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Is it competitiveness or violent content?: the effects of violent sports video games on aggression

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Is it competitiveness or violent content?

The effects of violent sports video games on aggression

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ABSTRACT

Past experimental research has shown that violent video game exposure can increase aggression-related variables compared to nonviolent video game exposure. Currently, there are two competing hypotheses to interpret these findings. The violent-content hypothesis states that violent video games increases aggression because the violent content increases the accessibility of aggression-related knowledge structures. The competition-only hypothesis states that violent video games typically have a high level of competition compared to nonviolent video games. According to this hypothesis, the heightened level of competition increases aggression. One way to test these hypotheses is to expose participants to violent and nonviolent video games matched on competition. Four experiments accomplished this by examining the impact of illicit violence in sport video games on aggression-related variables. Experiment 1 demonstrated that the illicitly violent sport video games contained more violence than the nonviolent same-sport video games, but were not significantly different on competitiveness. In the remaining experiments, participants played either a violent or nonviolent sports video game. Participants then completed measures assessing aggressive cognitions (Experiment 2), aggressive affect and attitudes towards aggression in sports (Experiment 3), or aggressive behavior (Experiment 4). Exposure to violent sports video games increased aggressive affect, aggressive cognition, aggressive behavior, and some positive attitudes towards aggression in sports. Because all games were competitive, these findings support the violent-content hypothesis and fail to support the competition-only hypothesis.

INTRODUCTION

The score is 3 to 3 in the bottom of the ninth inning. Your baseball team has a man on second base with two outs. Suddenly, the base runner tries to steal third base. The catcher throws the ball to the third baseman, but your runner is already safe at third. Then out of nowhere, your base runner starts physically assaulting the third basemen, causing him to drop the ball. Your base runner runs to home and scores the winning run!

This scenario has never occurred in any real-life professional baseball game. However, in the electronic world this is a common occurrence in some sports video games. There are numerous sports video games that allow players to engage in aggressive actions that do not occur in real-life professional sporting leagues. For example, in NFL Blitz, players can make the athletes complete highly aggressive tackles (even after a play is over) on other athletes that are not allowed in the real National Football League.

In 2002, ESPN aired an investigative piece examining the impact of illicitly violent sports video games (games that encourage violent actions that are not tolerated in real-life professional sporting leagues) on youth's attitudes towards sports (ESPN, 2002). At the time, Midway Games was producing a series of sports games (e.g., NFL Blitz, MLB Slugfest, NHL Hitz) that contained illicit violence, presumably to appeal to video game players who were not typical sports fans. The National Football League, Major League Baseball, and the National Hockey League officially licensed these games, which permitted Midway to include team logos as well as players' names and likenesses in the games. This allowed video game

players to control real-life athletes and perform aggressive actions on the electronic field. The ESPN program questioned why the athletic leagues would allow their license to be used in this manner and what effect these violent sports games had on young players. Their investigation yielded few answers.

In December 2004, the NFL granted exclusive license rights to EA Sports, making it the only company allowed to use NFL logos and players in a football video game (Rovell, 2004). In response to this, Midway Games released a more violent, grittier football game based on a fictitious league with fictitious players. The new football video game, which is rated appropriate only for people seventeen and older, features illicit violence on the field, illegal violent behaviors off the field, drug use, sex, and gambling (Robinson, 2005).

Violence and the Video Game Industry

The concern about violence in video games has become a major social issue and is not limited to violence in sports video games. Analyses have shown that over 85% of the games on the market contain some violence (Children Now, 2001). In addition, approximately half of video games include serious violent actions toward other game characters (Children Now, 2001; Dietz, 1998; Dill, Gentile, Richter, & Dill, 2005).

Time spent playing video games

Since 1999, the amount of daily video game usage by youth has nearly doubled (Roberts, Foehr, & Rideout, 2005). Almost 60% of American youth from ages 8-18 report playing video games on “any given day” and 30% report playing for more than an average of an hour a day (Roberts et al., 2005). Video game usage is

high among youth regardless of sex, race, parental education, or household income (Roberts et al., 2005).

Players' preference for violent content

A majority of children prefer violence in their video games. In surveys of paired children and parents, approximately two thirds of children named violent games as their favorite games (Funk, Flores, Buchman, & Germann, 1999). However, most parents are not likely to know what video games their child is playing. Only one third of parents were able to correctly identify their child's favorite video game. In 70% of the incorrect parental responses, children listed a violent video game as their favorite (Funk et al., 1999).

Parental supervision and parental control

Besides not being informed about which games their children are playing, parents rarely supervise or restrict video game usage. Almost 90% of teenagers report their parents never limited the amount of time spent playing video games (Gentile, Lynch, Linder, & Walsh, 2004). Also, 90% of the youth surveyed in grades 8-12 reported that their parents have never checked the ratings of video games before allowing the youth to purchase them. Only 1% of these youth reported their parents had ever prohibited them from purchasing a video game because of its rating. Fewer than 25% of parents set rules about which video games their children can play and limit video game exposure (Roberts et al., 2005).

Marketing violence towards youth

Not only is violence a dominant theme in current video games, but video game companies are also marketing those violent games towards youth. A Federal

Trade Commission report (2000) revealed that 70% of the M-rated games (games deemed by the Entertainment Software Rating Board as acceptable only for people 17 or older) were marketed toward children under 17. In addition, half of the M-rated game titles researched had at least one advertising plan that deliberately included children under seventeen as a target group. Ten of the eleven companies surveyed had documents that included males under seventeen as part of the target audience for their M-rated games.

Discrepancies in rating video games for violent content

Not surprisingly, there is a large discrepancy between what the video game industry and what the public considers to be classified as violent. The video game industry and its ratings board (Entertainment Software Rating Board) notice much less violence in video games than do parents (Walsh & Gentile, 2001) and other research groups (Thompson & Haninger, 2001). For example, many games contain cartoon-like violence, (known as mild animated violence) which the ESRB claims are appropriate for all ages (rated "E" for everyone), but parents and even children disagree (Funk et al., 1999). Also, parents prefer ratings systems that address content descriptions of the media while the current media ratings system primarily focus on age recommendations (Bushman & Cantor, 2003).

LITERATURE REVIEW

Effects of Violent Media Exposure

Exposing youth to violent media (e.g., television, movies, music, video games) has been a social concern for several decades. The vast amount of research conducted on the effects of violent television and movies on aggressive behavior spans several decades. By 1975, eighty studies had been published on the effects of media violence on aggressive behavior. These early studies revealed a clear consensus that exposure to media violence (both in the laboratory and in real-life settings) causes increases in aggressive behavior (Bushman & Anderson, 2001). Although the scientific research clearly demonstrated media violence exposure caused increases in aggressive behavior, the news media's coverage of this issue paints quite a different story. Since 1975, although research on media violence has yielded even stronger evidence of causal effects on aggression, the news coverage portrayed the media violence effects as weaker than did earlier news reports (Bushman & Anderson, 2001).

Despite how the news media continues to portray the effects of media violence, the research is clear: youth exposed to violent television tend to become more aggressive adults (e.g., Anderson et al., 2003; Anderson & Bushman, 2002b; Bushman & Anderson, 2001; Hearold, 1986; Huesmann & Miller, 1994; Huesmann, Moise-Titus, Podolski, & Eron, 2003; Paik & Comstock, 1994; Wood, Wong, & Chachere, 1991). Viewing violent television and movies causes increases in aggressive cognitions, affect, and behavior. The effect of viewing violent television on aggressive behavior has been demonstrated to be greater than the effect of

being exposed to asbestos on contracting laryngeal cancer, consuming calcium on increased bone mass, or wearing a condom on not contracting HIV (Bushman & Anderson, 2001).

Effects of Violent Video Game Exposure

Relative to the vast size of the violent television literature, the research examining violent video game exposure is rather small. This is mainly due to the fact that video games are a fairly new media type compared to television. However, the current research literature has already concluded that playing violent video games increases aggression and aggression-related variables. The latest meta-analyses examining the effects of violent video games on aggressive behavior and other aggression-related outcome variables (e.g., Anderson et al., 2004) have shown that violent video game exposure increases physiological arousal, increases aggressive affect, increases aggressive cognitions, increases aggressive behaviors, and decreases pro-social behavior. Recent meta-analyses have demonstrated average violent video game effect sizes (in correlation terms) in the .2-to-.3 range. New studies also indicate that violent video game exposure is also related to physiological desensitization to violence (e.g., Bartholow, Bushman, & Sestir, 2006; Carnagey, Bushman, & Anderson, in press).

Violent video games increase aggressive behavior

Several correlational studies have revealed a positive relationship between playing violent video games and aggressive behavior. For example, Anderson and Dill (2000) showed a positive relationship between violent video game exposure and self-reported aggression on the National Youth Survey, which includes items

assessing assault and robbery. Young adolescents who played more violent video games also reported more frequent aggressive behaviors, such as arguing with teachers and getting involved in physical fights (Gentile et al., 2004).

Experimental studies have revealed similar results: participants exposed to violent video games behave more aggressively than participants not exposed to violent video games (e.g., Anderson & Dill, 2000; Cooper & Mackie, 1986; Irwin & Gross, 1995; Schutte, Malouff, Post-Gorden, & Rodasta, 1988; Silvern & Williamson, 1987). The average effect size across studies between violent game exposure and aggressive behaviors was $r = 0.27$ (Anderson et al., 2004). The violent video game exposure effect on aggressive behavior has been found in children and adults, in males and females, and in experimental and non-experimental studies.

Violent video games increase aggressive cognition

There is both correlational and experimental evidence that violent video game exposure increases aggressive cognitions. In a correlational study, young adolescents who reported playing more violent games also had higher hostile attribution biases (Lynch, Gentile, Olson, & Van Brederode, 2001). People with hostile attribution biases have been shown to act aggressively and are often socially maladjusted (Crick & Dodge, 1994). These effects of hostile attribution biases have been found in laboratory settings. Bushman and Anderson (2003) and Kirsch (1998) showed that young adults who played a violent video game generated more aggressive endings to story stems than those who had played nonviolent video games.

Besides hostile attribution biases, aggressive cognitions can be measured in a variety of ways. For example, Anderson & Dill (2000) demonstrated that playing a violent video game increased the relative speed with which the person could read aggression-related words compared to playing a nonviolent game. In addition, numerous other studies have demonstrated that after playing violent video games, aggressive thoughts are increased compared to playing nonviolent video games (e.g., Calvert & Tan, 1994; Graybill, Kirsch, & Esselman, 1985).

Recent meta-analyses have shown the average effect size across studies between violent video game exposure and aggressive cognitions is $r = 0.27$ (Anderson et al., 2004). Much like the violent video game effects on aggression, the effects on aggressive cognition have been found in children and adults, in males and females, and in experimental and non-experimental studies.

Violent video games increase aggressive affect

Empirical studies have demonstrated that playing violent video games can cause increases in aggressive affect. For example, adults' state hostility and anxiety levels were increased after playing a violent game compared to control conditions (Anderson & Ford, 1986). In a study of 3rd through 5th grade children, those who played a violent game demonstrated higher frustration levels than those who played a non-violent game (Funk et al., 1999). Meta-analytic research has demonstrated that the effect size of playing violent videogame on aggressive affect is $r = .19$ (Anderson et al, 2004). Results examining aggressive affect are often considered less interesting because nonviolent video games can also cause increases in negative affect by being too difficult, resulting in player frustration.

Violent video games decreases prosocial behavior

Prosocial behavior has been shown to decrease as a result of exposure to violent video games (e.g., Ballard & Lineberger, 1999; Chambers & Ascione, 1987; Silvern & Williamson, 1987; Wiegman & Van Schie, 1998). Bushman, Shlecter, Anderson, & Carnagey (in preparation) showed that participants exposed to a violent video game were slower at providing help to a violence victim than participants exposed to a nonviolent video game. Recent meta-analytic research has demonstrated that the violent video game exposure effect on helping behavior is r = -.27 (Anderson et al., 2004).

Violent video games increase physiological arousal

Playing violent video games tends to increase heart rate, systolic and diastolic blood pressure compared to playing non-violent video games (e.g., Murphy, Alpert, & Walker, 1991). The average effect size across studies between violent game exposure and physiological arousal was r = 0.22 (Anderson et al., 2004). For example, Ballard and Wiest (1996) showed that playing a violent game (*Mortal Kombat* with the blood "turned on") resulted in higher systolic blood pressure responses than playing either a nonviolent game or a less graphically violent game (*Mortal Kombat* with the blood "turned off").

