescence, peaking during mid to late adolescence, and subsiding by late adolescence for most offenders (Moffitt, 1993).

Pertinent to this dissertation are the increases in risky behavior, particularly the prevalence of physical aggression in adolescence. Many different indices indicate that the prevalence and intensity of risky behavior that are aggressive and violent in nature increase during the middle school and the high school years (see United State’s Center for Disease Control, 2008). Official crime statistics also suggest that middle to late adolescence is associated with increased engagement in physical aggression and violent behavior. FBI (2008) arrest reports find that the number of adolescents arrested in 2007 for violent crimes (e.g., homicide, rape, aggravated assault) increased incrementally beginning at ages 13-14 with the number of juveniles being arrested for any violent crime peaking at age 18 and then decreasing by 31% by age 24.

Not only does the frequency of violent behavior increase during mid to late adolescence, but the severity of such behavior also intensifies. According to Loeber and his colleagues (1993, 1997), the onset of more serious and lethal forms of physical
aggression emerges during middle to late adolescence. Their research has utilized data from the Pittsburgh Youth Study, a longitudinal study of antisocial behavior among 1500 Pittsburgh youth in grades 1, 4, and 7. Analyzing multiple waves of data, these researchers report that the incidence of physical aggression among adolescents followed a pattern of systematic escalation with the onset of more serious forms of physical aggression occurring later in adolescence. While there was a linear increase in moderate forms of aggression (such as annoying others or bullying) from ages 3 to 16, the onset of more physically aggressive and violent behavior (e.g., fighting and attacking someone) began between ages 10 and 12, increased considerably from ages 10 and 12 to 16.

**The Role of Personality Characteristics in Physical Aggression**

The General Aggression Model (Anderson & Bushman, 2002) suggests that the mechanism by which violent video games influence aggressive behavior is via personality change. Some researchers have argued that the reports of consistent aggressive behavior throughout the life course indicate that aggression may be part of an individual's personality (Buss, 1991; Zuckerman, Kuhlman, Thornquist, & Kiers 1991).

Despite the considerable evidence suggesting that human personality can be described by the “Big Five” (Costa & McCrae, 1992; McCrae & Costa, 2007), not all researchers agree that these dimensions accurately describe variations in human behavior and thus, other personality traits may better describe personality. For instance, Zuckerman et al. (1991) asked college students to complete 33 various personality scales measuring multiple traits, including those identified by Eysenck (1990) as well as scales measuring attributes such as impulsivity, hostility, autonomy, social participation, and other traits (see p. 930 for all scales used in the study) similar to those that comprise the
"Big Five" (Costa & McCrae, 1992). Using two forms of data reduction, these researchers reported that a five-factor model best described the variations of personality revealed in all four samples of students surveyed. However, the factors that emerge were distinct from the typical "Big Five" (Costa & McCrae, 1992), with one trait being Aggression-Hostility.

A popular measure of "trait aggression" with strong reliability and concurrent validity (Bernstein & Gesn, 1997; Bushman, 1998; Sharpe & Desai, 2001; Suris et al., 2004) is the Aggression Questionnaire developed by Arnold H. Buss and Mark Perry (1992). This 29-item questionnaire measures four forms of aggression, Physical Aggression, Verbal Aggression, Anger, and Hostility. Researchers interested in assessing one's natural tendency to use aggression, i.e., trait aggression, often use the Aggression Questionnaire (Buss & Perry, 1992) to assess this domain. There are many reasons why researchers use the scale. Scores on this measure are strongly related to aggressive behavior exhibited in laboratory experiments and in the real world (Anderson & Busman, 1997; Anderson et al., 2004; Archer & Webb, 2006; Brady, 2007; Bushman, 1995; Fritz, Wiklund, Koposov, Klinteberg, & Ruchkin, 2008). Examining different subscales of the Aggression Questionnaire (Buss & Perry, 1992), researchers find that scores on the different scales are strongly associated with other self-reported measures of aggressive behavior, aggressive beliefs/emotions and aggressive cognitions (Anderson et al., 2004; Archer, 2004; Archer & Haigh, 1997; Archer & Webb, 2006; Brady, 2007; Marsee, Silverhorn, & Frick, 2005). For instance, Harris (1995) found that the subscales of the Aggression Questionnaire (Buss & Perry, 1992) had good test-retest reliability and scores on the four scale were positively associated with clinical measures of different forms of
aggression (e.g., physical, verbal, impulsive), antisocial attitudes, anger, aggressive attitudes among a sample of college women. Scores on the trait aggression questionnaire (Buss & Perry, 1992) are associated with “Big Five” personality traits (McCrae & Costa, 2007). For instance, Sharpe and Desai (2001) found that scores on the questionnaire were associated with the “Big Five” trait of Neuroticism and negatively associated with the traits of Agreeableness and Conscientiousness (for similar results see Tremblay & Ewart, 2005).
A Brief History of Video Games

Video games first gained widespread attention in 1972 with the release of one of the first electronic video games: Atari's Pong. The rudimentary pong consisted of two players controlling a side of the screen with the goal of hitting a white ball back and forth. Popularity of the electronic video games grew during the 1970s leading to more sophisticated and goal oriented games such as Space Invaders (1978) and Pac Man (1980) (see Weiss, 2007).

Although during the 1970s and 1980s, home computers could play some video games and the technologically savvy created their own home gaming systems, the first major home video game system to become a household name was the Atari 2600, which debuted in 1977 (Fox, 2006). The Atari 2600 with its simple graphics increased the console's popularity and inspired the creation of video consoles by other manufacturers who were consistently attempting to improve game play and graphics. Even so, the graphics of the early video games produced in the late 1970s and into the 1980s were basic. They consisted of very few colors and graphics that only slightly resembled figures in real life. Game play was also simple, with games having relatively basic plots with players controlling a figure (known as an avatar) who progressed through a game in a structured manner. Further, game play was simplistic, with only a two-dimensional screen surface, which lacked realism. The violent video games of the first home systems

The Video Game Revolution

Concern regarding the effects of repeated exposure to video games shortly began to gain media attention as the popularity of the media increased (Kutner & Olson, 2008). This concern focused on the effects of violent video games, as these games were, and still are, the most popular video games (Children Now, 2001; Kutner & Olson, 2008; Lenhart, et al., 2008). As video game popularity grew during the 1980s and 1990s, companies continued to develop more sophisticated video games including better graphics and more sophisticated game play. Gentile and Anderson (2003) pointed out that the violent video games being released in the mid-late 1990s and into 2000s were distinctly more graphic and intense. Newer violent video games on systems such as Sony’s Playstation 2 and Microsoft’s Xbox contained realistic, graphic violent depictions that were not possible in previous video game systems. Now even more powerful video game systems exist including the Playstation 3 and Xbox 360 which both provide even more detailed graphics at faster speeds. These more sophisticated video game machines now have the capability of providing fast paced games that moved in real time and have the ability to produce vibrant, realistic graphics, providing players true-to-life interfaces that resemble 3-D environments (Carnagey & Anderson, 2004; Kent, 2001).

Compared to early violent video games, modern violent video games now allow players to engage in extremely violent acts using realistic looking weapons and
characters. Researchers have assessed the effects of these more realistic violent video games on players and revealed that more realistic violent video games do have serious effects on players. Comparing technological advancement in video games, Ivory and Kalyanaraman (2007) controlled for violent content in video games and compared recent video games with video games produced in the early nineties and revealed that more recent video games were associated with greater physiological arousal and increased identification with characters in video games.

Similarly, other researchers specifically have examined violent video games and have revealed that more advanced violent video games, which include realistic graphics and 3-D environments, lead to increased physiological arousal, hostility, and aggressive thoughts and in some instances more aggressive behavior (Arriaga, Esteves, Caneiro, & Monteiro, 2008; Krcmar & Farrar, 2009; Persky & Blascovich, 2008; Tamborini et al., 2004). Other researchers have also indicated that the level of gore and amount of blood in modern video games predicts physiological arousal, ratings of hostility, and reports of aggression. Video games with more blood and gore lead to greater increases when compared to games with little or no blood and gore (Ballard & Weist, 1996; Barlett, Harris, & Bruey, 2008; Barlett & Rodeheffer, 2009; Krcmar & Farrar, 2009).

Although early violent video games depicted scenes including gun fire and fighting, the rudimentary graphics make those games seem unrealistic when compared to violent video games created twenty years later. These first generation violent video games may have had violent content, but not to the extent found in more recent video games (Carnagey & Anderson, 2004). Video game developers have utilized the capability of newer video game systems to display vibrant colors and life-like graphics.
The resulting violent video games of the 1990s and 2000s are much more realistic, violent, graphic, and interactive; therefore, it is possible that such drastically different video games may have different effects on players. Previous reviews of the violent video game research (see Bensley & Van Eenwyk, 2001; Carnagey & Anderson, 2004; Gentile & Anderson, 2003; Sherry, 2001) have suggested that these studies should be examined separately, because the effects of more recent violent video games should be greater than previous earlier games.

**Early Correlational Studies of Video Games and Aggression**

The first studies assessing the short term effects of violent video games did not offer conclusive evidence that violent video games affected individuals’ physical aggression. This partly may be due to earlier researchers’ failure to consider the how different types of video game exposure would affect players; instead, researchers assessed the association between time spent playing any type of video game and physical aggression. In one of the first surveys of adolescents, Dominick (1984) described that self reported amount of time playing video games was associated with reports of aggressive behavior among tenth and eleventh graders. Other researchers also examined children’s reports of time spent playing video games and found that these reports were positively associated with teachers’ reports of aggression and impulsivity for fourth through sixth grade students (Lin & Leper, 1987).

Other researchers used similar questionnaires and found that playing video games was associated with reports of physical aggression. For instance, Fling and colleagues (1992) examined both students’ self-reported aggression as well as teachers’ reports of aggression and student video game playing. These researchers surveyed students in
grades six through twelve and asked how often they played video games in a typical month (frequency), how many years they have been playing video games, and how much time they spent playing video games during a session (which was combined to form a measure of amount of video game play). Correlational analysis revealed that both frequency and amount of time spent playing video games significantly predicted both students’ reports of using physical aggression as well as teachers’ physical aggression ratings with students playing more video games being more aggressive. A comparable correlational analysis performed by Durkin and Barber (2002). Using data collected in 1988, Durkin and Barber (2002) asked 10th grade students how often they played video games and how many times in the past six months they engaged in aggressive behavior (i.e., had punched, kicked, or hit someone). Using these limited measurements of video game exposure and physical aggression, the researchers found a trend with adolescents who spent more time playing video games reporting more aggressive behaviors than participants who reported never playing any video games.

Other studies of video game usage offered conflicting results and interpretations. For instance, Kesetenbaum and Weinstein (1985) examined boys’ (aged 11-14) video game playing, personality, and psychological functioning. Researchers classified boys as either low or high video game players and reported that high video game players reported that they felt more relaxed after playing video games than low video-playing boys. However, relative to lows, high video game players also reported that they got in more trouble with the police, that they were more impulsive, that they were less able to delay gratification, and that they were more easily frustrated. Although the researchers interpreted these results to indicate that playing violent video games led to cathartic
effect, reducing aggression, their results did not support this claim (see Dill & Dill, 1998). Egli and Meyers (1984) also surveyed adolescents and found that time spent playing video games was not related to life outcomes including family and social life, although these researchers did not directly measure aggressive emotions or behavior. Other early surveys of video game players indicated that adolescents who played more video games were more intelligent and better adjusted than adolescents who played fewer or no video games (McClure & Mears, 1984).

While researchers using self-reports of physically aggressive behavior (e.g., Dominick, 1984) found associations between video game play and physically aggression, other researchers (e.g., Kesetenbaum & Weinstein, 1985) did not find that reports of playing video games were associated with negative life outcomes. However, these self-report studies suffer from many methodological limitations including a failure to measure violent video game exposure, as well as limited measures of physical aggression. To overcome these limitations, future researchers began to use better measures of exposure to violent video games, and included more precise measures of these variables to garner a better understanding of how violent video games might affect physical aggression.

Recent Correlational Studies of Exposure to Violent Video Games and Aggression

With the increase in sophistication and graphic violence in video games during the 1990s and into the 2000s (Gentile & Anderson, 2003; Kent, 2001), researchers investigating effects of violent video game exposure began to report that such exposure was associated with increases in aggressive attitudes, hostile attributions, aggressive personality, and physical aggression. For instance, Anderson and Dill (2000, Study 1) asked college students to report how often they played their five favorite video games as
well as rate the level of violence in these games. Researchers also asked participants to complete multiple dependent measures including Buss and Perry’s (1992) *Aggression Questionnaire*, Caprara et al.’s (1985) *Irritability Scale* (which measures one’s inclination to respond to life events quickly, without thinking), and the delinquent behavior scale from the National Youth Survey (Elliott, Huizinga, & Ageton, 1985), with respondents reporting how often during the last year they engaged in violent delinquent behavior (e.g., “hit (or threatened to hit) another student”) and nonviolent delinquent behavior (e.g., “taken a vehicle for a ride (drive) without the owner’s permission”). Using a composite score of violent video game exposure, researchers revealed that violent video game exposure predicted students’ reports of both violent and nonviolent delinquent behavior and these associations remained even after controlling for Trait Aggression, Irritability, and total video game playing.

Although researchers have revealed that violent video game exposure was associated with self reports of physical aggression, the above research failed to consider if the association between the variables was related to some third, unmeasured variable. While this research has controlled for Trait Aggression (Buss & Perry, 1992), there are other personality variables that could account for the relation, such as personality variables like the “Big Five” (Costa & McCrae, 1992). To examine if controlling for these variables diminished the association between violent video game exposure and physical aggression, Anderson and colleagues (2004, Study 1) examined college students’ self-reported violent video game exposure and both severe physical aggression (i.e., the violent delinquent subscale in Elliott et al., 1985) and mild aggression (i.e., Buss & Perry’s (1992) trait Physical Aggression). While controlling for these predictor
variables, researchers found that self-reported violent video game exposure predicted both mild aggression and severe aggression. However, these researchers did find that controlling for aggressive cognitions reduced the effect of violent video game exposure on aggression, indicating that cognitions may mediate the association between the two variables.

Bartholow and colleagues (2005, Study 1) conducted a similar analysis using a convenience sample of college students and found that while controlling for “Big Five” personality variables (Costa & McCrae, 1992b), hostility, and empathy, violent video game exposure significantly predicted participants reported physical aggression. Using mediation analysis, Bartholow et al. (2005) revealed that the effects of violent video game exposure on physical aggression were both direct and indirect via pathways through hostility and empathy. Greater exposure to violent video games led to lower empathy scores and higher hostility scores, which in turn, were associated with greater physical aggression.

Although much of the correlational evidence focused on adult samples, evidence of the effects of video game playing on physical aggression has been reported among adolescents. For instance, Gentile, Lynch, Linder and Walsh (2004) found that violent video game exposure significantly predicted eighth and ninth grade students’ reports of being in a physical fight. Similarly, Anderson et al. (2007, study 2) found that high school students’ reports of playing violent video games predicted their reports of physical aggression. This association remained significant even when the researchers controlled for sex, total media exposure, aggressive attitudes, and aggressive norms. Similarly, Bucolo, Trinkner, Cohn, Rebellon, and Van Gundy (2009) reported that violent video
game exposure predicted reports of physical aggression among 7th grade and 10th grade students. These researchers found that exposure to violent video games significantly predicted physical aggression in both groups of students even after controlling for sex and personality measures including items from Buss and Perry’s (1992) physical aggression subscale, and measures of impulsivity, risk seeking, and temper (Grasmick, Tittle, Bursik, & Arneklev, 1993).