Similar to aggressive affect, the effect of video game exposure on physiological arousal is not limited to violent video games. Non-violent video games, by being exciting and involving to the player, can also increase physiological arousal. Because this effect on physiological arousal isn't primarily limited to only violent video games, many researchers view this as less interesting than the violent

video game effect on other aggression-related variables. In fact, recent experimental research has successfully controlled for arousal between nonviolent and violent video game conditions, thereby eliminating a potential confound in the experimental design (e.g., Anderson & Dill, 2000, Carnagey & Anderson, 2005).

Violent video games can desensitize players to violence

Even though violent video game exposure has been shown to increase physiological arousal, it also has the capacity to cause physiological desensitization to real-life violence. Recent research has demonstrated that past violent video game exposure was related to reduced P300 amplitudes when exposed to violent photos, signifying a blunted emotional-physiological response to violence (Bartholow, Bushman, & Sestir, 2006). This still occurred after controlling for participants' initial levels of trait aggressiveness. Experimental research has demonstrated that participants who had played a violent video game for 20 minutes had lower galvanic skin responses and lower heart rates while watching scenes of real-life violence than participants who had played a nonviolent video game (Carnagey et al., in press). This study is the first to demonstrate that violent video games can cause physiological desensitization in players to observations of real-world violence.

The General Aggression Model: A Theoretical Explanation

A theory developed in recent years that can be used to understand the underlying processes in the media violence exposure effects is General Aggression Model (GAM; see Anderson & Bushman, 2002a; Anderson & Carnagey, 2004; Anderson & Huesmann, 2003; Carnagey & Anderson, 2003). GAM is a model that integrates several key ideas from earlier models: social learning theory and related

social cognitive theory concepts (e.g., Bandura, 1971, 1973; Bandura, Ross, & Ross, 1961, 1963; Mischel, 1973; Mischel & Shoda, 1995), Berkowitz's cognitive neoassociationist model (1984, 1990, 1993a), Dodge's social information-processing model (e.g., Crick & Dodge, 1994; Dodge & Crick, 1990), Geen's affective aggression model (1990), Huesmann's script theory (Huesmann, 1986), and Zillmann's excitation transfer model (1983). GAM describes a cyclical pattern of interaction between the person and the environment. Three main points compose the cycle: *input variables* of person and situation, *present internal state* of the individual, and *outcomes* resulting from various appraisal and decision processes.

Input variables

According to GAM, a person's behavior is based on two main kinds of input variables: the person and the situation (see Figure 1). The person variables are all the factors a person brings with him or her into the current situation, including traits, current states, beliefs, attitudes, values, sex, scripts, and aggressive personality. Situation variables are simply the environmental factors surrounding the individual that could affect the person's actions, like aggressive cues, provocation, pain, rewards, and frustration.

Routes

Input variables, sometimes interactively, affect an individual's appraisal of a situation and ultimately affect the behavior performed in response to that appraisal, primarily by influencing the individual's present internal state. According to GAM, these influences occur through three main routes of the present internal state: cognition, affect, and arousal.

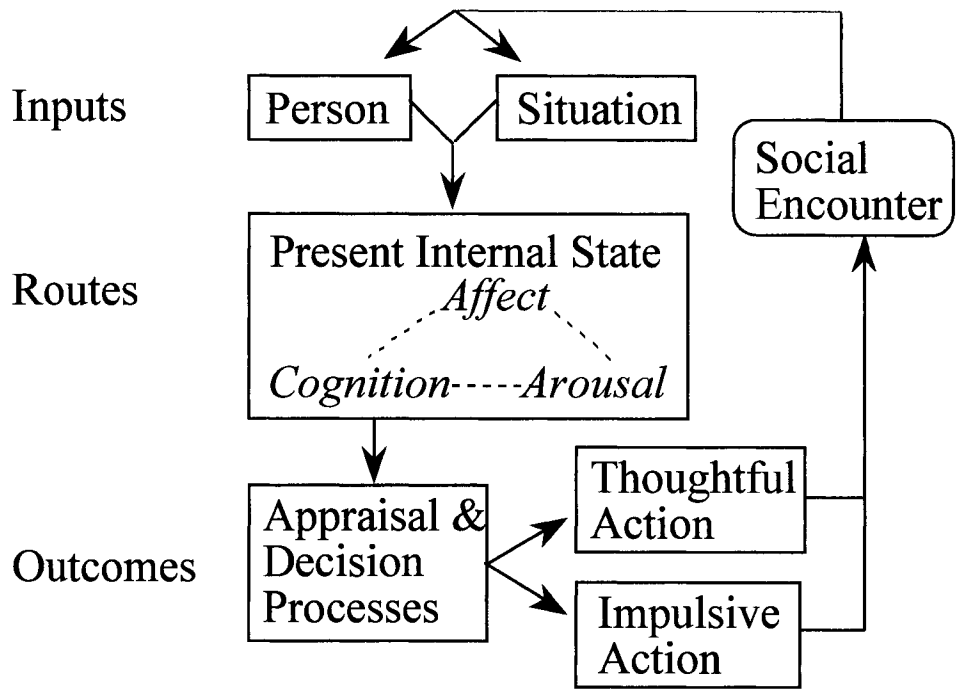

Figure 1. The general aggression model episodic processes (Anderson & Bushman, 2002a)

Cognition

Input variables can influence internal states by causing aggressive constructs to be more accessible in memory. Constructs can be either temporarily or chronically accessible (e.g., Bargh, Lombardi, & Higgins, 1988; Sedikides & Skowronski, 1990). When a construct is repeatedly accessed, its activation threshold decreases. A decrease in activation threshold results in a lower energy requirement necessary for activation, making it chronically accessible. A situational input (e.g., a violent film) results in a temporary lowered activation threshold, making the construct accessible for a short time. This temporary increase in accessibility of a construct is often called "associative priming." Situational variables can also activate aggressive scripts

(Huesmann, 1986). Aggressive scripts can bias the interpretation of a situation and indirectly alter the possible responses to that situation. Repeated access of aggressive scripts can also make the scripts more readily accessible and more likely to be activated in future situations, guiding future behavior.

Affect

Input variables can also influence the present internal state through affect, which in turn can impact future behavior. For example, pain and uncomfortable temperatures can increase state hostility (anger) and general negative affect (C. Anderson, Anderson, & Deuser, 1996; K. Anderson, Anderson, Dill, & Deuser, 1998). Exposure to violent movies, TV, or video games can also increase state hostility (Anderson, 1997; Anderson & Bushman, 2001; Bushman, 1995; Bushman & Geen, 1990; Bushman & Huesmann, 2001; Hansen & Hansen, 1990). Besides situational variables, personality variables are also related to hostility-related affect. It has been shown that self-reported trait hostility is positively related to state hostility (Anderson, 1997; K. Anderson et al., 1998).

Arousal

The final route of the present internal state is arousal. Arousal can influence the present internal state in a number of ways. Increasing arousal can strengthen an already present action tendency, which could be an aggressive tendency. For example, if the person has been provoked at the time of increased arousal, aggression is more likely to be an outcome than if the increase in arousal did not occur. Geen and O'Neal (1969) demonstrated this by showing that a loud noise increased arousal and aggression. A second way in which arousal could increase

aggression is explained within excitation transfer theory (Zillmann, 1983). Arousal elicited by other sources (e.g., exercise) may be misattributed as anger in situations involving provocation, thus increases the chances of producing an anger-motivated aggressive behavior. A third, and untested, way is that unusually high and low levels of arousal could be aversive and stimulate aggression in a similar manner as other aversive stimuli (Anderson & Huesmann, 2003; Geen & Bushman, 1997).

Interaction between routes

Not only can input variables influence cognition, affect, and arousal, but these three routes can also influence one another. The idea that cognitions and arousal influence affect dates all the way back to William James (1890) and was again examined by Schachter & Singer (1962). Affect has also been shown to influence both cognition and arousal (Bower, 1981). Research has shown that people often use their affective states to guide inference and judgment processes (Forgas, 1992; Schwarz & Clore, 1996). Thus, hostility-related affect may cause hostile cognitions to become more accessible, and vice versa.

Outcomes

Typically, an individual will appraise the current situation and then select an appropriate behavior before it is emitted. Depending on the situational variables and resources available to the individual, appraisals may be made hastily and automatically, without much (or any) thought or awareness, resulting in an impulsive behavior. However, frequently the individual will have the necessary time and resources to reappraise the situation and perform a more thoughtful action. Of course, both impulsive and thoughtful actions can be aggressive or nonaggressive.

The action performed by the individual will then be followed by a reaction from the environment (typically other people's response to the action). This social encounter can influence input variables, depending on the environmental response. This encounter could modify situation variables, person variables, or both, resulting in a reinforcement or inhibition of similar behavior in the future (Anderson & Bushman, 2002a).

Applying GAM to Video Game Violence Effects

GAM is not specifically a model of media violence effects, but can easily be applied to such effects. Theoretically, violent video game exposure can affect all three components of present internal state. As mentioned earlier, research on violent video games has shown that playing them can temporarily increase aggressive thoughts (e.g., Kirsh, 1998), affect (e.g., Ballard & Wiest, 1996), and arousal (e.g., Calvert & Tan, 1994). Also noted earlier, exposure to violent video games can reduce arousal to subsequent depictions of violence. Playing a violent video game can also influence the person's internal state through the affective route by increasing hostile affect and through the arousal route by increasing heart rate (Anderson & Bushman, 2001).

Currently, there are two competing hypotheses that interpret the findings that violent video game exposure increases aggression. Both of these hypotheses, to some extent, are consistent with GAM. These two hypotheses are the violent-content hypothesis and the competition-only hypothesis.

GAM and the violent-content hypothesis

The violent-content hypothesis states that violent video games increase aggression primarily because the violent content increases the accessibility of aggression-related knowledge structures. With repeated exposure to certain stimuli (e.g., media violence), particular knowledge structures (e.g., aggressive scripts) become more readily accessible. Over time, the individual will employ these knowledge structures and possibly receive environmental reinforcement for their usage. With time and repeated use, these knowledge structures gain strength and connections to other stimuli and knowledge structures, and therefore are more likely to be used in later situations. Research supports this notion by demonstrating that repeatedly exposing children to media violence produces aggressive adults (Huesmann & Miller, 1994, Huesmann et al., 2003). Such long-term effects result from the development, automatization, and reinforcement of aggression-related knowledge structures. In essence, the creation and automatization of these aggression-related knowledge structures along with emotional desensitization effects change the individual's personality. For example, long-term consumers of violent media can become more aggressive in outlook, perceptual biases, attitudes, beliefs, and behavior than they were before the repeated exposure, or would have become without such exposure (e.g., Funk, Baldacci, Pasold, & Baumgardner, 2004; Gentile et al., 2004; Uhlmann & Swanson, 2004; Krahé & Möeller, 2004).

GAM and the competition-only hypothesis

The competition-only hypothesis states that it is the competitive situations, not violent content, in violent video games that increase aggression. According to this hypothesis, many previous video game studies may have found links between

violent games and aggression not because of the violent content, but because the violent video games typically involve competition, whereas nonviolent video games are frequently noncompetitive. For example, if one found that exposure to an action-packed, shooting video game increased aggression compared to playing electronic solitaire; it could be that differences in the competitive nature of the comparison games caused the observed differences in later aggression, rather than differences in violent content.

The competitive aspect of video games might increase aggression by increasing arousal or by increasing aggressive thoughts. Previous research has demonstrated that increases in physiological arousal can cause increases in aggression under some circumstances (Berkowitz, 1993b). Competitive aspects of violent video games could also increase aggressive cognitions via links between aggressive and competition concepts (Anderson & Morrow, 1995; Deutsch, 1949, 1993). Thus, at a general level such competition effects would be entirely consistent with GAM and with the violent-content hypothesis. To date, the competition-only hypothesis has not been adequately tested.

It should be noted that the competition-only hypothesis is a more stringent version of the competition hypothesis. The competition hypothesis states that a highly competitive scenario can increase aggression. The competition hypothesis is also consistent with GAM. Research has shown that priming competitive knowledge structures can increase aggressive cognitions and thereby influence behavior (Anderson & Morrow, 1995). Unlike the competition-only hypothesis, the competition hypothesis does not exclude other factors (e.g., violent content) from influences

aggression. Because the competition-only hypothesis completely contradicts the violent-content hypothesis, it will be the primary focus of this investigation instead of the competition hypothesis.

Testing the competition-only hypothesis

There has been very little research conducted to examine the violent-content hypothesis versus the competition-only hypothesis (see Carnagey & Anderson, 2005 for one such example). To test these hypotheses against each other, one must randomly assign participants to play either violent or nonviolent video games, all of which are competitive. The use of sports video games meets this requirement and has other benefits. Violent sports games still obey the basic rules of the sport that they simulate. For example, MLB Slugfest utilizes the basic rules of baseball (e.g., three outs per half inning, one run scored for each player who crosses home plate, etc...). However, it includes violence in the game that would not be found in a regulation Major League Baseball event (e.g., assaulting other players without penalty, throwing baseballs covered in fire, etc...). These violent sports video games match the levels of competition compared to nonviolent, realistic simulation-based sports games. Thus, illicitly violent sports games and their same sport counterparts allow a clean test of the competition-only versus the violent content hypotheses. The competition-only hypothesis predicts that there should be no difference between violent and nonviolent sports game groups on any aggression-related variables measured after gameplay. However, the violent-content hypothesis predicts that participants who played the violent sports video games will be higher on at least some aggression-related variables (e.g., aggressive thoughts, aggressive behavior)

after gameplay compared to participants who played a nonviolent, simulation-based sports game. The following four experiments test these two hypotheses.

Current Studies Overview

Research has shown the exposure to violent video games can cause increases in aggression-related variables. There are currently two primary hypotheses that explain why this occurs. The violent-content hypothesis states that the violent content in video games primes aggressive thoughts in players, therefore, causing increases in aggression in later situations. The competition-only hypothesis states that it is the highly competitive aspect of violent video games heightens arousal and causes increases in aggression.

Experiment 1 was conducted to ensure that the selected violent and nonviolent sports games were equal on rated competitiveness, but differed on rated violence. If the selected video games differed on rated violence but did not differ on rated competition, they could be appropriately used to test the violent-content and competition-only hypotheses. The remaining three experiments will test those competing hypotheses by examining the impact of violent sports video games and same-sport nonviolent video games on aggression-related variables. In Experiments 2, 3, and 4, participants first completed an individual differences questionnaire, then played a randomly assigned sports video game, and subsequently completed measures of aggressive cognition (Experiment 2), aggressive affect and attitudes towards aggression in sports (Experiment 3), or aggressive behavior (Experiment 4).

EXPERIMENT 1 OVERVIEW

The primary purpose of this series of studies is to experimentally test the competition-only hypothesis and the violent-content hypothesis. One way to test these two competing hypotheses is to expose participants to either violent or nonviolent video games that are equally competitive, and then measure an aggression-related variable. If the competition-only hypothesis is correct, the violent and nonviolent groups will not score significant different on the measure of aggression. If the violent-content hypothesis is correct then the violent game participants will be higher on the aggression-related variables than the nonviolent game participants.

To conduct this series of studies, one must have a set of violent and nonviolent video games that are equally competitive. Experiment 1 was designed to examine whether the selected violent and nonviolent sports video games were equivalent on the rated level of competition, while differing on the rated level of violence. If the violent sports video games are rated as more violent but not more competitive the nonviolent sports video games, then they can appropriately be used to test the competition-only and violent-content hypotheses.

Experiment 1 had participants play both a violent and a nonviolent sports video game. Both games were based on the same sport. Participants played either a pair of football or baseball games. After playing each game, participants rated it on various characteristics, including violence and competitiveness.

Hypothesis 1 stated that the violent sports games would be rated as more violent than the nonviolent sports games. Although these games depict the same

sport as the nonviolent video game, the violent sports games contain additional violent actions (e.g., ultra aggressive tackles on the football field, ability to punch opposing players without penalty). Because of these additional actions, the violent sports video games should be rated as more violent than the nonviolent sports video games.

Hypothesis 2 stated that the rated level of competition would not be significantly different between violent and nonviolent video game conditions. Although the violent sports games have more violent content than the nonviolent sports games, they still follow the basic rules of the sport that they simulate. Because players are still competing with the computer in a competitive scenario, the violent and nonviolent game should be equivalent on the rated level of competitiveness.

EXPERIMENT 1 METHODS

Participants

Participants were 32 undergraduate students (16 men and 16 women) enrolled in introductory psychology classes at Iowa State University. Participants were recruited using the psychology department's research pool sign-up boards. Participants who choose to participate arrived at the laboratory at a scheduled time that was most convenient for them.

Design

This experiment examined whether the violent and nonviolent sports video games differed on violence and competitiveness. The design of the study was a 2 (video game violence: violent, nonviolent) X 2 (order: violent first, nonviolent first) X 2 (sport: baseball, football) X 2 (sex: male, female) mixed design. The between subjects variables were order, sport, and sex. The within subjects variable was video game violence. The primary dependent variables was rated violence and competitiveness.

Materials

Individual differences questionnaire

Before playing any video games, participants completed a questionnaire packet containing various individual difference variables. Participants first completed a modified version of the Video Game Violence Exposure Questionnaire (VGV; see Appendix; Gentile & Bonacci, in preparation). This questionnaire asked participants to list their five most played video games. Participants then estimated how much they have played each game using a 7-point scale anchored at 1 (*Rarely)* and 7

(*Often)*. Participants also rated how violent each game is using a 7-point scale anchored at 1 (*Little or No Violent Content)* and 7 (*Extremely Violent Content)*. Finally, participants rated how much the characters tease each other and how much the characters help each other using a 7-point scale anchored at 1 (*Rarely)* and 7 (*Often)*. A video game violence exposure score was calculated by multiplying each game exposure by each game's violent content and averaging those five scores. Participants who did not list any video games received a score of zero. A large score (scores can range from 0 to 49) indicates high video game violence exposure. Similar versions of this questionnaire has been used successfully in past research as a measure of past video game violence exposure (e.g., Anderson & Dill, 2000; Carnagey & Anderson, 2005).

Next, participants completed the Sports Video Game Exposure Questionnaire (see Appendix). Participants rated how often they play five different nonviolent sports video games (Madden Football, NHL 2004, MVP Baseball, FIFA Soccer, and ESPN NBA Basketball) and five different violent sports video games (NFL Blitz, NHL Hitz, MLB SlugFest, RedCard Soccer, and NBA Hoopz). Ratings were based on a 7-point scale anchored at 1 (*Never)* and 7 (*Often)*. Three different sports video game exposure scores were calculated. Total sports video game exposure was calculated by summing the responses of all ten items. Nonviolent and violent sports video game exposure scores were calculated by summing only the five nonviolent game items and five the violent game items, respectively.

Participants then completed the Sports Experience Questionnaire (see Appendix). Participants were asked to how much they watch five different sports

(football, hockey, baseball/softball, soccer, and basketball) using 7-point scales anchored at 1 (*Never)* and 7 (*Often).* Participants also rated how much they play each of the five sports using the same 7-point scales.

Finally, participants completed the physical aggression subscale of the Aggression Questionnaire (TA; see Appendix; Buss & Perry, 1992). This 9-item scale asks participants to rate various statements regarding aggressive actions using a 5-point scale anchored at 1 (*Extremely Uncharacteristic of Me)* and 5 (*Extremely Characteristic of Me).* The Buss-Perry Aggression Questionnaire has repeatedly been shown to be a valid measure of trait aggression (e.g., Anderson & Bushman, 1997).

Video games

Two violent sports video games (MLB Slugfest Baseball and NFL Blitz Football) and two nonviolent sports video games (MVP Baseball 2004 and Madden Football) were selected for this study[1]. The nonviolent sports games attempt to authentically depict the sport by replicating the official rules and simulating regulation play. MVP Baseball is produced by EA Sports and attempts to recreate the most realistic baseball environment possible. Players are allowed to control the athletes on the field, but are not allowed to engage in any actions that are against the rules of Major League Baseball. For example, players cannot make the athletes strike one other or engage in fighting. Madden Football is also produced by EA Sports and has been one the most popular simulation football video games over the past several

[1] Pairs of basketball, hockey, and soccer games were also initially considered. However, these games were not used because the violent video games (soccer and basketball) did not clearly depict aggressive actions or the nonviolent video game (hockey) also contained aggressive actions.

years. Like MVP Baseball, Madden attempts to recreate the most realistic football experience possible. Only standard tackles are programmed into the game and penalties are often assessed for unsportsmanlike conduct, such as roughing the passer or roughing the kicker. The computer-controlled team very rarely engages in such behaviors.

The violent sports video games followed the same scoring rules of the nonviolent games. However, these games also included illicitly violent actions. MLB Slugfest, produced by Midway Games, attempts to provide a baseball environment that also contains violent content to appeal players who are not interested in a pure simulation-based experience. For example, in MLB Slugfest players can make a base-runner punch a baseman so that the ball is dropped. Batters can also become angry, burst into flames, and attack the pitcher. The baseball is also on fire quite frequently. NFL Blitz, also produced by Midway, attempts to provide a football experience that allows violent actions that would not be allowed in an official National Football League game. Players can make the athletes complete illicitly violent tackles on other athletes, some which resemble professional wrestling-like maneuvers. Also, players can have the athletes strike another athlete after a play is complete. These actions would be normally penalized in a real-life football game, but are allowed in NFL Blitz.

Video game evaluation questionnaire

After playing a video game, participants completed the Video Game Evaluation Questionnaire (see Appendix). The core section of the questionnaire asked participants to rate the video game they played on several dimensions:

difficulty, enjoyment, frustration, excitement, pace of action, and violence. These items were answered using a 7-point scale anchored at 1 (e.g., *Not Enjoyable)* and 7 (e.g., *Enjoyable)*. Participants also rated their abilities on the video game using a 7-point scale anchored at 1 (*Well Below Average)* and 7 (*Well Above Average)*. Finally, the core section of the questionnaire asked participants to rate how much their abilities improved from the first five minutes of gameplay to the last five minutes of gameplay using a 7-point scale anchored at 1 (*No Improvement)* and 7 (*Extreme Improvement)*. This section of the video game evaluation was used in all four studies.

An additional section was added to the video game evaluation specifically for Experiment 1. Four items asked participants to rate the competitiveness: "to what extent did you feel like you were competing with the other team," "how hard were you trying to win the game," "how competitive was this video game," and "to what extent did this video game involve competition." The questionnaire also asked participants to rate the video game on realism, strategy, stimulating sound effects, distracting sound effects, and graphic quality, action, sporting action, and violent action.

The two primary variables from this questionnaire were the rated level of competition and the rated level of violence. Competition was measured by combining the four competition items (for nonviolent game, coefficient α = .84; for violent games, coefficient α = .84). Violence was measured by combing the "violence" and "violent action" items (for nonviolent game, coefficient α = .86; for violent games, coefficient α = .78).

Procedure

When a participant arrived at the lab, he or she first read and signed a consent form. The form stated that the study concerned evaluating various types of media. Once consent was obtained, the participant was escorted into a cubicle and completed the individual difference questionnaire, which consisted of the Video Game Violence Exposure Questionnaire (see Appendix), Sports Video Game Exposure Questionnaire (see Appendix), Sports Experience Questionnaire (see Appendix), and the physical aggression subscale of the Buss-Perry Aggression Questionnaire (see Appendix).

The participant was then given instructions on how to play one of the four video games (violent baseball, violent football, nonviolent baseball, or nonviolent football). After instructions were given, the participant was left alone in the cubicle to play the randomly assigned video game for 20 minutes.

After 20 minutes, the experimenter returned and had the participant complete the Video Game Evaluation Questionnaire (see Appendix). Next, the experimenter returned and gave the participant instructions on how to play another sports video game. All participants played a violent and nonviolent video game of the same sport (baseball or football). Violent and nonviolent games were played in a counterbalanced order: half of the participants played the nonviolent sports game first while half played the violent sports game first. After playing the second video game for twenty minutes, the participants again completed the Video Game Evaluation Questionnaire.