Using parental estimates of video game exposure and aggression among children aged 6-10, Hastings et al. (2009) reported that exposure to video games was negatively associated with children’s overall GPA and school competence and positively associated with reported aggressive behavior and delinquent behavior; however, violent video game exposure was only marginally ($p < .10$) associated with increased reports of aggressive behavior. It is possible that the failure to find that violent video game exposure affected children in this study could be due to the parental rating of these games and possible under reporting of violent video game exposure.

Kutner and Olson (2008) conducted in-depth interviews with seventh and eighth grade students regarding their video game exposure and negative life events, including reports of getting into fights at school, beating up others, and damaging others’ property. Researchers revealed that male and female students who played M-rated video games (i.e., only acceptable for players over 17 as the games contain adult content, including violence, see Entertainment Software Association, 2009) on a regular basis, were more likely than students who have not played to engage in the above mentioned aggressive behaviors (see also Olson et al., 2009). Although a majority of the M rated games do contain graphic, violent content, not only M-Rated games are violent. So, while Kutner
and Olson (2008) found that M-Rated games were associated with physical aggression, it is possible that their study underestimated the effect that playing violent video games have on adolescent aggressive behavior because they did not specifically investigate this type of video games exposure.

Summarizing the results of the research examining violent video game exposure and physical aggression, several literature reviews have concluded that exposure to violent video games is a contributing factor to players' aggression (Dill & Dill, 1998; Carnagey & Anderson, 2004; Gentile & Anderson, 2003). Researchers using meta-analytic techniques have also found that, across studies, exposure to violent video games can account for a significant amount of variance in players' aggressive behaviors, aggressive cognitions, and aggressive attitudes (e.g., Anderson & Bushman, 2001; Sherry, 2001). A more recent meta-analysis conducted by Anderson and colleagues (2010) examined the relation between violent video game exposure and the same aggressive outcomes in 136 research studies and again concluded that exposure to said games was significantly related to aggressive behaviors, aggressive cognitions, and aggressive attitudes. Further, using procedures similar to Anderson (2004), Anderson et al. (2010) reported that the effects of violent video games on aggressive outcomes were stronger in studies using more rigorous research designs.

**Longitudinal Examinations of Violent Video Game Exposure and Aggression**

To date, most studies assessing the relation between violent video game exposure and physical aggression have utilized cross-sectional research designs. Only recently, have researchers investigated the long-term effects of violent video games using various longitudinal designs. For example, Anderson et al. (2007, study 3) asked students in
grades 3 through 5 to complete two questionnaires over an average span of four months. Both questionnaires asked students to report how often they played violent video games (using Anderson & Dill's (2000) composite measure of violent video game exposure) along with other reports of engaging in physical aggression, (i.e., (1) hits, kicks, or punches others, and (2) pushes and shoves others). Path analyses revealed that violent video game exposure at Time 1 had a direct effect on Time 2 physical aggression with those playing more violent video games engaging in more physical aggression four months later. In addition, the effect of violent video game exposure was also indirectly related to physical aggression via hostile attribution bias—violent video game exposure at Time 1 predicted hostile attribution bias (averaged across both Time 1 and Time 2), which was positively associated with physical aggression measured at Time 2.

Möller and Krahé (2009) tested a longitudinal mediated model, based on the General Aggression Model (Anderson & Bushman, 2002), among a sample of German teenagers. Their model examined whether violent video game exposure would predict increased physical aggression (measured using Buss & Perry's 1992 Aggression Questionnaire) via changes in normative beliefs about aggression over a 30 month span. Their analysis revealed adolescents' reports of exposure to violent video games at Time 1 predicted physical aggression at Time 2. As the GAM (Anderson & Bushman, 2002) predicts, meditated path analysis revealed that violent video game exposure did not have a direct effect on physical aggression. Rather, researchers reported that playing violent video games lead to increased beliefs that aggressive behavior was an acceptable way to react to life events (i.e., normative beliefs about aggression) which was related to reports of physical aggression. Similarly, Hopf, Huber, and Wei (2008) reported results of a two
year longitudinal study of German adolescents examining the long term effects of violent media consumption on aggression. Violent video game exposure had direct effects on reports of student violence, a composite measure including verbal and physical aggression, with exposure to the medium during Time 1 predicting student violence two years later, while controlling for sex, socioeconomic status, students' violence reported during Time 1, students' attitudes toward violence and family reports of aggression taken during Time 1.

Using part of the same dataset Anderson et al. (2007) examined, Anderson and colleagues (2008) completed a longitudinal analysis comparing three cohorts of participants: one American cohort of children aged 9-12, one Japanese cohort consisting of children aged 12-15, and a second Japanese cohort of children aged 13-18. Exposure to violent video games in the older Japanese cohort was measured by having respondents complete a Likert scale indicating how often they played different categories of games and then summing 5 categories (e.g., action, first person shooter) to form a measure of violent video game exposure. Video game exposure for the other two cohorts was assessed by having respondents report their three favorite games and the amount of violence in each game and then using a composite measure of these ratings. Depending on the cohort, researchers asked participants to complete various criterion measures, including a 6 item trait physical aggression scale (the first Japanese cohort), a one item frequency item (second Japanese cohort) or a composite aggression measure of self reports, peer nominations, and teacher ratings reports of past year aggression (American cohort). Measurements of all variables occurred in two waves with the average time between waves being four months for each cohort. Longitudinal analysis indicated that
for each cohort, violent video game exposure during Time 1 significantly predicted measures of future aggression after controlling for sex and aggression reported at Time 1. Further, moderation analysis indicated that the association between Time 1 violent video game exposure and Time 2 physical aggression was stronger for the two younger Japanese and American cohorts when compared to the older, Japanese cohort.

Gentile and Gentile (2008) relied on parts of the dataset identified by Anderson et al. (2007) and examined elementary school children’s (grades 3-5), exposure to violent video games and reports of physical aggression, using self report, teacher report, and peer reports of various aggressive behaviors. The longitudinal prediction models replicated the reports above and indicated that violent video game exposure during Time 1 predicted children’s aggression 5 months later, after controlling for previous aggression, hostile attribution bias, sex, and total amount of video game playing.

The types of violent depictions in violent video games may have differential effects on adolescents. Shibuya, Sakamoto, Ihori and Yukawa (2008) used a longitudinal design and measured fifth grade students’ aggression (using the four subscales of the Buss and Perry (1992) Aggression Questionnaire, and a four item aggressive behavior measure) and monthly video game exposure twice, once during the December 2001 and again during November/December 2002. Students reported their three favorite video games and how often they played them during the first data collection. Video games were then coded for presentations of violence and the context in which violence occurred (e.g., violence was rewarded, violence was realistic/unrealistic, etc). Researchers found that while controlling for aggression at Time 1, violent video game exposure did not predict later aggression among either boys or girls. However, specific portrayals of
violence were associated with increased physical aggression in boys including violent video game exposure that had portrayals of justified violence and also had an attractive perpetrator. Unexpectedly, the opposite was reported for girls, with justified violence being negatively associated with later physical aggression.

While researchers have reported that playing violent video games is associated with self-reported physical aggression (e.g., Gentile & Gentile, 2008), researchers have not conclusively shown that violent video game exposure predicts later physical aggression. These correlational studies have found that the association of violent video games and physical aggression exists when controlling for other predictors of physical aggression, including personality and attitudes toward violence (e.g., Bartholow et al., 2005). However, most correlational studies are cross-sectional; thus, these studies can not establish if playing violent video games early in life predicts physical aggression later in life. Recently, a few studies have utilized longitudinal designs to investigate the effect of long term violent video game exposure. These researchers have begun to find that playing violent video games during one time predicts physical aggression at a second time (e.g., Hopf et al., 2008). The GAM (Anderson et al., 2007) predicts that long term exposure to violent video games alters aggressive personality and that aggressive personality is a mediator between violent video games and physical aggression. While some initial research has begun to assess claims made by the GAM (e.g., Anderson et al., 2007), the model has not been completely tested.

**Limitations of Current Research**

Researchers critical of correlational and self-report studies of violent video game exposure and physical aggression have suggested that video game researchers (such as
Anderson & Dill, 2000) have overstated the effects of this medium on players' aggressive behavior. For instance, Olson (2004) pointed out that although violent video games have gained in popularity and have become increasingly violent during the 1990s and earlier 2000s, rates of violent crime in the United States (e.g., see U.S. Department of Justice, 2008) actually decreased, indicating that violent video game proliferation was not associated with amount real life cases of violence. Ferguson (2007, 2008) also questioned the link between media violence and extreme acts of violence. He argues that researchers have failed to demonstrate a link between violent video game exposure and physical aggression that occurs in the real world (for a similar argument see Savage & Yancey, 2008).

Further, correlational studies of violent video game exposure and physical aggression suffer from methodological flaws limiting the generalizability of these studies to the real world. As Olson (2004) pointed out, researchers often confuse terms aggression and violence, claiming that associations with variables such as trait aggression or aggressive emotions and cognitions are equivalent measures of physical aggression and violent behavior. When researchers do examine physical aggression in these studies, they often do not provide an adequate operational definition. In this dissertation, an explicit operational definition of physical aggression was used (see p. 6); however, previous researchers do not provide such definitions in their own work, and thus they often rely on measures that do not capture the nature and essence of physical aggression.

Bucolo (2009) argued that when researchers do include behavioral measures of physical aggression, they often only measure a few behaviors (e.g., Gentile & Gentile,
2008). This limited operational definition does not validly reflect a wide range of physically aggressive behavior. In addition, other researchers tend to use composite measures of aggression, combining measures such as verbal aggression and physical aggression as one measure (e.g., Hopf et al., 2008). By combining multiple indices of aggression into one variable, these researchers cannot assess if violent video games increases physical aggression specifically.

While there are issues with how physical aggression is defined in previous research, the measure of violent video game exposure is also questionable. To measure exposure to violent video games, researchers often ask participants to list their favorite video games and then rate the amount of violence portrayed in these games (cf. Anderson & Dill, 2000). This measure relies on participants to rate the content of the games they play; this could lead participants to misrepresent the amount of violence in these games, underreporting or over reporting the amount of violence being displayed. Individuals who are more prone to view content as aggressive or violent may be more inclined to rate particular games as more violent when compared to individuals who are not naturally aggressive (see Crick & Dodge, 1996; Huesmann, 1988). Therefore, it is possible that players who are exposed to the same game may have different ratings of violent video game exposure (see Trinkner et al., 2010).

A better measure of violent video game exposure would have researchers measure the extent to which participants play particular games. Researchers would then use content analyses or video game industry ratings (Entertainment Software Association, 2009). This would provide a more valid and potentially reliable measure of violent video game exposure as all ratings of violent content would be based on an observable
standard. Some researchers have begun to use this methodology and find that measuring violent video game exposure using this approach is reliable and predictive of physical aggression (Anderson et al., 2008; Bucolo et al., 2009; Hopf et al., 2008; Möller & Krahé, 2009).

Most importantly, researchers using correlational research methods often only test parts of the General Aggression Model (Anderson & Bushman, 2002). Often, these researchers examine whether violent video game exposure predicts aggressive personality components and neglect testing whether personality mediates the relation between violent video game exposure and physical aggression. These studies often find that changes in cognitions partly mediate the relation between violent video game exposure and increased aggressive personality (Anderson et al., 2004; Anderson et al., 2008; Bartholow et al., 2005; Krahé & Möller, 2004). Still, other researchers have reported that changes in cognitions partly mediate the relation between violent video game exposure and physically aggressive behavior (Gentile & Gentile, 2008).

To date, only Ferguson et al. (2008, Study 2), have tested a fully mediated model, based on the GAM, that violent video game exposure increases aggressive personality which leads to greater physical aggression. These researchers asked college students to complete the entire Buss and Perry (1992) Aggression Questionnaire and report how often they play violent video games currently, as well as during high school and middle school. Researchers combined these reports to form a composite measure of lifetime violent video game exposure. To assess physical aggression, researchers asked students to report the number of times they engaged in 8 violent behaviors (see Elliot et al., 1985) over the course of their lifetime. Two regression analyses were performed to test
predictions made by the GAM regarding long term exposure to violent video games. Ferguson et al. (2008) first performed a regression analysis with trait aggression as the dependent variable; this analysis revealed that while gender, exposure to physical abuse, and verbal abuse (as a child) predicted trait aggression, violent video game exposure did not. Next, to determine if violent video games predicted violent behavior, a regression analysis with behavior as the criterion behavior was performed. While controlling for gender, trait aggression, and exposure to family violence, this regression analysis revealed that lifetime violent video game exposure did not significantly predict lifetime violent behavior. Further, researchers used structural equation modeling to compare predictions from the GAM (Anderson et al., 2007) and Catharsis Model (i.e. which would suggest that family violence is associated with aggressive personality which in turn predicts violence) and found that the Catharsis Model was a better fit to the data than the GAM (Ferguson, et al., 2008)

How violent video game exposure affects players of different ages is also not well understood. As Kirsh (2003) detailed, researchers examining the association among these variables have often ignored how player age may moderate any relation between violent video game exposure and physical aggression. Considering that players of different ages are at different developmental stages, it is possible that the effects of exposure to these games differ according to the players’ current level of development. Sherry (2001) provided evidence, using meta-analysis, that exposure to violent video games was actually stronger among older (i.e., adult) players when compared to younger (i.e., adolescent) players. Anderson (2004) did not find that age of participant moderated the effects of violent video game exposure on any aggressive outcome in his meta-analysis.
According to Anderson et al. (2007), the General Aggression Model would suggest that exposure to violent video games would have a greater effect on younger players when compared to older players. These younger players are more likely to rehearse and encode the violent images portrayed in these games leading to a greater likelihood that their aggressive personality will be altered, when compared to older players. Some preliminary evidence indicating this was the case was reported by Anderson et al. (2008). In that study, participants of different age groups also came from different countries, so it is possible that any differences reported in that study were due to cultural differences, and not age differences. Bucolo and colleagues (2009) found that the effect of violent video game exposure on physical aggression was strongest among high school students when compared to middle school students. The same study also failed to find that violent video game exposure predicted adult engagement in physical aggression. In their recent meta-analysis, Anderson et al. (2010) found a statistical tendency for correlational studies examining the effect of violent video games on aggressive behavior to have larger effect sizes when studies examine this effect among adolescent players than adult players. The inconsistent reports regarding the moderating effects of age on violent video game exposure on physical aggression indicates that future research directly testing if age moderates these associations is needed.

**Current Dissertation**

As researchers still debate the effect of violent video game exposure on physical aggression (Ferguson & Kilburn, 2010), it is apparent that the current body of research suffers from several methodological flaws. Researchers often do not use adequate measures of physical aggression that provide strong external validity to behaviors that
occur in the real world. The measurement of violent video game exposure used by most researchers (cf. Anderson & Dill, 2000) is also subjective, and it is possible that using this measure results in improper estimates of the effect of violent video game exposure on physical aggression (Bucolo, 2009). Further, while many research studies have been conducted to test the General Aggression Model (Anderson & Bushman, 2002), only one study has been conducted that tests all the predictions derived from this model (Ferguson et al., 2008). Further, even though the GAM (Anderson et al., 2007) suggests that the effects of violent video games will be greater among younger players than older players, this moderation has not been conclusively shown in the current literature.