EXPERIMENT 1 RESULTS

Main Analyses

Analysis strategy

Because participants played and rated both a violent and nonviolent sports video game, all analyses examining video game ratings utilized a repeated measures ANOVA with violence of the game played being a within subjects variable. Order of the two games (violent game 1st versus. 2nd) and participant sex were controlled for in these analyses.

Video game characteristics

Hypothesis 1 stated that the violent sports video games would be rated as more violent than the nonviolent sports video games. Results confirmed this hypothesis. Participants rated the violent sports video games as containing more violence than the nonviolent sports video games, $Ms = 5.39$ & 2.52, $F(1, 29) = 119.21$, $p < .0001$, $d = 4.05$. The violence X order and violence X sex interactions were non-significant, $Fs(1, 29) = 0.01$ and 0.51, $ps > .45$, $ds < .27$.

There was a significant violence X trait aggression interaction on rated violence, $F(1, 28) = 4.71$, $p < .05$. Further analyses were conducted by examining the effect of trait aggression on rated violence for both violent and nonviolent video game conditions. These analyses demonstrated that the regression slope between trait aggression and rated violence was not reliably different from zero for the nonviolent video games [$F(1, 28) = 0.94$, $b = -0.43$, $p > .30$] or for violent video game participants, $F(1, 28) = 1.41$, $b = 0.36$, $p > .20$. Although these slopes did differ from

each other, the fact that neither was significantly different from zero indicates that any interpretation of this interaction should be made with caution.

Also, the violence X sports playing interaction was moderately significant, $F(1, 28) = 4.13$, $p < .06$. Sports playing was negatively related to rated violence for nonviolent video game conditions, $F(1, 28) = 12.67$, $b = -0.88$, $p < .002$. For violent video game conditions, sports playing was less significantly related to rated violence, $F(1, 28) = 4.23$, $b = -0.39$, $p < .05$.

Past violent video game exposure, past violent sports video game exposure, past nonviolent sports video game exposure, and past sports viewing did not significantly moderate the violence effect on rated violence, $Fs(1, 28) < 2.55$, $ps > .12$.

Hypothesis 2 stated that the violent and nonviolent sports video games would not be significantly different on rated level of competitiveness. Results were consistent with this hypothesis. Participants did not rate the violent video games as having more competition than the nonviolent video games, $Ms = 4.89$ & 5.03, $F(1, 29) = 0.41$, $p > .50$, $d = .24$. Indeed, the nonviolent games were rated as slightly more competitive than the violent games. The violence X order interaction was non-significant, $F(1, 29) = 0.05$, $p > .80$, $d = .08$. However, the violence X sex interaction was significant, $F(1, 29) = 5.85$, $p < .03$, $d = .90$. Further examination revealed that women did not rate the violent sports games more competitive than the nonviolent sport games, $Ms = 5.39$ & 5.00, $F(1, 14) = 1.76$, $p > .20$, $d = .71$. Men rated the violent sports games as moderately less competitive than the nonviolent sports games, $Ms = 4.39$ & 5.06, $F(1, 14) = 4.04$, $p < .07$, $d = 1.08$. Violence did not

significantly interact with any of the individual difference variables, $Fs(1, 28) = 2.82$, $p > .10$.

Additional analyses

There were no significant differences between violent and nonviolent video games on enjoyableness [$Ms = 3.63$ & 3.97, $F(1, 29) = 0.81$, $p > .35$, $d = .33$] or excitement, $Ms = 3.56$ & 3.53, $F(1, 29) = 0.01$, $p > .90$, $d = .037$. Also, participants did not rate the violent and nonviolent sports video games as significantly different on stimulating sound effects [$Ms = 4.25$ & 4.25, $F(1, 29) = 0.00$, $p = 1.00$, $d = 0.00$] or graphical quality, $Ms = 4.63$ & 4.47, $F(1, 29) = 0.33$, $p > .55$, $d = .21$. Finally, there was not a significant difference between violent and nonviolent video game conditions on perceived improvement while playing, $Ms = 4.06$ & 3.78, $F(1, 29) = 0.84$, $p > .35$, $d = .34$.

Violent sports video games were rated as being slightly more difficult [$Ms = 4.97$ & 4.25, $F(1, 29) = 4.80$, $p < .04$, $d = .81$], being more frustrating [$Ms = 4.34$ & 3.53, $F(1, 29) = 5.00$, $p < .04$, $d = .83$], having a somewhat faster pace of action [$Ms = 4.47$ & 3.53, $F(1, 29) = 7.87$, $p < .01$, $d = 1.04$], having more distracting sound [$Ms = 3.63$ & 2.78, $F(1, 29) = 12.31$, $p < .01$, $d = 1.30$], being less realistic [$Ms = 3.13$ & 5.16, $F(1, 29) = 28.23$, $p < .0001$, $d = 1.97$], and involving less strategy, $Ms = 4.00$ & 5.16, $F(1, 29) = 16.73$, $p < .0003$, $d = 1.52$. Players also rated themselves as having somewhat lower abilities at playing the violent games, $Ms = 2.97$ & 3.53, $F(1, 29) = 6.02$, $p < .03$, $d = .91$.

Several of these main effects of violence were qualified by interactions. There was a significant violence X sex interaction for rated abilities on the video games,

$F(1, 29) = 4.76$, $p < .04$, $d = .81$. Women rated their abilities as equal on the violent and nonviolent sports video games, *Ms* = 2.13 & 2.19, $F(1, 14) = 0.10$, $p > .75$, $d = .17$. Men rated their abilities on the violent video game as lower than the nonviolent video game, *Ms* = 3.81 & 4.88, $F(1, 14) = 6.26$, $p < .03$, $d = 1.33$. There was also a significant violence X sex interaction for rated strategy, $F(1, 29) = 4.41$, $p < .05$, $d = .78$. Women gave equal ratings of strategy in the violent and nonviolent sports video games, *Ms* = 4.81 & 5.38, $F(1, 14) = 2.97$, $p > .10$, $d = .92$. Men rated the violent video game as having less strategy than the nonviolent video game, *Ms* = 3.19 & 4.94, $F(1, 14) = 13.72$, $p < .01$, $d = 1.98$. There was also a significant violence X order interaction for the amount of distracting sound effects, $F(1, 29) = 7.45$, $p < .02$, $d = 1.01$. When participants played a nonviolent video game first, participants rated the violent games as having more distracting sound effects than the nonviolent games, *Ms* = 4.38 & 2.88, $F(1, 14) = 12.00$, $p < .01$, $d = 1.85$. When participants played a violent video game first, participants rated the violent and nonviolent video games as having equally distracting sound effects, *Ms* = 2.88 & 2.69, $F(1, 14) = 0.72$, $p < .01$, $d = .45$.

Violent sports video games were also rated as containing more action [*Ms* = 5.31 & 4.22, $F(1, 29) = 18.08$, $p < .0002$, $d = 1.58$]. Recall that participants also rated the amount of sporting action and violent action contained in each video game. Participants rated violent and nonviolent video games as having the same amount of sporting action, [*Ms* = 5.41 & 5.72, $F(1, 29) = 1.10$, $p > .30$, $d = .39$]. However, participants rated the violent sports video games as having more violent action, *Ms* = 5.81 & 2.84, $F(1, 29) = 89.72$, $p < .0001$, $d = 3.52$.

EXPERIMENT 1 DISCUSSION

Experiment 1 examined whether the selected violent and nonviolent sport video games were appropriate stimuli to examine the competition-only and violent-content hypotheses. There were two hypotheses for this study. The first hypothesis stated that the violent sports video games would be rated as more violent than the nonviolent sports video games. This hypothesis was confirmed. Participants rated the violent sports game as containing significantly more violence than the nonviolent sports game.

The second hypothesis stated that the violent and nonviolent sports video games would not be significantly different on competitiveness. This hypothesis was also supported, but the results were slightly less clear. Women did not rate the violent and nonviolent sports video games as significantly different on competitiveness. However, men rated the nonviolent sports games as moderately more competitive than the violent sports games. This finding does not prevent the use of these stimuli in experiments to test the competition-only hypothesis. Rather, the use of these games constitutes a somewhat conservative test of the violent-content hypothesis, because the observed difference in competitiveness ratings by males works against this hypothesis, and favors the competition-only hypothesis.

Results also demonstrated that there were additional minor differences between the violent and nonviolent video games. Some of these differences can be explained by the varying level of violence in the violent and nonviolent video games. For example, violent games were rated being less realistic, containing less strategy, and having more distracting sound effects.

EXPERIMENT 2 OVERVIEW

Experiment 2 examined whether exposure to violent sports video games would increase aggressive cognition compared to exposure to nonviolent sports video games. There were three primary hypotheses addressed by this study. **Hypothesis 1** stated that the participants who played a violent sports video game would be higher in aggressive cognition, both on the Word Fragment Task (WFT) and the Word Pronunciation Task (WPT), compared to participants who played a nonviolent sports video game. This hypothesis supports the violent-content hypothesis and fails to support the competition-only hypothesis.

Hypothesis 2 stated that a larger effect of experimental violence exposure would be found on the WPT than the WFT. There are several reasons why the WPT should yield a stronger effect of game violence exposure. First, the WPT forces participants to complete every trial of the task, whereas the WFT allows participants to pick and choose which trials they complete. On the WPT, participants must verbally identify one word at a time. They cannot move on to the next trial without completing the previous trial. On the WFT, participants are allowed to skip trials that they are unable to complete. This characteristic of the WFT could potentially lower its validity.

Also, the WPT is better equipped to handle highly suspicious participants. While completing the WFT, if the participant believes that the task is measuring aggressive cognition, he or she could easily alter his or her responses. For example, if a participant understands how the WFT works and doesn't want to appear high in aggressive cognition, he or she could intentionally not complete certain items that

have aggressive possibilities. However, if someone understood how the WPT worked and wanted to score low in aggressive cognition, he or she would have to consciously identify the aggressive words a fraction of a second more slowly than nonaggressive words. Intentionally scoring low in aggressive cognition on the WPT is a much more difficult task than scoring low in aggressive cognition on the WFT, and can be detected by examining the reaction time patterns. For these reasons, one should expect the WPT to demonstrate a stronger effect of violent video game exposure on aggressive cognition than the WFT.

Hypothesis 3 states that the interactions between the manipulated video game violence exposure and the various individual difference variables on aggressive cognition will not be statistically significant. Such non-significant interactions would demonstrate a lack of moderation of the effect of violent video game exposure on aggressive cognition. Past research (e.g., Anderson & Dill, 2000; Anderson et al., 2004) has found that theoretically related individual differences (e.g., violent video game exposure, trait aggression) have not moderated the violent video game exposure effect in short term contexts similar to the present study. Non-significant interactions also would suggest that the effects found in past violent video game research are generalizable to the greater population, regardless of past violent media exposure, trait aggression, or sports experience.

EXPERIMENT 2 METHODS

Participants

Participants were 188 undergraduate students (92 men and 96 women) enrolled in introductory psychology classes at Iowa State University. Participants were recruited using the psychology department's research pool sign-up boards. Participants who choose to participate arrived at the laboratory at a scheduled time that was most convenient for them.

Design

This experiment examined the effects of illicit violence in sports video games on aggressive cognition. The design of the study was a 2 (video game violence: violent, nonviolent) X 2 (sport: baseball, football) X 2 (sex: male, female) between subjects design. The primary dependent variable was aggressive cognition measured by both the Word Pronunciation Task (WPT) and the Word Fragment Task (WFT). These dependent variables were completed in counter-balanced order.

Materials

Individual differences questionnaire

Participants completed the same individual differences questionnaire that was used in Experiment 1. Participants completed a questionnaire packet that included the Video Game Violence Exposure Questionnaire, Sports Video Game Exposure Questionnaire, Sports Experience Questionnaire, and the physical aggression subscale of the Buss-Perry Aggression Questionnaire. This packet was completed before the primary experimental manipulation of video game exposure.

Video games

Participants were randomly assigned to play one of the violent sports video games (MLB Slugfest Baseball and NFL Blitz Football) or one of two nonviolent sports video games (MVP Baseball 2004 and Madden Football). These were the same video games used in Experiment 1. Participants played one of the four video games for 20 minutes.