Therefore, the current dissertation was designed to address the limitations of the previous research. Based on the growing need for research testing the General Aggression Model (Anderson & Bushman, 2002), data were collected from the New Hampshire Youth Survey (NHYS; Cohn et al., 2005), a 3 year longitudinal study of the predictors of rule-violating behavior. The General Aggression Model (Anderson & Bushman, 2002) indicates that violent video game exposure affects physical aggression by altering aggressive personality. Therefore, cross-sectional and longitudinal tests were conducted to determine if violent video game exposure predicted physical aggression directly and indirectly, via pathways through aggressive personality and aggressive attitudes. The measurement of violent video game exposure used was based on the Entertainment Software Association (2009) video game ratings using a categorical based measure of violent video game exposure (see Anderson et al., 2008; Trinkner et al., 2010). The measurement of physical aggression was taken from the National Youth Survey; this has been shown to be a reliable and valid measure of adolescent aggression.
in everyday life (Elliott et al., 1989; Huizinga & Elliott, 1986). Lastly, because the NHYS collects responses from two cohorts of students, these studies were conducted to test whether player age, measured using cohort (middle school, high school), moderated the associations among violent video game exposure and physical aggression.
CHAPTER III

TESTS OF THE GENERAL AGGRESSION MODEL

Previous Research Testing the General Aggression Model

Many researchers (e.g., Anderson et al., 2004; Anderson et al., 2007; Bartholow et al., 2005) have investigated the effects of violent video game exposure on aggression using the General Aggression Model (Anderson & Bushman, 2002). Few researchers have presented models that test all predictions made by the GAM. Anderson and Bushman (2002) theorized that repeated exposure to violent video games leads to increased physical aggression via its effect on aggressive personality. According to the GAM, aggressive personality is comprised of several different components including attitudes regarding aggression, cognitions and beliefs about aggression, and physiological functioning related to aggression (Anderson & Bushman, 2002). Often researchers include measures of personality and cognitions/attitudes toward aggression as control variables, demonstrating that violent video game exposure predicts physical aggression/aggressive behavior even after those variables are controlled in prediction models (e.g., Anderson et al., 2004; Trinkner et al., 2009). To date, only Ferguson et al., (2008) have tested a fully mediated model based on the GAM (i.e., violent video game exposure predicted aggressive personality which then predicted physical aggression) and reported that violent video game exposure was not predictive of physical aggression nor aggressive personality.
The first goal of this dissertation was to test the mediated model outlined by the General Aggression Model (Anderson & Bushman, 2002) with a sample of adolescents. I wanted to determine if violent video game exposure had an indirect effect on physical aggression, via pathways from aggressive personality and aggressive attitudes. A second goal of this study was to determine if violent video game exposure differentially affected adolescents of varying age groups. Few researchers directly have compared players at different levels of development to determine if violent video game exposure has different effects on physical aggression among players of different age groups. Recently, Anderson et al. (2008) found that the effects of violent video game exposure on aggression appeared to be stronger among younger players when compared to older players. These results have to be interpreted cautiously, because the different cohorts of students came from different countries and completed different measures of violent video game exposure and aggression. Therefore, in this dissertation, I investigated if the association among violent video game exposure and physical aggression was different among two cohorts of students, a group of middle school students and a group of high school students.

To determine if violent video game exposure had direct effects on physical aggression, I first examined cross-sectional data taken from the fall 2007 session of the New Hampshire Youth Survey (Cohn et al., 2005). I hypothesized that violent video game exposure would directly predict physical aggression, even after controlling for aggressive personality, normative status, and other control variables (i.e., sex and average grade, see Anderson & Dill, 2000) with greater exposure predicting greater engagement in physical aggression. Next, I hypothesized that aggressive personality and normative
status would partially mediate the association between violent video game exposure and physical aggression with violent video game exposure still having a direct effect on physical aggression (see Bartholow et al., 2005; Trinkner et al., 2009). Finally, I wanted to determine if the effects of violent video game exposure differed among the two cohorts of students who are part of the NHYS (Cohn et al., 2005). Based on more recent evidence (e.g., Anderson et al., 2010), I hypothesized that the effect of violent video game exposure would be stronger among middle school students when compared to high school students.

The third goal of this dissertation was to assess if violent video game exposure affects reports of future physical aggression. Although researchers investigating the effects of other forms of violent media have conducted numerous longitudinal studies of such exposure and aggression (see Huesmann & Kirwil, 2007 for a review), few researchers have assessed whether exposure to violent video games affects future aggression. Only recently have researchers begun to investigate the long-term effects of violent video game exposure on aggression. These reports indicate that exposure to violent video games does predict future increases in aggressive personality (Anderson et al., 2007; Möller & Krahé, 2009) and future physical aggression (Anderson et al., 2008; Gentile & Gentile, 2008). While these longitudinal studies have tested hypotheses based on portions of the General Aggression Model (Anderson & Bushman, 2002), to date, researchers have not tested a longitudinal model of the GAM, to assess whether previous violent video game exposure leads to changes in aggressive personality, which mediates the association between such exposure and physical aggression. In this dissertation, I will
test this model by examining three waves of data from the New Hampshire Youth Survey (Cohn et al., 2005) over the span of 18 months.

Similar to the cross-sectional analyses, I hypothesized that violent video game exposure would significantly predict future physical aggression and this association would remain even after controlling for previous physical aggression, students’ average grades, and sex. Further, it is expected that the effects of violent video game exposure on future physical aggression will be partially mediated via pathways through trait aggression and normative status. These lag associations should indicate that exposure to violent video games leads to increases in these aggressive components, and that these changes led to increased physical aggression. Further, it was hypothesized that violent video game exposure would be a better predictor of physical aggression among middle school students when compared to high school students.

**Method**

**The New Hampshire Youth Survey**

Starting in the fall of 2006, the New Hampshire Youth Survey (NHYS, Cohn et al., 2005) is a three year, longitudinal study of rule-violating behavior among two cohorts of New Hampshire youths. The middle school cohort consists of students entering the sixth grade in fall of 2006 and the high school cohort consists of students entering 9th grade during the same term. The research focuses on the social, cognitive, and interpersonal factors associated with various forms of rule-violating behavior, including physical aggression (Cohn et al., 2005). Students participating in the study completed self report surveys every six months over the three year study period. Therefore, the study is comprised of six waves of data that allow researchers to track specific changes in these
dimensions and determine how these factors lead to the development of rule-violating behavior (e.g., see Cohn, Bucolo, Rebellon, & Van Gundy, in press).

**School Selection.** Starting in the fall of 2005, researchers approached superintendents and school boards in various communities within New Hampshire to participate in the three year study. After meeting with local school officials, four communities were chosen to provide researchers with a diverse sample of adolescents living in the state. These communities were located in urban and suburban centers in the Southeastern and Southwestern portions of the state, with populations and demographics similar to metropolitan areas in other Northeast states.

Within these four communities, researchers entered classrooms in five high schools and eight middle schools during the spring of 2006 to recruit students for the study. During these information sessions, researchers gave students a brief description of the study, including the benefits of participating in the study. Interested students were given parental informed consent forms and were asked to have their parents/legal guardians complete the forms and return them to their teachers or principals. Parental informed consent forms were returned to school teachers and principals and given to the researchers prior to the start of the fall 2006 school year. In the fall of 2006, researchers again visited schools and had students whose parents provided informed consent gather into mass testing sessions to perform the survey. Prior to the first data collection, students completed an assent form agreeing to participate in the study. Students were informed that they could refuse, at any time, to participate in any part or parts of the study over the three year period. Only students who agreed to participate during the first testing session were contacted for further data collections (N = 1040).
Participants

Nine hundred thirty-nine students filled out surveys during the third testing session of the NHYS in the fall of 2007. After accounting for missing/incomplete data, analyses conducted in this study was based on responses from 829 students (470 middle school students and 359 high school students). The gender composition of the sample was similar for both middle school and high school groups with approximately 56% of the sample being girls ($n = 465$). The ethnic/racial composition of the sample was also similar in both the middle school and high school sample with 80% of the sample reporting to be White/Caucasian ($n = 667$).

Of the 829 who completed surveys during the fall of 2007, completed responses were obtained for 648 students (78%) during the fall of 2008 and spring of 2009. This sample was approximately 57% female ($n = 368$) with 62.5% of students reporting they were currently in middle school ($n = 405$). Middle school students were in 7th grade during the fall of 2007 and were completing 8th grade during the fall of 2008 and spring of 2009. High schools students were in grade 10 in the fall of 2007 and were completing 11th grade during the fall of 2008 and spring 2009. The racial/ethnic composition of the sample was similar across grade levels with 81% of students reporting they were Caucasian/White ($n = 526$). During the fall of 2007 participants ages ranged from 11 to 17 ($M = 13.42, SD = 1.56$); student ages during the spring of 2009 ranged from 12 to 18 ($M = 14.91, SD = 1.61$).

Independent Variables

Demographics. During all three data collection periods (i.e., fall 2007, fall 2008, spring 2009) students reported their sex, current age, and grade in school, and
race/ethnicity. For analyses, sex (dummy coded female = 0, male = 1) and student's average grade from the fall of 2007 were used as covariates. Students reported their average grade using a 9 point Likert Scale (1: All As; 9 All Fs). This variable was reverse coded, (1: All Fs; 9 All As) so that higher scores now indicated a better grade point average. Most students indicated that they got mostly Bs ($M = 7.50, SD = 1.59$) in the fall of 2007.

**Trait Physical Aggression.** In the fall of 2007 and spring of 2009, 5 items from Buss and Perry's (1992) physical aggression subscale of the *Aggression Questionnaire* measured students natural tendency to respond to life events with physical aggression (e.g., “Once in a while I can't control the urge to strike another person”). During both times, respondents rated their agreement with each item on a four point Likert Scale (0: Strongly Disagree; 3: Strongly Agree) with higher scores indicating greater trait physical aggression (Cronbach’s $\alpha = .88$ for both the fall of 2007 and spring 2009). All items were summed and scores on the scale ranged from 0 to 15 (Fall 2007: $M = 6.16, SD = 4.45$; Spring 2009: $M = 6.28, SD = 4.38$). See Appendix A.

**Normative Status.** The modified version of Cohn and White’s (1990) normative status measure assessed participants approval of 8 physically aggressive behaviors during the fall of 2007 (Cronbach’s $\alpha = .91$; $M = 1.30, SD = 2.74$) and during the spring of 2009 (Cronbach’s $\alpha = .93$; $M = 2.67, SD = 4.13$). At both times, participants rated their approval of these behaviors on a four point Likert Scale (0: Strongly disapprove, 3: Strongly approve) with total scores ranging from 0 to 24 with higher scores indicating greater acceptance of physical aggression. See Appendix A.
**Violent Video Game Exposure.** The categorical measure of violent video game exposure (Trinkner et al., 2010) used in Study 1 assessed students’ exposure to four types of video games during the fall of 2007 (Cronbach’s $\alpha = .84$; $M = 1.77$, $SD = 2.87$) and fall of 2008 (Cronbach’s $\alpha = .79$; $M = 1.56$, $SD = 2.58$). Students reported their weekly video and computer game usage from four categories (i.e., fighting, action, adventure, first person shooter) on a 5 point Likert Scale (0: None; 4: 15 hours or more). Scores on the scale ranged from 0 to 16 with higher scores indicating greater violent video game exposure. See Appendix A.

**Dependent Variable**

**Physical Aggression.** Eight items from the Delinquency Component of the National Youth Longitudinal Survey (Wolpin, 1983) measured the number of physically aggressive acts committed by students (e.g., “Hit or seriously threaten to hit someone”, “Hurt someone badly enough to need bandages or a doctor”) during the fall of 2007 (Cronbach’s $\alpha = .77$; $M = .58$, $SD = 1.21$), fall of 2008 (Cronbach’s $\alpha = .68$; $M = 1.42$, $SD = 2.87$), and spring 2009 (Cronbach’s $\alpha = .86$; $M = .73$, $SD = 1.60$). Participants reported whether they engaged in any of the aggressive behaviors in the past six months by responding Yes/No with the total number of behaviors reported in the past six. Scores on the scale ranged from 0 to 8 with higher scores indicating greater physical aggression. See Appendix A.

**Procedure**

The data collection session for all waves of the NHYS (Cohn et al., 2005) were similar to previous data collection sessions with students in this study. The names of students who had completed the study in previous sessions were given to each school.
Researchers scheduled times to come to each school to administer the questionnaire in mass testing sessions during October and November of 2007 for the fall 2007 data collection. Researchers collected data from students approximately 12 months later, during October and November of 2009 in the fall of 2008, and finally, students completed surveys again eighteen months later in March and April of 2009, i.e., spring 2009. During all survey administrations, identified students were contacted by school officials and were given permission to leave class during the scheduled research session, which often occurred during a mid-morning period. Depending on the school, students who participated in the study completed the questionnaire in various locations including study halls, auditoriums, school libraries, and cafeterias. Researchers entered the location in which students were to complete the survey and made sure there was adequate room for all students to complete the survey prior to students’ arrival.

Upon entering the research location, all students were given an informed assent form, and only students who provided assent received questionnaires that contained all materials. Students were seated one-seat apart in increase student confidentiality and students were reminded not to place their names or any identifying information on the questionnaires containing all the measures. Participants were given verbal instructions on how to complete the questionnaire and they were told to raise their hand if they had any questions.

During the three different data collection periods, students completed additional measures assessing moral and legal reasoning, peer delinquency, interpersonal factors (e.g., empathy, belief in a justice world), and reported rule-violating behaviors besides physical aggression, including property crimes and substance use. These questionnaires
was divided into two sections and students were given a short break and a fruit snack after completing section 1—completing both sections of the entire research questionnaire took approximately 35 minutes. When respondents completed both sections of the questionnaire, they were asked to get up from their seat and to sign-in with a research assistant at a designated table in the same location. Once students signed in with the researchers they were given a $10 gift certificate to a national bookstore, thanked for their participation, and dismissed back to their class.

**Results**

**Exploratory Data Analysis**

Visual inspection of the data suggested that there maybe normality issues with data. Kurtosis and skewness measures for all variables, at all data collection times, are reported in Table 1. As this table suggests, most variables were leptokurtic (i.e., shape of the peak is greater than expected from a normal distribution, Kurtosis greater than 1) with trait aggression being platykurtic (i.e., shape of the peak flatter than a normal distribution). All variables were positively skewed with skewness greater than 1.

Table 1. Skewness and Kurtosis for Violent Video Games, Trait Aggression, and Physical Aggression Over 18 Months

<table>
<thead>
<tr>
<th>Variables</th>
<th>Fall 2007</th>
<th>Fall 2008</th>
<th>Fall 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Skewness</td>
<td>Kurtosis</td>
<td>Skewness</td>
</tr>
<tr>
<td>Physical Aggression</td>
<td>2.85</td>
<td>9.63</td>
<td>2.68</td>
</tr>
<tr>
<td>VVG</td>
<td>2.35</td>
<td>6.57</td>
<td>2.41</td>
</tr>
<tr>
<td>Trait Aggression</td>
<td>0.27</td>
<td>-0.972</td>
<td>--</td>
</tr>
<tr>
<td>Normative Status</td>
<td>3.21</td>
<td>13.56</td>
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</tbody>
</table>

*Note: VVG = Violent Video Game Exposure*
These deviations did not appear to be the result of outliers and data transformations done
to the dependent variable did not improve normality. Further, inspection of bivariate
normality or homoscedasticity of variance (see Warner, 2008), using scatter plots,
indicated that the predictor variables (i.e., trait aggression, normative status, and violent
video game exposure) appeared to be somewhat normally distributed at different levels of
the dependent variable physical aggression.