At the end of the gaming session, participants' scores and the computer scores on the video game were recorded by the experimenter to be used as possible covariates. Because sports having different scoring rules, the video game scores had to be standardized within each video game condition. First, the players' scores and the computer scores were converted into z-scores for each video game condition. Then, an overall score variable was calculated by subtracting the computer z-score from the player z-score. A positive value indicates the player performed well against the computer opponent.

Word pronunciation task

The WPT (Anderson, 1997; Anderson, Carnagey, & Eubanks, 2003) is one of the two measures of aggressive cognition used in this study. The WPT involved verbally identifying words as they appeared on a computer screen, one per trial. The computer recorded the time between visual presentation of the word and verbal identification of the word. The task was created in HyperCard 2.1 and the timer was triggered by a MacRecorder on a Macintosh computer. Fifty-eight words were presented twice (a total of 116 trials) in a different random order for each participant. The word list consisted of 24 aggressive words (e.g., assault, choke) and 36 control

words (18 escape words, e.g., abandon, desert; and 18 neutral words, e.g., behold, listen).

As in previous research with this task, the distribution of the reaction times was analyzed and outliers were removed. Outliers were determined separately for aggressive and control words because of possible differences in pronunciation and word length. First, all reaction times for each type of word were compiled. Then, means and standard deviations were determined for these distributions. Using Tukey's (1971) exploratory data screening procedures, any data points that were one and a half times the interquartile range above the upper quartile or below the lower quartile were considered outliers and removed from the data set. For aggressive words, trials less than 255 milliseconds or greater than 859 milliseconds were removed from the data set. For control words, trials less than 213 milliseconds or greater than 957 milliseconds were removed. These same data cleaning procedures have successfully been used in previous research (e.g., Anderson et al., 2004).

Also, participants who had fewer than 32 valid aggressive word trials (two thirds of the 48 aggressive word trials) were deleted from the data set. Twelve women and 16 men were deleted. This left 132 women and 121 men for WPT analyses. All participants had sufficient numbers of valid control word trials to yield stable RT estimates.

A difference score was calculated for each participant by subtracting the average aggressive word reaction time from the control word reaction time. A positive score indicates that the participant identified aggressive words more quickly

than control words; thus, larger scores indicate greater aggressive cognition accessibility.

Word fragment task

The other task used to measure aggressive cognition in this study was the WFT. This task presents participants with 98 words with missing letters. Participants are required complete as many words as possible within four minutes. Half of the word fragments contained only non-aggressive possibilities while the other half had at least one aggressive possibility. For example, K I __ __ could be completed as "kind", "kiss", "kick", or "kill". This task has been shown to be a valid measure of aggressive cognition (Anderson et al., 2004; Anderson, Carnagey, & Eubanks, 2003; Carnagey & Anderson, 2005). Aggressive cognition was calculated by counting the number of aggressive word responses divided by the number of total word fragment completions. A larger value indicates higher aggressive cognition accessibility.

Video game evaluation questionnaire

After all primary dependent variables were collected, participants completed the core section of the Video Game Evaluation Questionnaire (see Appendix). As stated in Experiment 1, this questionnaire asks participants to rate the video game they played on several dimensions: difficulty, enjoyment, frustration, excitement, pace of action, and violence. Participants also rated their abilities on the video game and how much they improved during the gaming session. All these items were answered using a 7-point scale anchored at 1 (e.g., *Not Enjoyable)* and 7 (e.g., *Enjoyable).*

Procedure

When a participant arrived at the lab, he or she first read and signed a consent form. The consent stated that the study concerned evaluation of various types of media. Once consent was obtained, the participant was escorted into a cubicle and a blood pressure cuff was attached to the participant's non-dominant arm. Next, the participant completed the individual difference questionnaire, which consisted of the Video Game Violence Exposure Questionnaire (see Appendix), Sports Video Game Exposure Questionnaire (see Appendix), Sports Experience Questionnaire (see Appendix), and the physical aggression subscale of the Buss-Perry Aggression Questionnaire (see Appendix).

The participant was then given instructions on how to play one of the four video games (violent baseball, violent football, nonviolent baseball, or nonviolent football). After instructions were given, the participant was left alone in the cubicle to play the randomly assigned video game for 20 minutes.

After 20 minutes, the experimenter returned and had the participant complete both measures of aggressive cognition. These two measures were presented in a counter balanced order: half of the participants completed the WPT first while half completed the WFT first. After completing both measures of aggressive cognition, all participants completed the Video Game Evaluation Questionnaire (see Appendix). After that questionnaire was complete, the experimenter returned, probed the participant for suspicion, and debriefed the participant.

Blood pressure and pulse were measured eight times during the laboratory session. Measurements were taken twice during completion of the individual

difference questionnaire (at two minutes and four minutes from the start of the questionnaire). These measurements served as baseline measurements. Four measurements were taken during game play (at 6, 10, 14, and 18 minutes from the start of video gameplay). Finally, a measurement was taken during each of the two aggressive cognition tasks (at two minutes from the start of each task).

EXPERIMENT 2 RESULTS

Preliminary Analyses

Video game characteristics

The violent sports video games were rated as more violent than the nonviolent sports video games, *Ms* = 4.13 & 3.77, $F(1, 182) = 101.56$, $p < .05$, $d = 1.49$.[2] The violent baseball game (MLB Slugfest) was rated as more violent than the nonviolent baseball game (MVP Baseball), *Ms* = 4.05 & 1.22, $F(1, 87) = 162.63$, $p > .05$, $d = 2.73$. The violent football game (NFL Blitz) was also rated as more violent than the nonviolent football (Madden NFL), *Ms* = 4.29 & 2.98, $F(1, 91) = 21.74$, $p > .05$, $d = .98$.[3]

The violent sports video games did not differ from the nonviolent sports video games in difficulty, enjoyment, excitement, or action, $Fs(1, 182) < 2.85$, $ps > .05$. Violent games were rated as slightly more frustrating than nonviolent games, *Ms* = 3.95 & 3.51, $F(1, 182) = 4.18$, $p < .05$, $d = .30$. Participants who played a violent sports game perceived they had lower abilities on the game [*Ms* = 3.22 & 3.81 $F(1, 182) = 8.70$, $p < .05$, $d = .44$] and lower improvement in gameplay during the session, *Ms* = 4.44 & 4.92, $F(1, 182) = 5.58$, $p < .05$, $d = .35$. There were no significant violence X sex interactions for any video game characteristics.

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[2] There was a significant violence X sex interaction for rated violence, $F(1, 182) = 4.79$, $p < .05$. Women rated the nonviolent sports games as moderately more violent than men, *Ms* = 2.39 & 1.89, $F(1, 91) = 3.13$, $p < .06$, $d = .37$. Women did not rate the violent sports games as more violent than men, *Ms* = 4.37 & 3.98, $F(1, 91) = 1.78$, $p > .05$, $d = .28$.

[3] There was also a significant violence X sex interaction for rated violence for the football games, $F(1, 91) = 5.01$, $p < .05$. Women rated the nonviolent football as moderately more violent than men, *Ms* = 3.36 & 2.61, $F(1, 46) = 3.74$, $p < .06$, $d = .57$. Women did not rate the violent football as more violent than men, *Ms* = 4.55 & 4.04, $F(1, 45) = 1.56$, $p > .05$, $d = .37$.

Physiological arousal

Mean arterial pressure and pulse were examined in separate 2 (video game violence: violent, nonviolent) X 2 (participant sex) X 4 (measurement time: baseline, during video game, during first DV completion, during second DV completion) mixed design ANOVAs. The key violence X measurement time interaction was nonsignificant for both mean arterial pressure and pulse, $F(3, 450) = 1.37$, $p > .05$ and $F(3, 447) = 0.55$, $p > .05$, respectively. This indicates that violent and nonviolent games did not differentially affect either of these measures of physiological arousal. Because the violent and nonviolent video game conditions were equal in physiological arousal, this eliminates a possible confound with the violence manipulation.

Relationship of primary dependent variables

Correlational analyses were conducted between participants' scores on the word fragment task and the word pronunciation task. Among all participants, the two tasks were not correlated, $r(179) = .01$, $p > .80$. Because the main manipulation of video game violence exposure is predicted to have an effect on the primary variables, additional correlations were conducted for participants in both the violent and nonviolent video game conditions. The two primary dependent variables were still not correlated for participants in the nonviolent video game group [$r(80) = -.11$, $p > .30$] or participants in the violent video game group, $r(85) = .16$, $p > .13$.

Main Analyses

Word pronunciation task

Violent sports game participants displayed higher levels of aggressive cognition than nonviolent sports game participants, *Ms* = 25.00 & 18.65, $F(1, 165) = 4.92$, $p < .05$, $d = .35$. Men were higher in aggressive cognition than were women, *Ms* = 26.91 & 16.74, $F(1, 165) = 12.64$, $p < .05$, $d = .55$. The violence X sex interaction was non-significant, $F(1, 165) = 0.09$, $p > .05$, $d = .05$.

The effect of game was stronger for those participants who completed the word pronunciation task first, with violent game players being higher in aggressive cognition than nonviolent game players, *Ms* = 26.28 & 16.85, $F(1, 107) = 6.78$, $p < .05$, $d = .51$. For participants who completed the word pronunciation task second, violent game players were no higher in aggressive cognition than nonviolent game players, *Ms* = 22.64 & 22.79, $F(1, 54) = 0.00$, $p > .05$, $d = .00$. This finding is consistent with other aggression research showing that measuring one dependent variable can reduce or eliminate the sensitivity of subsequently measured variables (e.g., Anderson, Carnagey, & Eubanks, 2003; Lindsay & Anderson, 2000). All further analyses examined only participants who completed the word pronunciation task first.

Game score on the video game was not related to aggressive cognition, $F(1, 105) = 2.78$, $b = 3.00$, $p > .09$. Even after controlling for score, the effect of violence was still significant on aggressive cognition, $F(1, 105) = 6.91$, $p < .01$, $d = .51$.

Measures of physiological arousal and participant ratings of the video game were entered into the statistical model as possible covariates. No measures of physiological arousal were significant predictors of aggressive cognition, *Fs* < 3.90,

ps > .05. The effect of violence on aggressive cognition was still significant after controlling for any measures of physiological arousal, *Fs* > 5.40, *ps* < .03. None of the video game ratings were significant predictors of aggressive cognition, *Fs*(1, 106) < 3.80, *ps* > .05. The effect of violence on aggressive cognition was still significant after controlling for any of the video game characteristics, *Fs*(1, 106) > 6.10, *ps* < .02.

Moderators of violent video game exposure on the word pronunciation task

Trait aggression, past video game violence exposure, past violent sports video game exposure, past nonviolent sports video game exposure, past sports playing, and past sports viewing were tested to determine whether they were related to aggressive cognition or moderated the violent video game effect on aggressive cognition. Trait aggression did not predict aggressive cognition, $F(1, 101) = 0.01$, $b = 3.61$, $p > .90$. However, there was a significant violence X trait aggression interaction on aggressive cognition, $F(1, 101) = 5.40$, $p < .03$, $d = .46$. Further analyses were conducted by examining the relationship of trait aggression and aggressive cognition within each game condition. These analyses demonstrated that the regression slope between trait aggression and aggressive cognition was not reliably different from zero for nonviolent video game participants [$F(1, 51) = 2.46$, $b = -8.20$, $p > .10$] or for violent video game participants, $F(1, 49) = 2.08$, $b = 2.90$, $p > .15$. Although these slopes did differ between game conditions, because neither was significantly different from zero, any interpretation of this interaction should be made with caution. The main effect of violence was significant after accounting for the violence X trait aggression interaction, $F(1, 49) = 7.05$, $p < .01$, $d = .76$.

Past video game violence exposure was not a predictor of aggressive cognition, [$F(1, 104) = 0.21$, $b = -.31$, $p > .65$] nor did it moderate the violence effect, $F(1, 104) = 0.03$, $p > .85$. Past violent sports video game exposure, past nonviolent sports video game exposure, past sports playing, and past sports viewing neither predicted aggressive cognition [$Fs < 0.75$, $ps > .35$] nor moderated the violence effect on aggressive cognition, $Fs < 2.40$, $ps > .10$.

Word fragment task

Aggressive cognition was calculated by counting the number of aggressive word responses divided by the number of total word fragment completions. Violent sports game participants did not score higher on the WFT than nonviolent sport game participants, $Ms = .203$ & $.210$, $F(1, 182) = 0.70$, $p > .05$, $d = .12$. There was no main effect of violence for participants who completed the WFT first [$Ms = .176$ & $.189$, $F(1, 62) = 0.81$, $p > .05$, $d = .23$] or for participants who completed the WFT second, $Ms = .219$ & $.220$, $F(1, 116) = 0.04$, $p > .05$, $d = .037$. Men were not higher in aggressive cognition than women, $Ms = .209$ & $.204$, $F(1, 182) = 0.31$, $p > .05$, $d = .083$. The violence X sex interaction was not significant, $F(1, 182) = 0.88$, $p > .05$, $d = .14$.

Game score was not significantly related to aggressive cognition for all participants [$F(1, 163) = 0.09$, $b = -.0012$, $p > .75$] or those who complete the word fragment task first, $F(1, 53) = 0.15$, $b = .0065$, $p > .65$. After controlling for game score, the violence effect on aggressive cognition was still non-significant for all participants [$F(1, 163) = 0.37$, $p > .50$, $d = .10$] or those who complete the word fragment task first, $F(1, 53) = 0.76$, $p > .35$, $d = .24$.

Physiological arousal measures and participant video game ratings were entered into the statistical model as possible covariates. None of the physiological measures were significant predictors of aggressive cognition, $Fs < 3.20$, $ps > .05$. Also, none of the participant video game ratings were significant predictors of aggressive cognition, $Fs(1, 181) < 1.20$, $ps > .05$.

Moderators of violent video game exposure on the word fragment task

Trait aggression, past video game violence exposure, past violent sports video game exposure, past nonviolent sports video game exposure, past sports playing, and past sports viewing were tested to determine whether they were related to aggressive cognition or moderated the violence effect on aggressive cognition. Trait aggression and past video game violence exposure neither predicted nor moderated the violence effect on the word fragment task, $Fs < 1.10$, $ps > .05$.

There was a significant violence X past nonviolent sports video game exposure interaction, $F(1, 172) = 11.10$, $p < .05$, $d = .51$. This interaction was qualified by a significant violence X sex X past nonviolent sports video game exposure interaction, $F(1, 172) = 6.97$, $p < .05$, $d = .40$. For men, the violence X nonviolent sport video game exposure was nonsignificant, $F(1, 87) = 0.81$, $p > .05$. Past nonviolent sport video game exposure was not related to WFT score, regardless if they were assigned to play a nonviolent video game [$F(1, 45) = 0.16$, $b = .0033$, $p > .05$] or a violent video game, $F(1, 45) = 0.77$, $b = -.0070$, $p > .05$. For women, there was a significant violence X nonviolent sport video game exposure for scores on the WFT, $F(1, 85) = 10.60$, $p < .05$. Past nonviolent sport video game exposure was positively related to women's WFT scores when they were assigned

to play a nonviolent video game [$F(1, 40) = 5.42$, $b = .054$, $p < .05$], but was negatively related to WFT when assigned to play a violent video game, $F(1, 45) = 5.08$, $b = -.035$, $p < .05$.

Results also showed a significant violence X past violent sports video game exposure on word fragment task, $F(1, 173) = 5.86$, $p < .05$. For participants assigned to play a nonviolent sports game, past violent sports video game exposure was positively related to WFT, $F(1, 85) = 7.26$, $b = .027$, $p < .05$. For violent game participants, past violent sports video game exposure was unrelated to WFT, $F(1, 87) = 1.36$, $b = -.017$, $p < .05$.

There was also a significant violence X past sports playing experience on word fragment task, $F(1, 174) = 6.55$, $p < .05$. For participants assigned to play a nonviolent sports game, past sports playing experience was positively related to WFT, $F(1, 85) = 1.86$, $b = .0017$, $p > .05$. For violent game participants, past sports playing experience was negatively related to WFT, $F(1, 88) = 5.29$, $b = -.010$, $p < .05$.

Finally, results demonstrated a significant violence X past sports viewing on word fragment task, $F(1, 174) = 4.87$, $p < .05$. Past sports viewing was positively related to WFT for participants who were randomly assigned to play a nonviolent video game, $F(1, 85) = 4.25$, $b = .0061$, $p < .05$. For violent game participants, past sports viewing was unrelated to WFT, $F(1, 88) = 1.96$, $b = -.011$, $p > .05$.

EXPERIMENT 2 DISCUSSION

Experiment 2 examined whether exposure to a violent sports video game would increase aggressive cognitions compared to a nonviolent sports video game. Because the violent and nonviolent games were matched by sport, the competition-only hypothesis predicted no difference between groups on aggressive cognition. However, because the violent sports game contained more violence, the violent-content hypothesis predicted that violent sports game players would be higher in aggressive cognitions compared to nonviolent game players.

There was partial support for several of the predicted hypotheses. Hypothesis 1 predicted violent game players would be higher in aggressive cognition on both the WPT and the WFT compared to nonviolent game players. This hypothesis was consistent with the violent-content hypothesis and not consistent with the competition-only hypothesis. Results demonstrated that violent game players did score higher on the WPT than nonviolent game players. This effect remained significant even after controlling for physiological arousal, video game characteristics, and participants' game scores. However, there was no difference between violent and nonviolent groups on the WFT.

In relation to Hypothesis 1, the second primary hypothesis stated that the WPT would demonstrate a stronger main effect of violent game exposure than the WFT. This hypothesis was supported. There was not a significant effect of game on the WFT, regardless of when participants completed the task. However, there was a main effect of violent game exposure on WPT.

Hypothesis 3 stated that the interactions between the individual difference variables and manipulated violent video game exposure on aggressive cognition would be nonsignificant. These nonsignificant interactions would demonstrate a lack of moderation on violent video game effect on aggressive cognition. This hypothesis was only partially supported. None of the individual difference variables moderated the effect of violent video game exposure on the WPT except trait aggression. There was a significant game by trait aggression interaction on the WPT, so the slope of trait aggression on aggressive cognition did differ between the violent and nonviolent video game conditions. However, when examining each regression slope separately, neither was significantly different from zero.

Upon further investigation, trait aggression was not significantly related to WPT scores regardless of whether participants were assigned to play a nonviolent or violent video game. Several individual difference variables moderated the effect of violent video game exposure on the WFT.

In summary, Experiment 2 demonstrated: a) support for the violent-content hypothesis, b) the WPT found a larger video game violence effect on aggressive cognition than the WFT, and c) only trait aggression partially moderated the effect of violent game exposure on the WPT. Experiment 3 further tested the violent-content and competition-only hypotheses, but with a focus on aggressive affect and attitudes towards aggression in sports.

EXPERIMENT 3 OVERVIEW

Experiment 2 examined whether exposure to violent sports video games would increase aggressive cognition compared to exposure to nonviolent sports video games. Experiment 3 used similar methods as Experiment 2, except it examined the impact of violent sports video games on aggressive affect and attitudes towards aggression in sports.

There were three primary hypotheses addressed by Experiment 3. **Hypothesis 1** stated that participants who played a violent sports video game would be higher in aggressive affect compared to participants who played a nonviolent sports video game. This hypothesis is consistent the violent-content hypothesis and not consistent with the competition-only hypothesis.

Hypothesis 2 stated that participants who played a violent sports video game would be more accepting of aggression in some sports compared to participants who played a nonviolent sports video game. After participants are exposed to a sports violent game that promotes illicit violence, they should be more likely to be accepting of less extreme aggressive acts in other sports. This effect is most likely to occur in sports where there is already ambiguity concerning the acceptability of aggression (e.g., hockey).

Hypothesis 3 states that the interactions between the manipulated video game violence exposure and the individual difference variables on aggressive affect will not be statistically significant. These non-significant interactions will help demonstrate a lack of moderation of the effect of violent video game exposure on

aggressive affect. This is the same as Hypothesis 3 in Experiment 2, in which there were mixed results.

EXPERIMENT 3 METHODS

Participants

Participants were 154 undergraduates students (72 men and 82 women) enrolled in introductory psychology classes at Iowa State University. Participants were recruited the same manner as in Experiment 2. However, three women and three men were deleted due to high suspicion or inappropriate and incompatible clothing. This left the final sample at 69 men and 79 women.

Design

This experiment examined the effects of illicit violence in sports video games on aggressive affect and acceptance of aggression in various sports. The design of the study was a 2 (video game violence: violent, nonviolent) X 2 (sport: baseball, football) X 2 (sex: male, female) between subjects design. The primary dependent variables were aggressive affect and acceptance of aggression in sports.

Materials

Individual differences questionnaire

Participants completed the same individual differences questionnaire that was used in Experiments 1 and 2. Before any experimental manipulations, participants completed a questionnaire packet that includes the Video Game Violence Exposure Questionnaire, Sports Video Game Exposure Questionnaire, Sports Experience Questionnaire, and the physical aggression subscale of the Buss-Perry Aggression Questionnaire.

Video games

Participants were randomly assigned to play one of the same four video games used in Experiments 1 and 2. These games include two violent games (MLB Slugfest Baseball and NFL Blitz Football) and two nonviolent games (MVP Baseball 2004 and Madden Football). Participants were randomly assigned to play one of the video games for 20 minutes. As in Experiment 2, the final game score was recorded at the end of the gaming session. Score was calculated in the same manner as in Experiment 1.

State hostility scale

After participants played one of the four randomly assigned games, they completed the State Hostility Scale (SHS; coefficient α = .94; Anderson, Deuser, & DeNeve, 1995; see Appendix). The SHS entailed rating current feelings on each of 35 adjectives, such as “irritated," “disgusted,” and “mean”, using a 5-point scale anchored at 1 (*e.g., strongly disagree)* and 5 (*e.g., strongly agree*). The SHS has been used in numerous studies and has been shown to be a valid measure of aggressive affect (e.g., Anderson, Carnagey, & Eubanks, 2003; Carnagey & Anderson, 2005). The SHS was scored by reverse coding non-aggressive adjectives (e.g., "sympathetic", "polite", "kindly") and averaging the 35 adjectives. Higher scores represent higher levels of aggressive affect.

Attitudes towards aggression in sports questionnaire

After completing the SHS, participants then completed the Attitudes Toward Aggression in Sports Questionnaire (ATAS; see Appendix). The ATAS involved rating the appropriateness of various aggressive behaviors in five different sports: football (coefficient α = .76), hockey (coefficient α = .77), baseball (coefficient α =

.75), soccer (coefficient α = .83), and basketball (coefficient α = .77). There were five items for each sport, for a total of 25 items. Items were rated on a 7-point scale anchored at 1 (*Strongly Disagree)* and 7 (*Strongly Agree)*. In addition to the 25 items, there were five general statements concerning the amount of aggression in sports (coefficient α = .91). Each item states, "I believe that there is too much violence in modern ...". The five items concerned football, hockey, baseball, soccer, and basketball. These five items were rated on the same 7-point scale anchored at 1 (*Strongly Disagree)* and 7 (*Strongly Agree)*.

Video game evaluation questionnaire

At the end of this experiment, participants completed the same Video Game Evaluation used in Experiment 2. Participants rated the sports video game they played on various dimensions: difficulty, enjoyment, frustration, excitement, pace of action, and violence. Participants also rated their abilities on the video game and how much they improved during the gaming session.

Procedure

The procedures of Experiment 3 were identical to the procedures in Experiment 2 except the WPT and the WFT were replaced by the SHS and the ATAS. However, in Experiment 3, the presentation order of the two primary dependent variables was not counter-balanced. Participants always completed the SHS first. This was done because ATAS was considered a secondary variable and less important than the SHS.

First, the participant gave consent and had a blood pressure cuff attached. The participant then completed the individual difference questionnaire, consisting of

the Video Game Violence Exposure Questionnaire, Sports Video Game Exposure Questionnaire, Sports Experience Questionnaire, and the physical aggression subscale of the Buss-Perry Aggression Questionnaire.

Next, the participant was given instructions on how to how to play one of the four video games and played for 20 minutes. After playing the game, the participant completed the SHS, ATAS, and the Video Game Evaluation Questionnaire. Finally, the participant was probed for suspicion and debriefed by the experimenter.

As in Experiment 2, blood pressure and pulse were again measured twice during the individual difference questionnaire (at two minutes and four minutes from the start of the questionnaire) and four times during gameplay (at 6, 10, 14, and 18 minutes from the start of video gameplay). Blood pressure and pulse were also measured twice during completion of the dependent variables (at two minutes and four minutes from the start of the SHS).