As Table 1 indicates, the distributions of these variables remained relatively
constant over the 18 months of the study. Due to the non-normality of the data, I decided
to conduct multiple tests of the mediating models to ensure that any significant results
revealed were not the result of biased data. First, to test the mediating model described by
the GAM, I utilized the causal model approached described by Baron & Kenny (1986)
using Multiple Regression analysis. Recently, Preacher and Hays (2008) argued that a
more robust way to test a multiple mediating model was to utilize a procedure known as
bootstrapping. Bootstrapping is a procedure in which multiple samples are taken from the
original sample and confidence intervals, standardized path coefficients, and standard
errors are calculated from these new samples. This procedure provides more reliable
estimates for mediated models when the data violates the assumptions of normality and
multivariate normality (Preacher & Hays, 2008). Therefore, to replicate the results from
the causal model mediation test, I used the SPSS script provided by Preacher & Hayes
(2008) and performed the mediating model utilizing a bootstrapping procedure.

Similarly, Browne (1984) argued that when testing causal models in which the
data are not normally distributed, researchers could utilize estimates of covariance
matrices using an “asymptotically distribution-free” method (also see Kaplan, 2009 for
greater discussion of this method). The statistical program AMOS allows researchers to test causal structural equation models using the asymptotically distribution-free estimation method. Further, AMOS provides a simple way of comparing models among different groups. Researchers can test if a variable is a moderating variable by entering this "grouping variable" into a model and then calculating the change in chi-square statistic (i.e., $\Delta \chi^2$). If this statistic is significant, adding the grouping variable changed the model, and researchers can then conclude that the grouping variable acted as a moderating variable (see Byrne, 2001). Therefore, I entered cohort (Middle School, High School) as a grouping variable in my structural equation models and calculated a $\Delta \chi^2$ to assess whether cohort moderated the association between violent video game exposure and physical aggression.

**Preliminary Analyses**

First, I examined the association among violent video game exposure, physical aggression, trait aggression, and normative status over the 18 month span of the study by computing Pearson $r$ bivariate correlations. Table 2 presents the results of those analyses. As expected, violent video game exposure in fall of 2007 was positively associated with physical aggression in the fall of 2007 ($r(648) = .32, p < .001$), physical aggression in fall 2008 ($r(648) = .25, p < .001$), and physical aggression in spring 2009 ($r(648) = .33, p < .001$). Exposure to violent video games in fall 2008 was related to physical aggression in fall 2007 ($r(648) = .21, p < .001$), physical aggression in fall of 2008 $r(648) = .21, p < .001$ and physical aggression in spring 2009 ($r(648) = .32, p < .001$). These findings indicated that increased exposure to violent video games was associated with increased reports of physical aggression at all three data collection points. Violent video game
Table 2. Bivariate Correlation Matrix for Physical Aggression, Violent Video Game Exposure, Trait Aggression, and Normative Status Over 18 Months

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
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<th>4</th>
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<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
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<tbody>
<tr>
<td>1. Sex</td>
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<td>2. GPA</td>
<td>-.19***</td>
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<tr>
<td>3. Cohort</td>
<td>.01</td>
<td>.01</td>
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<td>4. Physical Aggression Fall 2007</td>
<td>.16***</td>
<td>-.35***</td>
<td>.12**</td>
<td>--</td>
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<td>5. VVG Fall 2007</td>
<td>.43***</td>
<td>-.19***</td>
<td>-.01</td>
<td>.32***</td>
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<td>6. Trait Aggression Fall 2007</td>
<td>.32***</td>
<td>-.25***</td>
<td>.07</td>
<td>.47***</td>
<td>.33***</td>
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<tr>
<td>7. Normative Status Fall 2007</td>
<td>.12**</td>
<td>-.24***</td>
<td>.20**</td>
<td>.52***</td>
<td>.25***</td>
<td>.38***</td>
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<tr>
<td>8. Physical Aggression Fall 2008</td>
<td>.11**</td>
<td>-.27***</td>
<td>-.01</td>
<td>.55***</td>
<td>.25***</td>
<td>.45***</td>
<td>.47***</td>
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<td>9. VVG Fall 2008</td>
<td>.43***</td>
<td>-.23***</td>
<td>-.04</td>
<td>.21***</td>
<td>.55***</td>
<td>.30***</td>
<td>.17***</td>
<td>.21***</td>
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<tr>
<td>10. Physical Aggression Spring 2009</td>
<td>.18***</td>
<td>-.32***</td>
<td>-.06</td>
<td>.55***</td>
<td>.33***</td>
<td>.39***</td>
<td>.42***</td>
<td>.69***</td>
<td>.32***</td>
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<tr>
<td>11. Trait Aggression Spring 2009</td>
<td>.30***</td>
<td>-.19***</td>
<td>-.08*</td>
<td>.35***</td>
<td>.25***</td>
<td>.55***</td>
<td>.28***</td>
<td>.44***</td>
<td>.32***</td>
<td>.40***</td>
<td>--</td>
</tr>
<tr>
<td>12. Normative Status Spring 2009</td>
<td>.17***</td>
<td>-.20***</td>
<td>-.02</td>
<td>.41***</td>
<td>.19***</td>
<td>.34***</td>
<td>.49***</td>
<td>.44***</td>
<td>.20***</td>
<td>.50***</td>
<td>.38***</td>
</tr>
</tbody>
</table>

Note: Sex dummy coded (female = 0, male = 1), GPA = Students average grades, Cohort dummy coded (middle school = 0, high school = 1) VVG = Violent Video Game Exposure

*p < .05, **p < .01, ***p < .001
exposure was associated with trait aggression in the fall of 2007 \( r(648) = .33, p < .001 \) and trait aggression reported in the spring of 2009 \( r(648) = .25, p < .001 \) such that greater exposure at both time points was related to increased reports of trait aggression.

Similarly, there was a positive association between violent video game video exposure in fall 2007 and normative status in fall 2007 \( r(648) = .25, p < .001 \) and normative status in spring 2009 \( r(648) = .19, p < .001 \), indicating that increased exposure to violent video games was related to increased acceptance of physical aggression. As expected, the control variables of sex and students’ average grades were related to the variables. Sex was positively associated with violent video game exposure, trait aggression, and normative status during all collection points, indicating that being male was associated with these variables (see Table 2). Students’ average grades (i.e., GPA) was negatively associated with violent video game exposure, trait aggression, normative status, and physical aggression suggesting that students with higher grades reported lower levels of these variables (See Table 2).

There was some attrition over the course of the 18 month study, with 181 students who completed the study in the fall of 2007 failing to complete subsequent surveys (22% of sample). To determine if students who did not complete all three-waves of the study differed from students who did complete all three waves of the study, I performed a One-Way MANOVA with Completing all Three-Waves (Not Complete, Complete) as the independent variable and physical aggression, violent video game exposure, trait aggression, and normative status during the fall of 2007 as the dependent variables. There was a multivariate effect for completing all three-waves (Wilks’ \( \Lambda = .974, F(4, 824) = 5.57, p < .001, \eta^2 = .026 \)). The means and standard deviations are reported in Table 3.
Follow-up F-tests indicated that students who did not complete all three waves of the study reported significantly more physical aggression \((F(4, 824) = 11.61, p < .001, \eta^2 = .014)\), reported significantly greater trait aggression \((F(4, 824) = 6.56, p = .01, \eta^2 = .01)\), and reported significantly higher normative status \((F(4, 824) = 19.73, p < .001, \eta^2 = .023)\) when compared to students who did complete all three-waves of the study.

Table 3. Means and Standard Deviations For Study Variables as a Function of Completing All Three Waves of the Study

<table>
<thead>
<tr>
<th>Variables</th>
<th>Completed all Three Waves</th>
<th>Completed</th>
<th>Not Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>(n = 648)</td>
<td>(n = 181)</td>
</tr>
<tr>
<td>Physical Aggression Fall 2007</td>
<td>0.58ᵃ (1.21)</td>
<td>0.97ᵇ (1.70)</td>
<td></td>
</tr>
<tr>
<td>Violent Video Game Exposure Fall 2007</td>
<td>1.77ᵃ (2. 87)</td>
<td>2.22ᵇ (3.53)</td>
<td></td>
</tr>
<tr>
<td>Trait Aggression Fall 2007</td>
<td>6.15ᵃ (4.48)</td>
<td>7.11ᵇ (4.59)</td>
<td></td>
</tr>
<tr>
<td>Normative Status Fall 2007</td>
<td>1.30ᵃ (2.74)</td>
<td>2.45ᵇ (4.06)</td>
<td></td>
</tr>
</tbody>
</table>

Note: Means with different superscripts in a column are significantly different at \(p < .05\)

Follow-up F-tests indicated that students who did not complete all three waves of the study reported significantly more physical aggression \((F(4, 824) = 11.61, p < .001, \eta^2 = .014)\), reported significantly greater trait aggression \((F(4, 824) = 6.56, p = .01, \eta^2 = .01)\), and reported significantly higher normative status \((F(4, 824) = 19.73, p < .001, \eta^2 = .023)\) when compared to students who did complete all three-waves of the study.

and Group (Middle School, High School) on the variables over the 18 span. Next, I examined the effect of Sex (Girls, Boys) 2 Cohort (Middle School, High School) X 3 Physical Aggression (Fall 2007, Fall 2008, Spring 2009) mixed-model ANOVA with Physical Aggression as the within subject variable revealed a multivariate two-way interaction between Group and Physical Aggression (Wilk's \(\Lambda = .97, F(2, 643) = 9.53, p < .001, \eta^2 = .03\)) and Sex and Physical Aggression (Wilk's \(\Lambda = .99, F(2, 643) = 3.26, p < .05, \eta^2 = .01\)); none of the of the other interactions were significant.
Table 4. Means and Standard Deviations For Physical Aggression Over 18 Months as a Function of Cohort

<table>
<thead>
<tr>
<th>Variables</th>
<th>Middle School</th>
<th>High School</th>
<th>t-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Aggression</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall 2007</td>
<td>0.47 (1.04)</td>
<td>0.77 (1.43)</td>
<td>t(646) = -3.13, p &lt; .01</td>
</tr>
<tr>
<td>Physical Aggression</td>
<td>0.70 (1.40)</td>
<td>0.66 (1.47)</td>
<td>t(646) &lt; 1.00, p &gt; .10</td>
</tr>
<tr>
<td>Spring 2009</td>
<td>0.80 (1.65)</td>
<td>0.60 (1.51)</td>
<td>t(646) = 1.49, p &gt; .10</td>
</tr>
</tbody>
</table>

Post hoc t-tests, examining the interaction between Group and Physical Aggression, revealed that high school students reported significantly more physical aggression (M = .77, SD = 1.43) than middle school students (M = .47, SD = 1.04) during the fall of 2007 (t(642) = 3.13, p < .01); however, there were no significant differences in physical aggression reported during the fall of 2008 or the spring of 2009 (see Table 4).

Follow up t-tests assessing the interaction between Sex and Physical Aggression revealed that boys reported more physical aggression than girls (see Table 5) during all three data collections with the largest difference occurring during the spring of 2009 (t(642) = 4.60, p < .001, Cohen's d = .36).

Table 5. Means and Standard Deviations For Physical Aggression Over 18 Months as a Function of Participant Sex

<table>
<thead>
<tr>
<th>Variables</th>
<th>Boys</th>
<th>Girls</th>
<th>t-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Aggression</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall 2007</td>
<td>0.80 (1.46)</td>
<td>0.42 (.94)</td>
<td>t(646) = 4.09, p &lt; .001</td>
</tr>
<tr>
<td>Physical Aggression</td>
<td>0.87 (1.61)</td>
<td>0.54 (1.25)</td>
<td>t(646) = 2.93, p &lt; .01</td>
</tr>
<tr>
<td>Spring 2009</td>
<td>1.05 (1.97)</td>
<td>0.48 (1.20)</td>
<td>t(646) = 4.61, p &lt; .001</td>
</tr>
</tbody>
</table>

A 2 Sex X 2 Group mixed-model ANOVA with Violent Video Game Exposure (Fall 2007, Fall 2008) as the within subject variable revealed a multivariate effect for time (Wilk's Λ = .99, F(1, 645) = 5.70, p < .05, η² = .01) with reports of exposure to

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violent video games decreasing from fall of 2007 ($M = 1.77, SD = 2.87$) to fall of 2008 ($M = 1.56, SD = 2.58$). There were no other significant multivariate effects. There was also a between-subject effect for Sex ($F(1, 644) = 190.19, p < .001, \eta^2 = .23$) with boys reporting more violent video game exposure over the course of the year ($M = 3.00, SD = 3.30$) than girls ($M = .63, SD = 2.79$) (see Table 6).

A 2 Sex X 2 Group X 2 Trait Aggression (Fall 2007, Spring 2009) mixed model ANOVA with Trait Aggression as the within-subject variable revealed a two-way multivariate effect between Sex and Trait Aggression (Wilk’s $\Lambda = .97, F(1, 645) = 14.61, p < .001, \eta^2 = .02$), which was qualified by a three-way interaction among Sex, Group, and Trait Aggression (Wilk’s $\Lambda = .99, F(1, 645) = 5.31, p < .05, \eta^2 = .01$).

### Table 6. Means and Standard Deviations For Violent Video Game Exposure Over 12 Months as a Function of Participant Sex

<table>
<thead>
<tr>
<th>Variables</th>
<th>Sex</th>
<th>M(SD)</th>
<th>t-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>VVG Fall 2007</td>
<td>Boys</td>
<td>3.18(3.44)</td>
<td>$T(646) = 12.05, p &lt; .001$</td>
</tr>
<tr>
<td>VVG Fall 2008</td>
<td>Girls</td>
<td>0.70(1.69)</td>
<td>$T(646) = 11.93, p &lt; .001$</td>
</tr>
</tbody>
</table>

Note: VVG = Violent Video Game Exposure

### Table 7. Means and Standard Deviations for Trait Aggression Over 18 Months as a Function of Participant Sex and Group

<table>
<thead>
<tr>
<th>Sex</th>
<th>Cohort</th>
<th>Trait Aggression Fall 2007</th>
<th>Trait Aggression Spring 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Middle School</td>
<td>High School</td>
<td>Total</td>
</tr>
<tr>
<td>Boys</td>
<td>7.73$^a$(4.33)</td>
<td>7.92$^a$(4.00)</td>
<td>7.80$^a_b$(4.27)</td>
</tr>
<tr>
<td>Girls</td>
<td>4.52$^a$(1.04)</td>
<td>5.57$^b$(1.14)</td>
<td>4.92$^b_b$(4.18)</td>
</tr>
<tr>
<td>Total</td>
<td>5.52$^a$(4.54)</td>
<td>6.57$^b$(4.22)</td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>7.90$^a$(4.11)</td>
<td>7.58$^a$(3.89)</td>
<td>7.78$^a_b$(4.02)</td>
</tr>
<tr>
<td>Girls</td>
<td>5.51$^a$(4.33)</td>
<td>4.48$^b$(4.18)</td>
<td>5.14$^b_b$(4.31)</td>
</tr>
<tr>
<td>Total</td>
<td>6.57$^a_b$(4.40)</td>
<td>5.81$^b$(4.33)</td>
<td></td>
</tr>
</tbody>
</table>

Note: Means with different superscripts in a row are significantly different at $p < .05$ Means with different subscripts in a column are significantly different at $p < .05$
Follow-up analysis indicated that neither were no differences trait aggression for either high school boys or middle school boys over the 18th month span (see Table 7). Among the girls, there was a significant increase in trait aggression ($t(227) = -3.56$, $p = .001$) from fall 2007 to spring of 2008 for middle school girls; whereas, there was a significant decrease in trait aggression for high school girls ($t(138) = 3.43$, $p = .001$) from fall 2007 ($M = 5.57$, $SD = 4.13$) to spring 2009 ($M = 4.48$, $SD = 4.18$). There was also a between-subject effect for Sex ($F(1, 645) = 86.49$, $p < .001$, $\eta^2 = .11$) which indicated that boys reported greater trait aggression when compared to girls during both the fall of 2007 and the spring of 2009 (See Table 7).