EXPERIMENT 3 RESULTS

Preliminary Analyses

Video game characteristics

As expected, violent games were rated as more violent than nonviolent games, *Ms* = 4.06 & 2.02, $F(1, 144) = 97.44$, $p < .05$, $d = 1.65$. The violence X sex interaction was nonsignificant for rated violent content, $F(1, 144) = 1.92$, $p > .05$, $d = .23$. The violent baseball game (MLB Slugfest) was rated as more violent than the nonviolent baseball game (MVP Baseball), *Ms* = 4.04 & 1.32, $F(1, 68) = 107.92$, $p < .05$, $d = 2.52$. The violent football game (NFL Blitz) was also rated as more violent than the nonviolent football (Madden NFL), *Ms* = 4.06 & 2.63, $F(1, 72) = 27.23$, $p < .05$, $d = 1.23$.[4]

There was no difference between violent sports video games and nonviolent sports video games on participants' ratings of difficulty, enjoyment, and excitement, *Fs*(1, 144) < 1.70, *ps* > .05. The violent sports video games were rated as more frustrating [*Ms* = 4.20 & 3.58, $F(1, 144) = 4.39$, $p < .05$, $d = .35$] and as having more action than nonviolent sports games, *Ms* = 4.33 & 3.63, $F(1, 144) = 8.18$, $p < .05$, $d = .48$. Violent game conditions were not higher than nonviolent game conditions in participants' self-perceived ability on the game or improvement in gameplay during the session, *Fs*(1, 144) = 3.20 & 0.02, *ps* > .05, *ds* = .30 & .02, respectively.

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[4] As in Experiment 2, there was a significant violence X sex interaction for rated violence for the football games, $F(1, 72) = 5.74$, $p < .05$. Upon further examination, women rated the nonviolent football as moderately more violent than men, *Ms* = 2.91 & 2.35, $F(1, 37) = 2.76$, $p < .11$, $d = .55$. However, women rated the violent football game as moderately less violent than men, *Ms* = 3.68 & 4.44, $F(1, 35) = 2.99$, $p < .10$, $d = .58$.

Physiological arousal

Mean arterial pressure and pulse were examined in separate 2 (video game violence: violent, nonviolent) X 2 (participant sex) X 3 (measurement time: baseline, during video game, during DV completion) mixed design ANOVAs. The key violence X measurement time interaction was nonsignificant for mean arterial pressure, $F(2, 278) = 0.65$, $p > .05$. However, it was significant for pulse, $F(2, 278) = 4.73$, $p < .05$. There was also a violence X measurement time X sex interaction for pulse, $F(2, 278) = 3.21$, $p < .05$. Further examination revealed that nonviolent game participants were higher in pulse than violent game participants at baseline, *Ms* = 79.27 & 72.77, $F(1, 139) = 10.04$, $p < .05$, $d = .54$. During gameplay, nonviolent game participants were no higher in pulse than violent game participants, *Ms* = 74.12 & 72.99, $F(1, 139) = 0.42$, $p > .05$, $d = .11$. Then while completing the dependent variables, nonviolent game participants were higher in pulse than violent game participants, *Ms* = 75.76 & 71.85, $F(1, 139) = 4.61$, $p < .05$, $d = .36$. The violence X sex interaction was not significant during baseline or gameplay, *Fs*(1, 139) = 0.14 & 0.00, *ps* > .05, *ds* < .07. However, it was significant during dependent variable completion, $F(1, 139) = 5.33$, $p > .05$. For nonviolent game participants, women were no higher in pulse than men during dependent variables completion, *Ms* = 74.54 & 76.29, $F(1, 71) = 0.41$, $p > .05$, $d = .15$. For violent game participants, women were significantly higher in pulse than men during dependent variables completion, *Ms* = 75.00 & 68.70, $F(1, 72) = 6.92$, $p < .05$, $d = .62$. Because of these differences, the pulse measurements were entered as possible covariates in the primary analyses.

Main Analyses

State hostility scale

The measure of aggressive affect was calculated by averaging participants' responses to the State Hostility Scale items. Participants who played a violent sports game were higher in aggressive affect post-play than participants who played a nonviolent sports game, *Ms* = 2.26 & 2.07, $F(1, 144) = 4.02$, $p < .05$, $d = .33$. Men were no higher in aggressive affect than women, *Ms* = 2.16 & 2.18, $F(1, 144) = 0.07$, $p > .05$, $d = .044$. The violence X sex interaction was non-significant, $F(1, 144) = 1.13$, $p > .05$, $d = .18$.

None of the pulse measurements [*Fs* < 0.10, *ps* > .05] nor the mean arterial pressure measurements [*Fs* < 2.60, *ps* > .05] were related to aggressive affect. Participants' ratings of enjoyment, excitement, action, perceived ability, and perceived improvement were all unrelated to aggressive affect, $Fs(1, 143) < 1.80$, *ps* > .05[5]. However, game difficulty was a significant predictor of aggressive affect, $F(1, 143) = 7.10$, $b = .077$, $p < .05$. Controlling for game difficulty made the violence effect moderately significant, $F(1, 143) = 3.06$, $p < .09$, $d = .29$.

Game score was not significantly related to SHS, $F(1, 143) = 0.62$, $b = -.026$, $p > .40$. After controlling for score, the violence effect was still significant on aggressive cognition, $F(1, 143) = 3.97$, $p < .05$, $d = .33$.

Moderators of the state hostility scale

Trait aggression did not predict aggressive affect [$F(1, 139) = 2.36$, $b = .12$, $p > .05$], nor did it interact with the violence effect, $F(1, 139) = 0.00$, $p > .05$. Past video

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[5] Game frustration was specifically not used as a covariate because the SHS includes "frustration" and several closely related terms on the scale. It would be inappropriate to examine the violence effect on a frustration-related construct while using game frustration as a covariate.

game violence exposure was positively related to aggressive affect, [$F(1, 141) = 8.23$, $b = .026$, $p < .05$], but it did not interact with the violence effect, $F(1, 141) = 0.42$, $p > .05$. The violence effect became non-significant after controlling for past video game violence exposure, $F(1, 141) = 0.28$, $p > .05$, $d = .089$.

Past violent sports video game exposure, past nonviolent sports video game exposure, past sports viewing, and past sports playing were also not significant predictors of aggressive affect nor did they interact with the violence effect, $Fs < 3.15$, $ps > .05$. None of the individual difference measurements moderated the effect of violence on the State Hostility Scale.

Attitudes towards aggression in sports

Exposure to a violent or nonviolent game did not significantly affect overall attitudes on aggression in sports, $F(1, 144) = 1.69$, $p > .05$, $d = .22$. To examine this further, the effect of violence was examined on each of the subscales. Violence exposure did not affect violence attitudes in football, baseball, or basketball, $Fs(1, 144) < 0.50$, $ps > .05$. However, participants who played a violent sports video game were more supportive of violence in hockey than participants who played a nonviolent sports game, [$Ms = 2.75$ & 2.35, $F(1, 144) = 4.49$, $p < .05$, $d = .35$] and moderately more supportive of violence in soccer, $Ms = 2.35$ & 2.05, $F(1, 144) = 2.98$, $p < .09$, $d = .29$. Men were more supportive (relative to women) of violence in hockey [$Ms = 2.79$ & 2.31, $F(1, 144) = 6.65$, $p < .05$, $d = .43$] and in soccer [$Ms = 2.41$ & 1.99, $F(1, 144) = 6.06$, $p < .05$, $d = .41$]. The violence X sex interaction was nonsignificant for both hockey and soccer attitudes, $Fs(1, 144) = 1.78$ & 0.90, $ps > .05$, $ds = .22$ & $.16$.

Baseline mean arterial pressure was positively related to hockey attitudes, $F(1, 139) = 4.30$, $b = .022$, $p < .05$. None of the other mean arterial pressure or pulse measurements were related to hockey attitudes, $Fs < 3.50$, $ps > .05$. None of the video game ratings were related to hockey attitudes, $Fs < 1.60$, $ps > .05$.

None of the mean arterial pressure or pulse measurements were related to soccer attitudes, $Fs < 1.85$, $ps > .05$. Game enjoyment was positively related to soccer attitudes, $F(1, 143) < 4.04$, $b = .10$, $p < .05$. No other video game ratings were related to soccer attitudes, $Fs < 3.10$, $ps > .05$.

Game score was not significantly related to any of the attitude subscales, $Fs(1, 143) < 1.35$, $ps > .25$. Controlling for game score did not alter the effect of game on the various attitude subscales. After controlling for score, the effect of game was still significant on attitudes towards hockey, $F(1, 143) = 4.44$, $p < .05$, $d = .35$. The violence effect on soccer attitudes was still moderately significant after controlling for game score, $F(1, 143) = 2.98$, $p < .09$, $d = .29$. The violence effect was still nonsignificant on the remaining attitude subscales after controlling for game score, $Fs(1, 143) < 0.60$, $ps > .45$.

Moderators of attitudes towards aggression in sports

Trait aggression, past video game violence exposure, past violent sports video game exposure, past nonviolent sports video game exposure, past sports playing, and past sports playing were unrelated to hockey attitudes. All main effects [$Fs < 2.40$, $ps > .05$], and interactions with experimental violence exposure [$Fs < 2.70$, $ps > .05$] were nonsignificant.

Past video game violence exposure was positively related to violence in soccer attitudes [$F(1, 141) = 4.19$, $b = .0052$, $p < .05$], but did not interact with experimental violence exposure, $F(1, 141) = 0.62$, $p > .05$. No other moderators were related to soccer attitudes [$Fs < 0.70$, $ps > .05$], nor did they moderate the experimental violence exposure effect, $Fs < 2.15$, $ps > .05$.

EXPERIMENT 3 DISCUSSION

Experiment 3 further supported the violent-content hypothesis while failing to support the competition-only hypothesis. This study found that exposure to illicit violence in sports video games can increase aggressive affect and can influence attitudes towards aggression in sports. Participants who played a violent sports video game scored higher on the SHS than participants who played a nonviolent simulation-based sports video game. Also, those who played a violent sports video game were more endorsing of aggression in sports, but only for hockey. This could be due to the relatively ambiguous acceptance of violence in hockey compared to other sports. For example, fights routinely break out in a hockey game and are penalized similar to any other penalty. However, in baseball if there is a fight, players are thrown out of the game. Because the acceptability of violence is much more ambiguous in hockey than the other sports assessed in this study, it seems logical that attitudes towards violence in this sport were affected by violent game exposure. The marginally significant effect on soccer may be the result of the sport's relative unfamiliarity among U.S. citizens, also making it more ambiguous whether violence is accepted. Attitudes towards ambiguous sports appear to be more malleable than attitudes towards better-known American sports, such as basketball, football, and baseball.

Although Experiments 2 and 3 demonstrate that exposure to a violent sports video game can increase aggressive cognitions and affect, as well as influence attitudes towards violence, these results do not address the impact of exposure on aggressive behavior. Experiment 4 was designed to test the competition-only

hypothesis versus the violent-content hypothesis utilizing aggressive behavior as the primary dependent variable.

EXPERIMENT 4 OVERVIEW

The previous studies have demonstrated that exposure to a violent sports video game increases aggressive cognition (Experiment 2) and state hostility (Experiment 3) compared to a nonviolent sports video game. These studies have supported the violent-content hypothesis while rejecting the competition-only hypothesis. However, none of the previous experiments have addressed whether exposure to violence in a sports game can influence aggressive behavior. This is the primary purpose of Experiment 4.

Experiment 4 examined whether exposure to violent sports video games would increase aggressive behavior compared to exposure to nonviolent sports video games. There were three primary hypotheses that addressed by this study. **Hypothesis 1** stated the participants who played a violent sports video game would be higher in aggressive behavior compared to participants who played a nonviolent sports video game. This hypothesis supports the violent-content hypothesis and contradicts the competition-only hypothesis.

Hypothesis 3 states that the interactions between the manipulated video game violence exposure and the individual difference variables on aggressive behavior will not be statistically significant, except possibly trait aggression. Previous research has suggested that aggressive cognition is the primary route through which violent video games affect aggression on the CRT. If this is the case, then one should expect trait aggression to also moderate the effect of violent video game exposure on aggressive behavior. Because Experiment 2 demonstrated a weak

moderation on aggressive cognition by trait aggression, one should expect to possibly find a similar weak moderation on aggressive behavior.