A similar 2 Sex X 2 Group X 2 Normative Status mixed-model ANOVA with Normative Status as the within-subject variable revealed a two-way interaction between Sex and Normative Status (Wilk’s $\Lambda = .99$, $F(1, 645) = 5.70$, $p < .05$, $\eta^2 = .01$). Post-hoc t-tests indicated that there was significant increase in reported normative status from Fall 2007 to Spring of 2009 among girls; but, there was an even larger increase in reported normative status among boys from over the 18 month span (see Table 8).

Table 8. Means and Standard Deviations For Normative Status Over 18 Months as a Function of Participant Sex

<table>
<thead>
<tr>
<th></th>
<th>Fall 2007</th>
<th>Spring 2009</th>
<th>t-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>$t$-test</td>
</tr>
<tr>
<td>Boys</td>
<td>1.65 (3.28)</td>
<td>3.46 (4.74)</td>
<td>$t(277) = -7.79$, $p &lt; .001$</td>
</tr>
<tr>
<td>Girls</td>
<td>1.02 (2.19)</td>
<td>2.07 (3.51)</td>
<td>$t(367) = -5.73$, $p &lt; .001$</td>
</tr>
</tbody>
</table>

There was also a multivariate interaction among Group and Normative Status (Wilk’s $\Lambda = .97$, $F(1, 645) = 19.19$, $p < .001$, $\eta^2 = .03$). Post-hoc analysis of indicated that high school students reported significantly greater normative status than middle school in
the fall of 2007; however, there were no significant differences in normative status as reported by middle school and high school students in the spring of 2009 (see Table 9).

Table 9. Means and Standard Deviations For Normative Status Over 18 Months as a Function of Student Cohort

<table>
<thead>
<tr>
<th>Variables</th>
<th>Middle School</th>
<th>High School</th>
<th>t-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normative Status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall 2007</td>
<td>0.88 (2.28)</td>
<td>1.99 (3.24)</td>
<td>(t(646) = -5.09, p &lt; .001)</td>
</tr>
<tr>
<td>Normative Status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring 2009</td>
<td>2.75 (4.43)</td>
<td>2.54 (3.58)</td>
<td>(t(646) &lt; 1.00, p &gt; .50)</td>
</tr>
</tbody>
</table>

Cross-Sectional Tests of the General Aggression Model using the Causal Method

During the fall of 2007 a total of 829 students completed all measures as part of the NHYS (Cohn et al., 2005); however, I was only able to track a total of 648 of those students (78%) over the course of 18 months. Results of a MANOVA comparing students who did not complete all three waves of the study to students who did complete all three waves indicated there were significant differences between these two groups on measures of physical aggression, trait aggression, and normative status (see Table 3). Therefore, to examine the association among violent video game exposure and physical aggression at the cross-sectional level, I completed analyses using both the complete sample of students from fall 2007 (i.e., 829 students) and the smaller sample of students from longitudinal dataset (i.e., 648 students).

First, to test predictions made by the General Aggression Model (Anderson & Bushman, 2002) that personality variables mediate the relation between violent video game exposure and physical aggression, I used the causal model approach to mediation described by Baron and Kenny (1986). Examining responses from all 829 students who completed surveys during the fall of 2007 I found that violent video game exposure (β =
.30, \( p < .001 \), was a direct predictor of physical aggression in the fall of 2007, while controlling for sex (\( \beta = .11, p < .01 \)) and student average grade (\( \beta = -.27, p < .001 \)), \( F(3, 825) = 65.74, p < .001, R^2 = .19 \). Next, I regressed physical aggression onto the two potential mediators, trait aggression and normative status, while controlling for sex and students' average grade. The results of those two regression models indicated that violent video game exposure significantly predicted trait aggression (\( \beta = .14, p < .001 \)) and normative status (\( \beta = .11, p < .01 \)), respectively.

Finally, I performed a hierarchical multiple regression with the control variables, violent video game exposure and the two mediators predicting physical aggression. The last step of this regression was significant (\( F(6, 822) = 89.31, p < .001, R^2 = .40 \)). Table 10 provides the standardized path coefficients for this analysis. Violent video game exposure was a direct predictor of physical aggression, as well as, an indirect predictor via pathways through trait aggression and normative status.

**Table 10. Standardized Path Coefficients for a Multiple Regression Predicting Physical Aggression from Violent Video Game Exposure, Trait Aggression, and Normative Status among 829 Students During the Fall of 2007**

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Step 1</th>
<th>Step 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>.11**</td>
<td>.07*</td>
</tr>
<tr>
<td>Student Average Grades</td>
<td>-.27***</td>
<td>-.16***</td>
</tr>
<tr>
<td>VVG</td>
<td>.30***</td>
<td>.19***</td>
</tr>
<tr>
<td>Trait Aggression</td>
<td>--</td>
<td>.28***</td>
</tr>
<tr>
<td>Normative Status</td>
<td>--</td>
<td>.29***</td>
</tr>
</tbody>
</table>

Note: Sex dummy coded (girls = 0, boys = 1); VVG = Violent Video Game Exposure.
* \( p < .05 \), ** \( p < .01 \), *** \( p < .001 \)

Using the smaller, longitudinal data set of 648 students, I replicated these findings. Among this smaller group, I found that violent video game exposure (\( \beta = .27, p < .001 \)), was a direct predictor of physical aggression in the fall of 2007, while controlling for sex (\( \beta = .01, p > .70 \)) and student average grade (\( \beta = -.30, p < .001 \)), \( F(3, 644) = 49.56, p < .001 \),
Table 11. Standardized Path Coefficients for a Multiple Regression Predicting Physical Aggression from Violent Video Game Exposure, Trait Aggression, and Normative Status among 648 Students During the Fall of 2007

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Step 1</th>
<th>Step 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>-.01</td>
<td>.06</td>
</tr>
<tr>
<td>Student Average Grades</td>
<td>-.30***</td>
<td>-.18***</td>
</tr>
<tr>
<td>VVG</td>
<td>.27***</td>
<td>.13***</td>
</tr>
<tr>
<td>Trait Aggression</td>
<td>--</td>
<td>.25***</td>
</tr>
<tr>
<td>Normative Status</td>
<td>--</td>
<td>.38***</td>
</tr>
</tbody>
</table>

Note: Sex dummy coded (girls = 0, boys = 1); VVG = Violent Video Game Exposure.

*p < .05, **p < .01, ***p < .001

$p < .001$, $R^2 = .19$. I regressed physical aggression onto the two potential mediators, trait aggression and normative status, while controlling for sex and students' average grade, and found that violent video game exposure significantly predicted trait aggression ($\beta = .10, p < .01$), with a tendency for violent video game exposure to predict normative status ($\beta = .08, p = .07$). Finally, a hierarchical multiple regression was performed; the last step of this regression was significant $F(5, 642) = 93.01, p < .001$, $R^2 = .42$. Table 11 provides the results of this analysis. Similar to the mediated test with all 829 students from fall 2007, these analyses conducted with only 648 students from the longitudinal dataset indicated that violent video game exposure was a direct and indirect predictor of physical aggression.

Cross-Sectional Tests of the General Aggression Model Using Bootstrapping

Exploratory data analysis indicated that the variables in this study deviated from normality. Such deviation could affect the estimates derived from multiple regression analyses (Warner, 2008). Thus, to determine if the results of the mediation analysis above could be replicated using a more robust statistical procedures, I used Preacher and Hayes' (2008) bootstrapping procedure for SPSS for both the entire fall 2007 sample as well as the smaller, longitudinal sample.
Among the 829 students who completed surveys in the fall of 2007, the overall regression using this approach was significant ($F(5, 823) = 100.70, p < .001, R^2 = .38$). Result indicated that Sex ($\beta = .21, p < .05, SE = .084$) and students’ average grade ($\beta = -.14, p < .001, SE = .025$) were significant predictors of physical aggression. Violent video game exposure was predictive of physical aggression ($\beta = .13, p < .001, SE = .015$) when the mediators were not included. Both trait aggression ($\beta = .08, p < .001, SE = .010$) and normative status ($\beta = .13, p < .001, SE = .013$) were predictive of physical aggression. Including the two mediators into the model reduced the effect of violent video game exposure ($\beta = .08, p < .001, SE = .014$) on physical aggression. As such, the effect of violent video game exposure on physical aggression was partially mediated via routes through both trait aggression ($\beta = .28, p < .001, SE = .051$) and normative status ($\beta = .21, p < .001, SE = .038$), respectively.

I replicated this bootstrapping procedure (Preacher & Hayes, 2008) among the 648 students who completed all three waves of the study. The overall regression using this approach was significant ($F(5, 642) = 93.01, p < .001, R^2 = .42$). Result indicated students’ average grade ($\beta = -.14, p < .001, SE = .024$) was a significant predictor of physical aggression among this smaller sample; however, sex ($\beta = .13, p = .10, SE = .084$) did not significantly predictor of physical aggression. Violent video game exposure was predictive of physical aggression ($\beta = .11, p < .001, SE = .017$) when the mediators were not included. Both trait aggression ($\beta = .07, p < .001, SE = .010$) and normative status ($\beta = .17, p < .001, SE = .015$) were predictive of physical aggression. Including the two mediators into the model reduced the effect of violent video game exposure ($\beta = .05, p < .001, SE = .015$) on physical aggression. As such, the effect of violent video game exposure...
exposure on physical aggression was partially mediated via routes through both trait aggression (β = .33, p < .001, SE = .062) and normative status (β = .21, p < .001, SE = .040), respectively.

Cross-Sectional Tests of the General Aggression Model Using the Asymptotically Distribution-Free Method

Using AMOS, I estimated the mediated model of violent video game exposure on physical aggression, controlling for sex and students' average grades using Browne's (1984) ADF method. This method provides reliable estimates for datasets in which the assumptions of normality and multivariate normality have been violated. AMOS provides an estimate of multivariate normality. Again, to be consistent with the above analyses I performed these analyses for both the entire fall 2007 sample and the smaller, longitudinal sample.

Among the 829 students who completed the surveys in fall of 2007, AMOS indicated that the data was not multivariate normal (Statistic = 66.50, p < .001). I controlled for all potential associations among the variables; therefore, the model estimated by AMOS was saturated with no free parameters. Thus, there was no $\chi^2$ statistic to report and all fit indices equaled 1.00 (i.e., GFI, CFI, NFI). The results of these analyses accounted for 36% of the variance in physical aggression during the fall of 2007 (Multiple $R^2 = .36$). Standardized path coefficients indicated that violent video game exposure ($\gamma = .18, p < .01$), trait aggression ($\gamma = .28, p < .01$), and normative status ($\gamma = .30, p < .001$) predicted physical aggression. Further, the mediated paths from violent video game exposure to physical aggression through trait aggression ($\gamma = .13, p < .01$) and through normative status were significant ($\gamma = .20, p < .001$), suggesting that there
Table 12. Standardized Path Coefficients for Structural Equation Model Testing the Associations Among Physical Aggression from Violent Video Game Exposure, Trait Aggression and Normative Among Two Samples of Students

<table>
<thead>
<tr>
<th></th>
<th>Sex</th>
<th>GPA Fall 2007</th>
<th>Physical Aggression Fall 2007</th>
<th>VVG Fall 2007</th>
<th>Trait Aggression Fall 2007</th>
<th>Normative Status Fall 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td>.06*</td>
<td>.43***</td>
<td>.32***</td>
<td>.12**</td>
</tr>
<tr>
<td>GPA Fall 2007</td>
<td>-.08*</td>
<td>--</td>
<td>-.18***</td>
<td>-.19***</td>
<td>-.25***</td>
<td>-.24***</td>
</tr>
<tr>
<td>Physical Aggression Fall 2007</td>
<td>.08*</td>
<td>-.16***</td>
<td>--</td>
<td>.13**</td>
<td>.25***</td>
<td>.38***</td>
</tr>
<tr>
<td>VVG Fall 2007</td>
<td>.41***</td>
<td>-.09*</td>
<td>.18**</td>
<td>--</td>
<td>.25***</td>
<td>.31***</td>
</tr>
<tr>
<td>Trait Aggression Fall 2007</td>
<td>.02</td>
<td>-.15***</td>
<td>.28***</td>
<td>.13**</td>
<td>--</td>
<td>.38***</td>
</tr>
<tr>
<td>Normative Status Fall 2007</td>
<td>.19***</td>
<td>-.19***</td>
<td>.30***</td>
<td>.20***</td>
<td>.28***</td>
<td>--</td>
</tr>
</tbody>
</table>

Note: Sex dummy coded (female = 0, male = 1), GPA = Students average grades, VVG = Violent Video Game Exposure
*p < .10, **p < .05, ***p < .001
Below the diagonally are standardized path coefficients for the 829 students who completed surveys in the fall 2007 and standardized path coefficients above the diagonal are from the 648 students who completed all three waves of the study.
was an indirect effect of violent video games on physical aggression via these two variables (see Table 12).

I replicated this analysis among the 648 students who completed all three waves of the study. Exploratory data analysis indicated that the data was not multivariate normal (Statistics = 58.45, p < .001). Similar to the analyses above, there was no $\chi^2$ statistic to report and all fit indices equaled 1.00 (i.e., GFI, CFI, NFI). The results of these analyses accounted for 42% of the variance in physical aggression during the fall of 2007 (Multiple $R^2 = .42$). Standardized path coefficients indicated that violent video game exposure ($\gamma = .13, p < .01$), trait aggression ($\gamma = .25, p < .001$), and normative status ($\gamma = .38, p < .001$) predicted physical aggression. Further, the mediated paths from violent video game exposure to physical aggression through trait aggression ($\gamma = .25, p < .001$) and through normative status were significant ($\gamma = .31, p < .001$), suggesting that there was an indirect effect of violent video games on physical aggression via these two variables (see Table 12).

Byrne (2001) reported that entering a grouping variable into AMOS can test whether this variable acts like a moderating variable. I was interested in determining if players’ age group, measured using Cohort (Middle School, High School) moderated the associations among violent video game exposure and physical aggression. I entered Cohort into the model assessing these associations among the 829 students who completed surveys in the fall of 2007, but a $\Delta \chi^2$ could not be computed. Comparisons of the main pathways indicated that the associations between the variables were very similar for both groups of students (see Table 13). A similar analysis performed among the 648 students who completed all three waves of data collection also indicated that relation...
Table 13 Standardized Path Coefficients From A Structural Equation Model Testing the Associations Among Physical Aggression from Violent Video Game Exposure, Trait Aggression, and Normative Status Among 829 Middle School and High School Students

<table>
<thead>
<tr>
<th></th>
<th>Physical Aggression</th>
<th>VVG</th>
<th>Trait Aggression</th>
<th>Normative Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Aggression</td>
<td>--</td>
<td>.19*</td>
<td>.27***</td>
<td>.33***</td>
</tr>
<tr>
<td>VVG</td>
<td>.19*</td>
<td>--</td>
<td>.15*</td>
<td>.22**</td>
</tr>
<tr>
<td>Trait Aggression</td>
<td>.29***</td>
<td>.15*</td>
<td>--</td>
<td>.34***</td>
</tr>
<tr>
<td>Normative Status</td>
<td>.22**</td>
<td>.19**</td>
<td>.21**</td>
<td>--</td>
</tr>
</tbody>
</table>

Note: Sex is dummy coded (girls = 0, boys = 1); GPA = Student average grades; VVG = Violent Video Game Exposure

Estimates below the diagonally are for Middle School students and estimates above the diagonally are for High School students

*p = .055, *p < .05, **p < .01, ***p < .001

among these variables were similar for middle school and high school students (See Table 14). The results of this moderation test indicated that violent video game exposure was a direct predictor of physical aggression for both middle school and high school students. In addition, there violent video game exposure was an indirect predictor of

Table 14 Standardized Path Coefficients From A Structural Equation Model Testing the Associations Among Physical Aggression from Violent Video Game Exposure, Trait Aggression, and Normative Status Among 648 Middle School and High School Students

<table>
<thead>
<tr>
<th></th>
<th>Physical Aggression</th>
<th>VVG</th>
<th>Trait Aggression</th>
<th>Normative Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Aggression</td>
<td>--</td>
<td>.15*</td>
<td>.23***</td>
<td>.45***</td>
</tr>
<tr>
<td>VVG</td>
<td>.13*</td>
<td>--</td>
<td>.31***</td>
<td>.31***</td>
</tr>
<tr>
<td>Trait Aggression</td>
<td>.27***</td>
<td>.22**</td>
<td>--</td>
<td>.47***</td>
</tr>
<tr>
<td>Normative Status</td>
<td>.27***</td>
<td>.34***</td>
<td>.31***</td>
<td>--</td>
</tr>
</tbody>
</table>

Note: Sex is dummy coded (girls = 0, boys = 1); GPA = Student average grades; VVG = Violent Video Game Exposure

Estimates below the diagonally are for Middle School students and estimates above the diagonally are for High School students

*p < .05, **p < .01, ***p < .001
violent video game exposure via pathways from trait aggression and normative status.

**Longitudinal Effect of Violent Video Game Exposure on Physical Aggression**

This dataset allowed me to examine the longitudinal effects of violent video game exposure over three time periods, from fall 2007 to fall 2008 (12 month period), from fall 2008 to spring 2009 (6 month period), and from fall 2007 to spring 2009 (18 month period). The six month model, with violent video game exposure from fall 2008 predicting physical aggression in spring 2009 was significant, $F(4, 644) = 171.66, p < .001, R^2 = .29$. Violent video game exposure during the fall of 2008 ($\beta = .15, p < .001$) predicted physical aggression during the spring of 2009 after controlling for physical aggression reported during the fall of 2008 ($\beta = .62, p < .001$), sex ($\beta = -.02, p > .45$), and students' average grades ($\beta = -.11, p < .001$). The twelve month model, predicting physical aggression in the fall of 2008 from violent video game exposure in the fall of 2007 was significant, $F(4, 644) = 64.81, p < .001, R^2 = .29$. Violent video game exposure during the fall of 2007 ($\beta = .09, p < .05$) predicted physical aggression during the fall of 2008 after controlling for physical aggression reported during the fall of 2007 ($\beta = .47, p < .001$), sex ($\beta = .01, p > .65$), and students' average grades ($\beta = -.09, p < .05$).

Both models were replicated in AMOS using the Browne's (1984) Asymptotically Distribution-Free Method estimation method. Similar to the multiple regressions, I controlled for sex, student's average grades, and previous physical aggression. For both models, (i.e., six month lag model and year long lag model) there were no free parameters so the program could not calculate a $\chi^2$ and all fit indices equaled 1.00. The six month model, with violent video game exposure in the fall of 2008 predicting physical aggression in spring 2009 revealed that violent video game exposure
(γ = .15, p = .01) was a significant predictor of later physical aggression (see Table 15).

Results of the year long model, with violent video game exposure during fall 2007 predicting physical aggression in the fall of 2008 revealed a trend for violent video game exposure in fall 2007 (γ = .09, p = .096) to predict on physical aggression in fall 2008; these results are presented in Table 15.

Table 15. Standardized Path Coefficients for Structural Equation Models Predicting Future Physical Aggression from Violent Video Game Exposure, and Previous Physical Aggression.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Physical Aggression</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fall 2008</td>
</tr>
<tr>
<td>Sex</td>
<td>.01</td>
</tr>
<tr>
<td>GPA</td>
<td>-.09*</td>
</tr>
<tr>
<td>VVG Fall 2007</td>
<td>.09+</td>
</tr>
<tr>
<td>Physical Aggression Fall 2007</td>
<td>.47***</td>
</tr>
<tr>
<td>VVG Fall 2008</td>
<td>--</td>
</tr>
<tr>
<td>Physical Aggression Fall 2008</td>
<td>--</td>
</tr>
</tbody>
</table>

Note: Sex dummy coded (girls = 0, boys = 1); GPA = Student's Average Grades; VVG = Violent Video Game Exposure.

*p < .05, **p < .01, ***p < .001

A Longitudinal Test of the General Aggression Model using Multiple Regression

Using this dataset, I wanted to examine if violent video game exposure predicted future physical aggression directly, as well as, indirectly, via changes in trait aggression and normative status. I performed this analysis using both the causal model of testing mediation (Baron & Kenny, 1986) and the multiple mediation bootstrapping procedure described by Preacher and Hayes (2008). First, I regressed physical aggression reported in the spring of 2009 onto violent video game exposure reported in fall of 2007, while controlling for physical aggression reported during the fall of 2007, sex, and student’s average grades. This multiple regression was significant, F(4, 644) = 83.74, p < .001, R² = .34. This analysis revealed that violent video game exposure during the Fall of 2007 (β = .14 p < .001), predicted physical aggression 18 months later after controlling for
physical aggression reported during the fall of 2007 ($\beta = .46, p < .001$), sex ($\beta = -.02, p > .60$), and student’s average grades ($\beta = -.13, p < .001$). I was interested in testing if the effects of violent video games exposure were mediated by changes in trait aggression and normative status. Therefore, I performed two multiple regressions, assessing whether violent video game exposure predicted trait aggression and normative status reported during the spring of 2009.

Table 16. Results of Multiple Regressions Predicting Trait Aggression and Normative Status in Spring of 2009 from Violent Video Game Exposure, Physical Aggression, Trait Aggression, and Normative Status during Fall 2007

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Trait Aggression</th>
<th>Normative Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>.14**</td>
<td>.07</td>
</tr>
<tr>
<td>GPA</td>
<td>-.01</td>
<td>-.02</td>
</tr>
<tr>
<td>Physical Aggression Fall 2007</td>
<td>.10*</td>
<td>.16***</td>
</tr>
<tr>
<td>VVG Fall 2007</td>
<td>.01</td>
<td>.03</td>
</tr>
<tr>
<td>Trait Aggression Fall 2007</td>
<td>.45***</td>
<td>.11**</td>
</tr>
<tr>
<td>Normative Status Fall 2007</td>
<td>.04</td>
<td>.35***</td>
</tr>
<tr>
<td>$F(6, 642)$</td>
<td>54.13***</td>
<td>42.21***</td>
</tr>
<tr>
<td>$R^2$</td>
<td>.34***</td>
<td>.29***</td>
</tr>
</tbody>
</table>

Note: Sex dummy coded (girls = 0, boys = 1); GPA = Student’s Average Grades; VVG = Violent Video Game Exposure.

* $p < .05$, ** $p < .01$, *** $p < .001$

Included in both analyses as covariates were sex, students’ average grades, and physical aggression during the fall of 2007, trait aggression measured during fall 2007, and normative status measured during the fall of 2007. While both multiple regressions were significant, violent video game exposure during the fall of 2007 did not predict future trait aggression or normative status (See Table 16).

I entered all variables into a multiple regression predicting physical aggression during the spring of 2009. This multiple regression was significant, $F(8, 631) = 62.78, p < .001, R^2 = .44$. Table 17 presents the standardized path coefficients for this regression. After controlling for trait aggression and normative status collected during both the fall of
2007 and spring of 2009, as well as controlling for sex and students’ average grades, violent video game exposure during the fall of 2007 directly predicted physical aggression in the spring of 2009 ($\beta = .14, p < .001$).

Table 17 Standardized Path Coefficients Predicting Physical Aggression in Spring of 2009 from Violent Video Game Exposure, Trait Aggression, and Normative Status using the Causal Method of Testing for Mediation

<table>
<thead>
<tr>
<th>Predictor</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>-.03</td>
</tr>
<tr>
<td>GPA</td>
<td>-.11**</td>
</tr>
<tr>
<td>Physical Aggression Fall 2007</td>
<td>.29***</td>
</tr>
<tr>
<td>VVG Fall 2007</td>
<td>.14***</td>
</tr>
<tr>
<td>Trait Aggression Fall 2007</td>
<td>.03</td>
</tr>
<tr>
<td>Trait Aggression Spring 2009</td>
<td>.12**</td>
</tr>
<tr>
<td>Normative Status Fall 2007</td>
<td>.04</td>
</tr>
<tr>
<td>Normative Status Spring 2009</td>
<td>.27***</td>
</tr>
</tbody>
</table>

Note: Sex dummy coded (girls = 0, boys = 1); GPA = Student’s Average Grades; VVG = Violent Video Game Exposure.

* $p < .05$, ** $p < .01$, *** $p < .001$

Also, I used Preacher and Hayes (2008) bootstrapping procedure for SPSS to replicate these results. I entered sex, students’ average grades, prior physical aggression, trait aggression, and normative status collected during the fall of 2007 as covariates. The overall regression model using this approach was significant ($F(8, 639) = 62.78, p < .001, R^2 = .44$). Sex ($\beta = -.11, p > .30, SE = .11$) was not a significant predictor of physical aggression during the spring of 2009, but students’ average grade ($\beta = -.11, p < .01, SE = .033$) did predict this behavior. Violent video game exposure in fall 2007 was predictive of physical aggression in spring of 2009 ($\beta = .07, p < .001, SE = .021$) when the mediators were not included in the model. Both trait aggression during the spring of 2009 ($\beta = .04, p < .01, SE = .014$) and normative status during spring of 2009 ($\beta = .11, p < .001, SE = .014$) were predictive of physical aggression measured at the same time. Including the two mediators into the model did not have any effect on the relation between violent
video game exposure in fall of 2007 and physical aggression in the spring of 2009 ($\beta = .08, p < .001, SE = .019$). As such, the effect of violent video game exposure during the fall of 2007 on physical aggression during the spring of 2009 was not mediated via pathways through either trait aggression during the spring of 2009 ($\beta = .01, p > .75, SE = .057$), or normative status during spring of 2009 ($\beta = -.04, p > .45, SE = .056$).

A Longitudinal Test of the General Aggression Model Using the Asymptotically Distribution-Free Method

As Farrell (1994) demonstrated, structural equation modeling provides a robust way of examining cause and effect associations among variables collected using longitudinal research designs. The results of the multiple regression analyses reported above indicated that violent video game exposure did not predict future trait aggression or normative status, but such exposure was a direct predictor of future physical aggression. I tested a mediated, lagged model using Asymptotically Distribution Free estimation method (Browne, 1984) in AMOS. This model predicted that violent video game exposure during the spring of 2007 leads to changes in trait aggression and normative status, from fall of 2007 to spring of 2009, with changes in those variables predicting increased physical aggression from fall 2007 to spring 2009. Further, as the results above indicated, I added a direct path from violent video game exposure in fall 2007 to physical aggression in spring 2009. The results of this analysis suggested that the model was not an adequate fit to the data $\chi^2(11) = 62.42, p < .001, GFI = .995, CFI = .875, NFI = .861, RMSEA = .085$ (Range = .065 to .106). Modification indices indicated that adding a pathway from sex to trait aggression in the spring of 2009 and correlating trait aggression in spring of 2009 with normative status in spring of 2009 improved model fit.
Adding these pathways improved model fit, $\chi^2(9) = 18.77$, $p = .02$, GFI = .998, CFI = .976, NFI = .958, RMSEA = .041 (Range = .013 to .067) with the model accounting for 44% of variance in physical aggression in spring 2009.

Figure 1 Results of a Longitudinal Mediated Model of Violent Video Game Exposure, Trait Aggression, Normative Status, and Physical Aggression.

Note: The effects of participant sex and student average grade are controlled for in the above analyses, but not depicted. Dashed lines indicate that pathway is not significant at $p < .05$. *$p < .05$, **$p < .01$, ***$p < .001$

Reviewing the modification indices revealed that the model could not be significantly improved. Figure 1 provides estimates for major causal pathways (Table 18 presents the remaining standardized path coefficients). While students’ average grades ($\gamma = -.11$, $p < .01$) predict physical aggression in spring 2009, participant sex was not a direct predictor of this future physical aggression ($\gamma = .04$, $p > .30$).
Table 18. Standardized Path Coefficients For Longitudinal Structural Equation Model Predicting Physical Aggression From Fall 2007 to Spring 2009 from Violent Video Game Exposure, Trait Aggression, and Normative Status

<table>
<thead>
<tr>
<th>Physical Aggression Fall 2007</th>
<th>Sex</th>
<th>GPA Fall 2007</th>
<th>Trait Aggression Fall 2007</th>
<th>Normative Status Fall 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Aggression Fall 2007</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>.14***</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>GPA Fall 2007</td>
<td>-.39**</td>
<td>-.19***</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Trait Aggression Fall 2007</td>
<td>.46**</td>
<td>.30***</td>
<td>-.24***</td>
<td>--</td>
</tr>
<tr>
<td>Normative Status Fall 2007</td>
<td>.51***</td>
<td>.09*</td>
<td>-.24***</td>
<td>.41***</td>
</tr>
<tr>
<td>VVG Fall 2007</td>
<td>.34**</td>
<td>.43**</td>
<td>-.22***</td>
<td>.34**  .27***</td>
</tr>
</tbody>
</table>

Note: Sex dummy coded (female = 0, male = 1), GPA = Students average grades, VVG = Violent Video Game Exposure

*p < .05, **p < .01, ***p < .001
These results indicated that violent video game exposure was a direct predictor of physical aggression in spring of 2009 ($\gamma = .14, p < .01$); however, the mediated pathways from violent video game exposure in fall of 2007 indicated that there was no indirect effect of violent video game exposure via changes in trait aggression ($\gamma = .06, p > .17$) or normative status ($\gamma = .06, p > .60$).

Figure 2. Results of a Longitudinal Mediated Model of Violent Video Game Exposure, Trait Aggression, Normative Status, and Physical Aggression among Middle School Students

Note: The effects of participant sex and student average grade are controlled for in the above analyses, but not depicted. Dashed lines indicate that pathway is not significant at $p < .05$. *$p < .05$, **$p < .01$, ***$p < .001$
To determine if Cohort (Middle School, High School) moderated the associations revealed in the structural equation model, I enter this variable as a grouping variable in the model. The $\Delta \chi^2(9) = 13.65, p = .13$, indicated a tendency for the model to fit better when run for middle school and high school students. The model fit for this analysis was adequate, $\chi^2(18) = 42.69, p < .001$, GFI = .997, NFI = .922, CFI = .948.

Figure 3 Results of a Longitudinal Mediated Model of Violent Video Game Exposure, Trait Aggression, Normative Status, and Physical Aggression among High School Students

<table>
<thead>
<tr>
<th></th>
<th>Fall 2007</th>
<th>Spring 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Violent Video Game</td>
<td>.60***</td>
<td>.36*</td>
</tr>
<tr>
<td>Game Exposure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall 2007</td>
<td>.11</td>
<td>.17**</td>
</tr>
<tr>
<td></td>
<td>.05</td>
<td>.08</td>
</tr>
<tr>
<td>Trait Aggression</td>
<td>.52***</td>
<td>.08</td>
</tr>
<tr>
<td>Fall 2007</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normative Status</td>
<td>.17**</td>
<td>.08</td>
</tr>
<tr>
<td>Spring 2009</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Aggression</td>
<td>.41***</td>
<td></td>
</tr>
<tr>
<td>Spring 2009</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: The effects of participant sex and student average grade are controlled for in the above analyses, but not depicted. Dashed lines indicate that pathway is not significant at $p < .05$.

*p < .05, **p < .01, ***p < .001

RMSEA = .046 (Range = .028 to .064). Figure 2 and Figure 3 presents the models separately for these two groups; covariances appear in Table 19.
Table 19 Standardized Path Coefficients For Longitudinal Structural Equation Model Predicting Physical Aggression From Fall 2007 to Spring 2009 from Violent Video Game Exposure, Trait Aggression, and Normative Status

<table>
<thead>
<tr>
<th></th>
<th>Physical Aggression Fall 2007</th>
<th>Sex</th>
<th>GPA Fall 2007</th>
<th>Trait Aggression Fall 2007</th>
<th>Normative Status Fall 2007</th>
<th>VVG Fall 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Aggression</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall 2007</td>
<td>--</td>
<td>.11</td>
<td>-.39***</td>
<td>.47***</td>
<td>.62***</td>
<td>.45***</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GPA Fall 2007</td>
<td>.19***</td>
<td></td>
<td>-.19**</td>
<td>.25***</td>
<td>.18**</td>
<td>.48***</td>
</tr>
<tr>
<td>Trait Aggression</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall 2007</td>
<td>-.33***</td>
<td>-.18***</td>
<td>--</td>
<td>-.30***</td>
<td>-.27**</td>
<td>-.29**</td>
</tr>
<tr>
<td>Normative Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall 2007</td>
<td>.42***</td>
<td>.34***</td>
<td>-.19***</td>
<td>--</td>
<td>.45**</td>
<td>.37***</td>
</tr>
<tr>
<td>VVG Fall 2007</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>.77***</td>
<td>.18**</td>
<td>-.23***</td>
<td>.60***</td>
<td>--</td>
<td>.38***</td>
</tr>
</tbody>
</table>

Note: Sex dummy coded (female = 0, male = 1), GPA = Students average grades, VVG = Violent Video Game Exposure

*p < .05, **p < .01, ***p < .001

Standardized path coefficients for middle school students appear below the diagonal; high school students standardized path coefficients appear above the diagonal.
In middle school, sex ($\gamma = .06, p > .25$) and students’ average grades ($\gamma = -.08, p > .10$), did not predict physical aggression in spring 2009. Although, violent video game exposure in fall 2007 ($\gamma = .16, p < .05$) was a direct predictor of physical aggression in spring 2009.

Among high school students, sex ($\gamma = .13, p < .01$) and student’s average grades ($\gamma = -.17, p < .01$) both predicted physical aggression in spring 2009, but violent video game exposure in the fall 2007 was not a direct predictor of physical aggression in spring 2009 either ($\gamma = .08, p > .30$), nor was it an indirect predictor via pathways from trait aggression or normative status (See Figure 3).

**Discussion**

**Summary of Cross-Sectional Findings**

Anderson and his colleagues (2001; 2010) confidently stated that exposure to violent video games increases physical aggression among players of both sexes and all ages. Using predictions based on the General Aggression Model (Anderson & Bushman, 2002), these researchers claimed that repeated exposure to violent video games increases physical aggression by altering aggressive personality.

In this dissertation, I tested predictions based on the General Aggression Model (Anderson & Bushman, 2002) among a sample of adolescents. Some researchers have examined if the association between violent video game exposure and physical aggression still exists when attitudes and cognitions are incorporated into prediction models (Anderson et al., 2004; Gentile & Gentile, 2008; Trinkner et al., 2009) and have found that the exposure directly predicts physical aggression. In contrast, other researchers report that the association between violent video game exposure and physical aggression is no longer significant when other variables are entered into prediction models. (e.g., Ferguson et al., 2008). Few researchers have tested if personality and
attitudinal variables mediate the relation between violent video game exposure and physical aggression (for an exception see Bartholow et al., 2005). At the cross-sectional level, I found that violent video game exposure was related to trait aggression, attitudes approving of physical aggression (i.e., normative status), and physical aggression. Further, in three separate tests of the mediated model derived from the GAM (Anderson & Bushman, 2002), violent video game exposure was a direct predictor of physical aggression, even after controlling for participant sex and average grade (cf. Anderson & Dill, 2000). More importantly, these analyses indicated that both trait aggression and normative status were partial mediators between violent video game exposure and physical aggression. Greater reports of exposure to violent video games were related to increased trait aggression and greater normative status. In turn, both trait aggression and normative status were positively related to physical aggression.

An additional goal of this study was to assess how participant age group, measured using cohort, affected the associations among these variables. Most recently, Anderson et al. (2010) suggested that the effects of violent video game exposure were greater among younger players when compared to older players'.. When examining the data at the cross-sectional level, the results of the structural equation modeling indicated that the relation among violent video game exposure, trait aggression, and normative status among the two different groups (i.e., middle school students and high school students) was similar. Among both middle school and high school students, violent video game exposure was a direct predictor of physical aggression as well as an indirect predictor of this behavior, via pathways through trait aggression and normative status. These initial results suggest that the effect of violent video game exposure is similar for students in different age groups when these associations are examined at the same time.
Summary of Longitudinal Findings

The mediated model based on the General Aggression Model (Anderson & Bushman, 2002) attempts to explain how long-term exposure to violent video games leads to physical aggression; therefore, I tracked a subset of students for a period of 18 months to determine if violent video game exposure led to increased aggressive personality which mediated the relation between violent video game exposure and future physical aggression. To date, few longitudinal studies have examined if these associations do exist over extend periods of time. For instance, Gentile and Gentile (2008) found that violent video game exposure directly predicted changes in physical aggression over five month time span, with the effect of violent video game exposure being partially mediated via changes in aggressive cognitions (i.e., hostile attribution bias). Møller and Krahé (2009) reported that violent video game exposure led to changes in aggressive personality over a two-half year span with those effects being fully mediated via changes in normative beliefs about aggression. No researchers have tested a full mediated model of violent video game exposure leading to changes in aggressive personality, leading to increased physical aggression using a longitudinal research design.

Using multiple statistical tests, I found that violent video game exposure led to increased physical aggression over three time periods; over the course of six months (from fall 2008 to spring 2009), the course of one year (from fall 2007 to fall 2008) and over the course of 18 months (from fall 2007 to spring 2009). Greater exposure to violent video games was predictive of greater, future physical aggressions in these lag models, while controlling for participant sex and students average grades. While a mediated model could not be tested at all time intervals, a test of the General Aggression Model (Anderson & Bushman, 2002), over an 18 month time span indicated that violent video
game exposure was a direct predictor of physical aggression; however, such exposure was not an indirect predictor of this behavior. Violent video game exposure during the fall of 2007 did not lead to increased trait aggression in the spring of 2009 or to increased normative status in spring of 2009. Thus, the longitudinal model based on the General Aggression Model (Anderson & Bushman, 2002) was not empirically supported in his dissertation.

At the cross-sectional level participant age group was not found to be a moderator. Those analyses indicated that the effect of violent video game exposure on physical aggression was similar for both middle school and high school students. This was not the case when examining these associations over the 18 month period. Comparisons of structural equation models for middle school and high school students suggested that the effects of violent video games on physical aggression did differed between the two groups. Among middle school students, violent video game exposure in the fall of 2007 directly predicted physical aggression in spring of 2009. In high school students, there was no direct relation between these two variables. The effect of violent video game exposure was not mediated via pathways through trait aggression or normative status among either group. There were other noticeable differences among these two groups. For instance, trait aggression was not a significant predictor of physical aggression among high school students, but was a significant predictor among middle school students. Normative status appeared to be a stronger predictor among high school students when compared to middle school students.

Some researchers have reported that the effects of violent video game exposure are similar among players of all ages (e.g., Anderson, 2004), but Anderson et al. (2010) reported that exposure to violent video games may have a stronger effect on younger
players when compared to older players. Anderson and colleagues (2007) suggested that exposure to violent video game exposure would be stronger among younger players because younger players are more susceptible to the images displayed while playing violent video games, leading to greater increases in aggressive attitudes, cognitions, and other beliefs when compared to older players. I did not find that the violent video game exposure among middle school students increased physical aggression via changes in either normative status or trait aggression. It is possible that repeated exposure to violent video games leads to increased changes in other components of personality, such as cognitions (see Anderson et al., 2004). Further, it is possible that violent video game exposure among younger players leads to greater physical aggression because of social learning factors (Bandura, 1973). Witnessing the violent acts in violent video games might have led middle school students to engage in more physical aggression because they were modeling the behaviors they have seen in these games in real-life.

Implications for Future Researchers

This dissertation was designed to address methodological and theoretical limitations in the current literature. From a methodological standpoint, I want to conduct research assessing the effects of violent video game exposure on physical aggression using a measure of physical aggression with strong external validity. Critics of the violent video game exposure and aggression literature cite the failure of researchers in this field to adequately measure physical aggression, and often point to the fact that violent video game exposure is unrelated to macro-level measurement of violence and aggression reflected in crime statistics (e.g., Ferguson, 2009; Savage & Yancey, 2008). Using the violent delinquency component of the National Youth Survey (Elliot et al., 1985) I used a measure of physical aggression that is very similar to the types of
behaviors reported by official crime statistics. This measure has been studied heavily and is widely accepted as good measure of adolescent physical aggression (Elliott et al., 1989; Huizinga & Elliot, 1986). A few researchers have examined the relation between violent video game exposure and the scale used in this dissertation among college students (e.g., Anderson & Dill, 2000), but this research is the first to demonstrate that exposure to violent video games predicts this form of physical aggression among adolescents. Researchers studying adolescents often use peer or teacher nominations of physical aggression, measuring a few aggressive behaviors (e.g., hits, punches, or kicks other students) (Anderson et al., 2008; Gentile & Gentile, 2008). Future researchers should use the National Youth Survey violent delinquency subscale when examining the effect of violent video games exposure on physical aggression. Replicating the findings reported in this dissertation would demonstrate that exposure to violent video games has an effect on physical aggression that occurs outside of the laboratory.

Further, from a methodological standpoint, the measure of violent video game exposure used in this dissertation was different than the traditional measure of this variable, introduced by Anderson & Dill (2000). Instead of relying on participants' own ratings of the violent content in the video games they play, I used a category-based measure of violent video game exposure. Bucolo (2009) argued that having players rate the level of violence in video games could lead individuals who are naturally aggressive to rate the violence portrayed in the games as more graphic and intense when compared to players who are not naturally aggressive (e.g., see Berkowitz, 1993; Dodge & Coie, 1987). Möller (2006) made a similar argument in her comparison of different methods for measuring exposure to media violence. She found that a category-based measures based on independent evaluations of violence in media were more reliable and had similar
predictive power than measures of violent media that relied on participants' ratings of violence.

For my measure of violent video game exposure, the categories and examples used in this dissertation were similar to those used by more modern research (e.g., Anderson et al., 2008; Möller & Krahé & 2009). Further, Trinkner et al. (2009) used a similar categorical measure to assess both violent video game exposure and nonviolent video game exposure and reported that only the former, and not the latter, were predictive of physical aggression. Further, Trinkner et al. (2010) found that a similar category-based measure of violent video game exposure was strongly related to Anderson and Dill’s (2000) measure of violent video game exposure, indicating that these variables are measuring similar levels of exposure.

In this dissertation, exposure to violent video games, which was the sum of exposure to four categories of games, predicted physical aggression in cross-sectional design as well as a 18 month longitudinal design. Future researchers should replicate these findings to provide support for using a category based measure of violent video games. In Anderson et al.’s (2010) meta-analysis, they indicated that the effects of violent video game exposure on aggressive behavior were smaller in studies that used a category-based measure of violent video game exposure when compared to the Anderson & Dill (2000) measure. Thus, future researchers should compare the type of violent video game measure I used in this study with the measure typically used by Anderson & Dill (2000). If violent video game exposure is related to physical aggression using both variable measurement approaches, this would provide additional evidence of the robustness of this effect. However, if results begin to indicate that violent video game exposure only predicts physical aggression when it is measured a certain way, then it calls into question
whether it is violent video game exposure itself or measurement issues driving these effects.

From a theoretical standpoint, I designed this dissertation to conduct multiple tests of the General Aggression Model (Anderson & Bushman, 2002). Using the General Aggression Model (Anderson & Bushman, 2002) as a theoretical framework, I tested whether violent video game exposure affected physical aggression directly and indirectly, via associations through trait aggression (Buss & Perry, 1992) and normative status (Cohn & White, 1990). The results revealed that violent video game exposure predicted physical aggression directly, both at a cross-sectional level, and over the span of 18 months. At the cross-sectional level, both trait aggression and normative status were partial mediators between violent video game exposure and physical aggression. Over the span of 18 months, violent video game exposure only directly predicted increased physical aggression. Exposure to violent video games did not affect either trait aggression or normative status over that time period. Therefore, the results of the study do not support predictions derived from the General Aggression Model (Anderson & Bushman, 2002), that changes in aggressive personality mediate the relation between long term violent video game exposure and physical aggression.

While many researchers have used cross-sectional designs to assessing how long term exposure to violent video games affects physical aggression, recently researchers have begun using longitudinal studies to address how exposure affects future aggression (e.g., Anderson et al., 2008; Gentile & Gentile, 2008). This dissertation was designed to provide a longitudinal test of the mediated model described by Anderson and Bushman’s (2002) General Aggression Model. Other researchers have conducted similar longitudinal tests, with Möller and Krahé’s (2009) 30 month longitudinal model being the longest.
time period researchers have examined the long term effects of violent video game exposure. Future researchers need to conduct longer studies to determine the extent to which violent video game exposure predicts future physical aggression. To date, longitudinal studies have only examined the relation between violent video games and aggression over a few months or years among adolescents. Researchers have been investigating the effects of violent media on aggression for decades and have found that exposure to violent media when a child predicts future aggression when viewers are adults (see Huesmann & Taylor, 2006). It would be interesting to see if these relations persistent for adolescent exposure to violent video games.

The General Aggression Model (Anderson & Bushman, 2002) indicates that aggressive personality is comprised of five components, including cognitions and attitudes. In this dissertation, I only examined one measure of aggressive personality and one measure of attitudes toward aggression. It is possible that there are other potential mediators between long term violent video game exposure and physical aggression. Many researchers in this field have examined how violent video game exposure alters cognitive processing. These studies have indicated that long-term exposure to violent video games alters players cognitive processing, making these players more likely to perceive aggression in neutral and ambitious situations, and increases the likelihood that players will elicit aggressive thoughts in everyday interactions. These changes have been found to lead to increased aggressive personality (Anderson et al., 2007; Möller & Krahé, 2009) and increases in aggressive behavior (Anderson et al., 2008; Gentile & Gentile, 2008). More research is needed to determine if cognitions are the only mediators between violent video games and physical aggression. Perhaps, future researchers could compute mediated models in which cognitions and attitudes mediate changes in aggressive

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personality which, in turn, is a mediator to physical aggression. Such models would provide more robust tests of the General Aggression Model (Anderson & Bushman, 2002) and would allow researchers to compare how attitudes and cognitions affect aggressive personality.

I did not find that violent video game exposure had an impact on aggressive personality. Unfortunately, I did not use all the items that make up the aggressive personality scale developed by Buss and Perry (1992). Other researchers who have used the entire measure of aggressive personality have reported that exposure to violent video games does increase aggressive personality over an extended period of time (e.g., Anderson et al., 2007; Möller & Krahé, 2009). Ferguson et al. (2008) used the entire Buss and Perry (1992) trait aggression measure and found that violent video game exposure did not affect this measure of personality. These researchers utilized a retrospective correlational design, measuring all the variables at one time, limiting researchers' claims that they were examining long-term exposure to violent video games. Future researchers need to try and replicate the mediated model I tested in the current dissertation using the complete trait aggression scale (Buss & Perry, 1992). If future researchers do find that repeated violent video game exposure affects aggressive personality, then the results of this dissertation may have been the result of measurement error. Further, while I examined only one measure of aggressive personality, there are other components or "traits" researchers could examine that make up aggressive personality. For instance, Trinkner et al. (2009) used the subscales of impulsivity, temper, and risk-preference from Grasmick et al.'s (1993) measure of self-control as components of aggressive personality. These researchers found that violent video game exposure predicted physical aggression after controlling for these variables. It is possible that
exposure to violent games alters these traits, leading to an increased aggressive personality. Future researchers should use additional measures of aggressive personality to determine if violent video game exposure alters these traits.

Theoretically, I assessed how exposure to violent video games affects adolescents of different age groups. Anderson et al. (2007) described that the GAM would indicate that the effects of violent video game exposure would be greater among younger players, as these players would be more likely to rehearse the violent images portrayed in violent video games. Being more susceptible to the learning experiences when exposed to violent video games, the GAM indicates that younger players' aggressive personality is more likely to be altered than older players. Previous research in this domain has been inconsistent with researchers reporting that older players are more affected by violent video game exposure than younger players (Sherry, 2001), and other researchers indicating that the effects of violent video game exposure on physical aggression are stronger among younger players (Anderson et al., 2008).

At the cross-sectional level player age group, as measured using cohort, revealed that the partially mediated model of violent video game exposure and physical aggression was similar for middle school and high school students, respectively. Overtime, exposure to violent video games only affected middle school students; there was no association between violent video game exposure and physical aggression among high school students when assessing these relations over an 18 month time span. Other predictors, including sex and normative status, became better predictors among high school students, indicating that boys were more likely to engage in this behavior and those high school students who were more accepting of physical aggression engaged in additional physical aggression. Although, Anderson et al. (2008) reported similar findings, they found that
violent video game exposure still predicted older players' aggression. Their study examined adolescents of different ages from different cultures. Thus, the differences reported by those researchers may have resulted from cultural differences, not differences in how violent video game exposure affects players at different age groups.

The preliminary results from my longitudinal analysis support the predictions made by the General Aggression Model (Anderson & Bushman, 2002), as violent video game exposure only predicted future physical aggression among middle school, and not high school, students. These findings should be replicated with players from different age groups to determine when violent video game exposure becomes a factor related to adolescents' physical aggression. Studies examining school age children have not found that violent video game exposure predicts aggression in these younger players (e.g., Hastings et al., 2009), so it is possible that there is only a small window in adolescent development in which violent video game exposure affects physical aggression.

Researchers have found that violent video game exposure predicts adults' physical aggression, at least at the cross-sectional level (Anderson & Dill, 2000; Anderson et al., 2004), so it would be interesting to conduct longitudinal comparisons of players from a wide range of age groups. With 25% of video game players being above 50 and an additional 25% being under 18 (and the remaining 50% being between 19 and 49) video game exposure occurs across the life span (Entertainment Software Association, 2009). Further research assessing the mechanisms by which exposure to violent video games affects older and younger players is need to determine if exposure to these games has lasting effects throughout a player's life.

Additionally, researchers should begin tracking violent video game exposure among players of different ages now, so data from additional cohorts of players can be
analyzed years into the future. By tracking players for multiple years, researchers can measure a variety of physically aggressive behaviors, including spousal reports of aggression, peer reports of aggression, and official crime statistics such as arrest data and convictions (cf., Huesmann et al., 2003; Johnson et al., 2002). Getting official reports of physical aggression witnessed by police or prosecuted in the courts and linking these reports to violent video game exposure would clearly demonstrate that exposure to violent video games does have a long term effect on physical aggression in the real world.

Other researchers have argued that the effects of violent video game exposure are spurious, and that other “third variables” will eliminate the effect of these games when included in prediction models (Ferguson et al., 2008). To date, the longitudinal models in this dissertation are the first to show that violent video game exposure was predictive of future physical aggression, when other third variables including aggressive personality and aggressive attitudes, were included in prediction models. More longitudinal research is needed to determine if long term exposure to violent video games predicts future physical aggression when other risk-factors, including personality, beliefs, and family variables are included in prediction models. It is possible that such exposure will not predict future physical aggression, especially adult physical aggression (Ferguson, 2009).

**Applied Implications Outside of the Research Laboratory**

This dissertation was not designed to examine what factors could reduce the effects of violent video game exposure on adolescent physical aggression. However, the results of the study could inform the policies and initiatives that other researchers have proposed.

Unlike movies or television, in which access to violent content is restricted by
federal regulations and state laws, there is no federal legislation barring adolescents from purchasing and/or playing violent video games. The Entertainment Software Association (2009) provides ratings for games, based on the content of those games, with many violent video games receiving ratings of Mature, meaning things games should be played by adults older than 17. Some violent video games only receive ratings of Teen, meaning they are appropriate for players 13 years old or older. Regardless of rating, there are no agencies or state/federal offices that monitor who buy video games and currently many states, and the federal government, do not require stores to verify the age of individuals purchasing a video game.

As Collier, Liddell, & Liddell, (2008) summarized, some of the state initiatives that have been proposed to prohibit adolescents from being exposed to violent video games have been struck down by federal courts as a violation of video game makers' first amendment rights. In 2006, the House of Representatives entered a bill, entitled the Video Games Ratings Enforcement Act (HR 5345), which would have made it illegal to sell a video game rated Mature to adolescents younger than 17. The bill was never voted on and was reentered in May of 2008—congress has yet to vote on the act. Requiring photo identification would reduce adolescents' exposure to violent video game, especially among younger adolescents, as it would reduce their ability to purchase these games. As the results of this dissertation indicate, exposure to violent video game has a greater effect on future physical aggression among younger players when compared to older players. It would make sense to verify adolescents age, similar to movie theatres, and to restrict purchasing privileges to players who are only 17 or older. It is possible, that restricting access to these violent video games, through legislation, could reduce the effects of violent video game exposure on physical aggression among younger players.
Beyond using legislation, Collier et al., (2008) suggested changing the rating system, so games with extreme acts of violence receiving the most restricted video game rating, Adult. This rating is often reserved for video games with strong sexual content and can only be purchased by adults 18 years old or older. Because of the nature of Adult games, many major retailers (e.g., Wal-Mart, Best Buy, and Toys R Us) refuse to carry games that receive this rating. According to Collier et al. (2008), if the rating system was altered to rate games with strong violent content as Adult games; it is possible that many retailers would not sell those games. By reducing where young adolescents could buy violent video games, exposure to these games would be reduced, further reducing the negative effect of violent video game exposure on physical aggression.

According to sales data, the average video game purchaser is 35 years old (Entertainment Software Association, 2009). Therefore, providing restrictions on purchasing violent video games or requiring photo identification to purchase Mature and Adult video games would not totally eliminate adolescents’ exposure to these games. Parents often purchase games for their children and parents routinely do not even check the ratings of the games they buy for their children (Funk, Hagan, & Schimming, 1999; Gentile & Walsh, 2002). Although parents indicate that the rating system is important and that they understand what the ratings mean (see Kutner & Olson, 2008) it appears that they often do not examine the ratings before purchasing games.

A better alternative would be to find ways of reducing the negative effects of violent video games directly, as opposed to trying to prohibit adolescents from playing these games. One approach to reducing the negative effects of violent video games on adolescent aggression is through parental involvement. Gentile and colleagues (2004) examined violent video game exposure and physical aggression among eighth and ninth
grade students and found a positive association between violent video game exposure and getting into physical fights. These researchers found the effects of violent video game exposure were reduced, although still significant, when researchers included parental involvement in media in their prediction models. These researchers measured parental involvement by asking adolescents how often their parents checked the ratings of video games they own and rented and how often their parents limited the amount of time students play video games. Thus, the effect of violent video game exposure on children’s aggression was reduced when students reported their parents were more aware of the games they play and limited children spent playing these games.

A similar measured was recently used by Anderson et al., (2007) to assess how parental involvement affected short-term violent video game exposure in an experimental context. These researchers asked children, aged 9-12, how often their parents limited their video game exposure, played video games with them, and how often their parents talked to them about the games they play. What these researchers discovered was that the level of parental involvement eliminated the effect of violent video game exposure, in an experimental context. Students that reported high parental involvement with video games did not engaging in significantly more aggressive behavior, after playing a violent video game, when compared to students who played a nonviolent video game. However, students who reported low parental involvement with video games, were significantly more likely to be aggressive after playing a violent video game when compared to similar students who played a non-violent video game.

Although I did not examine parents in the current dissertation, my findings suggest that parents should spend time with their younger children, getting to know the video games they play. By being involved in the video games, including violent video
games, parents can teach their students about proper uses of physical aggression in the real world. Further, as Anderson et al. (2007) reported, parental involvement provides opportunity for parents to see the games their children are playing and understand how these games may affect their children. Then, parents can have conversations with their children regarding the violent images and themes found in violent video games. By augmenting violent video game exposure with the proper messages and communications, parents could limit the social learning factors (Bandura, 1986) that accompany violent video game exposure. This could reduce the probability that exposure to violent video games will lead to changes in physical aggression, as students can divorce the images portrayed in these games, with the nature of physical aggression in the real world.

Conclusion

Even though researchers confidently claim that violent video game exposure affects aggression (Anderson et al., 2020), critics of this research suggest that previous researchers have exaggerated the effects of violent video games, indicating that violent video game exposure is not related to physical aggression in the real world (Ferguson, 2009; Olson, 2004, Savage & Yancey, 2008). Further, these researchers have reported models that to not support predictions derived from the General Aggression Model (Anderson & Bushman, 2002), that violent video game exposure affects aggression via changes in aggressive personality (Ferguson et al., 2008). In this current dissertation, I conducted cross-sectional and longitudinal tests of predictions made from the General Aggression Model (Anderson & Bushman, 2002). Although I did not find that the effect of violent video game exposure on physical aggression was mediated by aggressive personality, I did find that exposure to violent video games was a direct predictor of physical aggression. These effects remained significant over the course of 18 months.
Adolescent age moderated this association, with the longitudinal effect of violent video game exposure only occurring among middle school, and not high school students. Future research is needed to determine if these results can be replicated in other samples.

Further, long-term research is needed to determine if violent video game exposure in adolescences predicts aggression in adulthood.
LIST OF REFERENCES


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Huesmann, L. R., Moise, J., Podolski, C.L. & Eron, L. D. (2003). Longitudinal relations between children’s exposure to TV violence and their aggressive and violent

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Influences on aggressive feelings and behavior. *Presence: Teleoperators & Virtual Environments, 17, 57-72.*


Buss and Perry (1992) Items from the Physical Aggression Subscale

<table>
<thead>
<tr>
<th>How much do you agree with each statement below?</th>
<th>Disagree Strongly</th>
<th>Disagree Somewhat</th>
<th>Agree Somewhat</th>
<th>Agree Strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Once in a while I can't control the urge to strike another person.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2. If someone provokes me enough, I may hit them.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3. If somebody hits me, I hit back.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4. If I have to resort to violence to protect my rights, I will.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5. There are people who pushed me so far that we ended up hitting one another.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Violent Video Game Measures (from Trinkner et al., 2009)

Now we are interested in how often you played different TYPES of video/computer games during the past week.

<table>
<thead>
<tr>
<th>In the past week only, how many hours did you play...</th>
<th>No hours</th>
<th>1-4 hours</th>
<th>5-8 hours</th>
<th>9-14 hours</th>
<th>15+ hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. ...action games? (Grand Theft Auto, SOCOM, Hitman, Mercenaries, etc.)</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3. ...adventure games? (Tomb Raider, Resident Evil, God of War, Zelda, etc.)</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6. ...first person shooter games? (Halo, Doom, Call of Duty, etc.)</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7. ...fighting games? (Mortal Kombat, Tekken, DOA, WWE Smackdown, etc.)</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
### Cohn & White’s (1990) Normative Status

<table>
<thead>
<tr>
<th>How much do you APPROVE OF...</th>
<th>Strongly Disapprove</th>
<th>Disapprove</th>
<th>Approve</th>
<th>Strongly Approve</th>
</tr>
</thead>
<tbody>
<tr>
<td>13. intentionally damaging or destroying property that does not belong to you?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>14. getting into a fight at school?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>15. hitting or seriously threatening to hit someone?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>16. attacking someone with the idea of seriously hurting or killing them?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>17. hurting someone badly enough to need bandages or a doctor?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>19. using a knife/gun/other object (like a bat) to get something from a person?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>20. committing assault (a violent physical attack)?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>21. using force to get money or things from another person?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

### Wolpin (1983) Physical Aggression Scale

<table>
<thead>
<tr>
<th>In the PAST 6 MONTHS, how many times have YOU...</th>
<th>times</th>
</tr>
</thead>
<tbody>
<tr>
<td>13. Intentionally damaged or destroyed property that did not belong to you?</td>
<td>times</td>
</tr>
<tr>
<td>14. gotten into a fight at school?</td>
<td>times</td>
</tr>
<tr>
<td>15. hit or seriously threatened to hit someone?</td>
<td>times</td>
</tr>
<tr>
<td>16. attacked someone with the idea of seriously hurting or killing them?</td>
<td>times</td>
</tr>
<tr>
<td>17. hurt someone badly enough to need bandages or a doctor?</td>
<td>times</td>
</tr>
<tr>
<td>19. used a knife/gun/other object (like a bat) to get something from a person?</td>
<td>times</td>
</tr>
<tr>
<td>20. committed assault (a violent physical attack)?</td>
<td>times</td>
</tr>
<tr>
<td>21. used force to get money or things from another person?</td>
<td>times</td>
</tr>
</tbody>
</table>
APPENDIX B

INSTITUTIONAL REVIEW BOARD
March 28, 2006

Ellen Cohn
Psychology
Conant Hall
Durham, NH 03824

IRB #: 3644
Study: Cognitive Developmental Factors and Rule-Violating Behavior: The Role of Personal Attributes, Attitudes, and Peers
Approval Date: 02/24/2006

The Institutional Review Board for the Protection of Human Subjects in Research (IRB) has reviewed and approved the protocol for your study.

Approval is granted to conduct your study as described in your protocol for one year from the approval date above. At the end of the approval period you will be asked to submit a report with regard to the involvement of human subjects in this study. If your study is still active, you may request an extension of IRB approval.

Researchers who conduct studies involving human subjects have responsibilities as outlined in the attached document, Responsibilities of Directors of Research Studies Involving Human Subjects. (This document is also available at http://www.unh.edu/osr/compliance/irb.html.) Please read this document carefully before commencing your work involving human subjects.

If you have questions or concerns about your study or this approval, please feel free to contact me at 603-862-2003 or Julie.simpson@unh.edu. Please refer to the IRB # above in all correspondence related to this study. The IRB wishes you success with your research.

For the IRB,

Julie F. Simpson
Manager

cc: File