EXPERIMENT 4 METHODS

Participants

Participants were 103 undergraduate students (65 male and 38 women) enrolled in introductory psychology classes at Iowa State University. As in the previous experiments, participants were recruited by using the psychology department's research pool sign-up boards. Participants arrived for individual laboratory sessions that were most convenient for them.

Design

This experiment examined the effects of illicit violence in sports video games on aggressive behavior. The design of this study was similar to Experiments 2 and 3. The design of this study was a 2 (video game: violent, nonviolent) X 2 (sport: baseball, football) X 2 (sex: male, female) between subjects design. The primary dependent variable was aggressive behavior on the Competitive Reaction Time Task.

Materials

Individual differences questionnaire

Participants completed the same individual differences questionnaire as used in all three previous experiments. Before playing a randomly assigned video game, participants completed the Video Game Violence Exposure Questionnaire, Sports Video Game Exposure Questionnaire, Sports Experience Questionnaire, and the physical aggression subscale of the Buss-Perry Aggression Questionnaire.

Video games

Participants were randomly assigned to play either a violent or nonviolent sports video game. The same violent sports games (MLB Slugfest Baseball or NFL Blitz Football) and nonviolent sports games (MVP Baseball 2004 or Madden Football) used in the previous experiments were also used in this experiment. Participants were randomly assigned to play one of the four games for 20 minutes.

Competitive reaction time task

An altered version of the Taylor Competitive Reaction Time (CRT) task was used to measure aggressive behavior. The CRT is a widely used and externally valid measure of aggressive behavior (see Anderson & Bushman, 1997; Anderson, Lindsay, & Bushman, 1999; Bushman & Anderson, 1998; Carlson, Marcus-Newhall, & Miller, 1989; Giancola, & Chermack, 1998). The CRT is a computer game in which participants are induced to believe that they are competing with another participant to see who can press a mouse button faster after hearing an auditory cue. In the standard version of this computer task, the "loser" of each trial receives a burst of white noise. The participant's opponent supposedly is responsible for the selected intensity and duration. In the present study the scale of intensities that participants could choose from had eleven levels, ranging from no noise (level 0), 60 decibels (level 1), through 105 decibels (level 10). Each level (1-10) increased by 5 decibels over the previous level. Participants selected the intensity level they wanted their opponent to hear prior to each of the 25 trials. These selections constituted the measure of aggressive behavior.

In reality there was no other partner. A pattern of wins and losses was constructed in the program, which predetermined whether the participant won or lost

a particular trial. All participants won 13 trials and lost 12 trials, as long as they responded within 750 milliseconds. Participants automatically lost a trial if they were slower than 750 milliseconds, even if it was originally designated as a win trial. Across the 12 lose trials, participants were presented with two noise bursts of levels 2, 4, 5, 7, 8, and 9, in a random order.

Video game evaluation questionnaire

At the end of this experiment, participants completed the same Video Game Evaluation used in Experiments 2 and 3. Participants rated the sports video game they played on various dimensions, as well as their abilities on the game and how much they improved during the gaming session.

CRT motivation questionnaire

After completing the Video Game Evaluation, participants then completed the CRT Motivation Questionnaire (see Appendix; Anderson et al., 2004). This questionnaire asked participants their perceptions of the CRT session and what their motivations behind their behavior on the CRT. Participants first estimated various aspects of the CRT session, including how many trials they won, average intensity issued to opponent, average duration issued to opponent, lowest and highest intensities issued, and the lowest and highest durations issued. Participants also rated how angry and afraid they were on the task using a 5-point scale anchored at 1 (*Not At All)* and 7 (*A Lot)*.

Next, participants completed the motivation subsection of the CRT questionnaire. These six items asked participants why they selected the particular intensities for their partner during completion of the CRT. Two items measured

participants' instrumental motivation (e.g., "I wanted to control my opponent's level of responses"; coefficient α = .62) and four items measured revenge motivation (e.g., "I wanted to make my opponent mad"; coefficient α = .70). Items were rated using a 5-point scale anchored at 1 (*Not At All)* and 7 (*A Lot)*.

The CRT questionnaire then asked participants questions specific to the CRT program. Participants were asked whether the computer handled the CRT as it was supposed to and whether they detected any pattern of noise levels they received from their partner. Participants also classified the noise pattern as increasing, decreasing, or random. Participants also rated whether they thought their partner took the CRT more seriously, less seriously, or equally seriously compared to themselves. Finally, participants completed an open-ended item that asked them what they thought was the purpose of the entire experiment.

Procedure

The procedures of Experiment 4 were similar to the procedures in Experiments 2 and 3 with some minor modifications. First, the participant gave consent to a study that he or she believed was examining abilities on simple and complex computer tasks. The consent form informed participants that they would complete one complex computer task (a commercially released video game) and one simple computer task (the CRT). After providing consent, the participant had a blood pressure cuff attached, and completed the individual difference questionnaire, which including the Video Game Violence Exposure Questionnaire, Sports Video Game Exposure Questionnaire, Sports Experience Questionnaire, and the physical aggression subscale of the Buss-Perry Aggression Questionnaire.

Next, the participant was given instructions on how to complete the CRT session. Then, the participant was instructed how to play one of the four video games. The participant then played the randomly assigned video game for 20 minutes. After playing the game, the participant completed the CRT. The participant then completed the Video Game Evaluation Questionnaire and the CRT Motivation Questionnaire. Finally, the participant was probed for suspicion and debriefed by the experimenter.

As in Experiments 2 and 3, blood pressure and pulse were again measured twice during the individual difference questionnaire (at two minutes and four minutes from the start of the questionnaire) and four times during game play (at 6, 10, 14, and 18 minutes from the start of video gameplay). Blood pressure and pulse were also taken once during completion of the CRT and once during completion of the CRT Motivation Questionnaire (at two minutes from the start of each task).

EXPERIMENT 4 RESULTS

Preliminary Analyses

Video game characteristics

Violent games were rated as more violent than nonviolent games, *Ms* = 3.75 & 2.08, $F(1, 99) = 48.51$, $p < .05$, $d = 1.40$. As in the previous experiments, the violent baseball game was rated more violent than the nonviolent baseball game [*Ms* = 3.49 & 1.28, $F(1, 47) = 70.00$, $p < .05$, $d = 2.44$] and the violent football game was rated as more violent than the nonviolent football game, *Ms* = 4.03 & 2.77, $F(1, 48) = 14.30$, $p < .05$, $d = 1.09$.

There was no difference between violent and nonviolent games on participants' ratings of difficulty, enjoying, frustrating, and exciting, *Fs*(1, 99) < 1.00, *ps* > .05. Also, violent game conditions were not different from nonviolent game conditions in participants' perceived ability on the game [*Ms* = 3.17 & 3.21, $F(1, 99) = 0.02$, $p > .05$, $d = .028$] or participants' perceived improvement in gameplay during the session, *Ms* = 4.19 & 4.08, $F(1, 99) = 0.18$, $p > .05$, $d = .085$. However, violent games were rated as containing more action than nonviolent games, *Ms* = 4.60 & 3.54, $F(1, 99) = 13.62$, $p < .05$, $d = .74$.

Physiological arousal

Mean arterial pressure and pulse were examined in the same 2 (video game violence) X 2 (sex) X 3 (time) mixed design ANOVA as in Experiment 3. The violence X measurement time interaction was nonsignificant for both mean arterial pressure and pulse, $F(2, 120) = 1.81$, $p > .05$ and $F(2, 110) = 2.46$, $p > .05$, respectively.

Main Analyses

Aggressive behavior

Aggressive behavior was calculated by counting the number of high intensities (levels 8, 9, and 10) selected by participants across the 25 trials in the CRT session. Violent sports game participants were more aggressive than nonviolent sports game participants, *Ms* = 4.65 & 2.65, $F(1, 99) = 6.27$, $p < .05$, $d = .50$ (see Figure 2). Men were more aggressive than women, *Ms* = 4.48 & 2.82, $F(1, 99) = 4.38$, $p < .05$, $d = .42$. The violence X sex interaction was nonsignificant, $F(1, 99) = 2.31$, $p > .05$, $d = .31$.

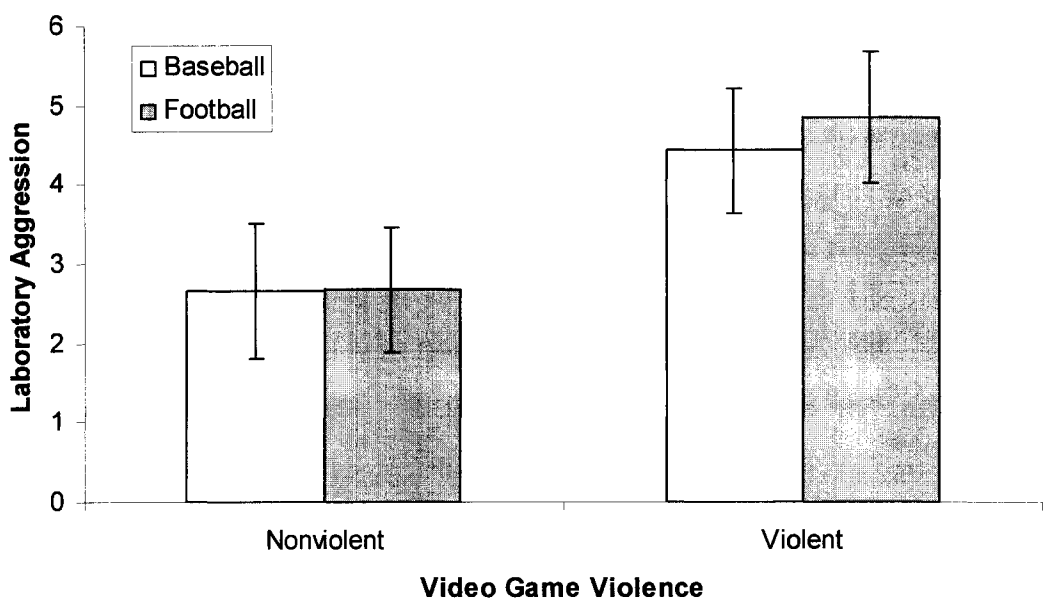

Figure 2. The effect of video game violence on laboratory aggression, separated by the sport of the video game. Capped vertical bars denote 1 SE.

None of the mean arterial pressure or pulse measurements were related to aggressive behavior, $Fs < 1.50$, $ps > .05$. Also, none of the video game characteristics were significant predictors of aggressive behavior, $Fs(1, 98) < 3.35$, $ps > .05$.

Game score was not significantly related to aggressive behavior, $F(1, 98) = 0.06$, $b = 0.28$, $p > .85$. The effect of violence on aggressive behavior remained significant after controlling for game score, $F(1, 98) = 6.19$, $p < .02$, $d = .50$.

Moderators of violent video game exposure on aggressive behavior

The main effect of trait aggression was not significant, $F(1, 96) < 0.02$, $b = -1.41$, $p > .05$. However, there was significant violence X trait aggression interaction on aggressive behavior, $F(1, 96) < 4.61$, $p < .05$, $d = .44$. To dissect this interaction, the relationship of trait aggression and aggressive behavior was examined within each game condition. Results demonstrated that the regression slope between trait aggression and aggressive behavior was not reliably different from zero for nonviolent video game participants [$F(1, 47) = 2.12$, $b = 1.76$, $p > .05$], or for violent game participants, $F(1, 48) = 1.73$, $b = -1.88$, $p > .05$. The two slopes did differ between game conditions, but neither was significantly different from zero. Because of the relative weak strength of this interaction, interpretations should be made cautiously. The main effect of violence was still significant even after accounting for the violence X trait aggression interaction, $F(1, 96) = 7.60$, $p < .01$, $d = .56$.

Motivations of aggressive behavior

Revenge motivation and instrumental motivation were entered into an ANCOVA to determine whether either motivation was related to aggressive

behavior. Revenge motivation was a strong positive predictor of aggressive behavior, $F(1, 98) = 13.78$, $b = .60$, $p < .05$,. However, instrumental motivation was not related to aggressive behavior, $F(1, 98) = 2.26$, $b = .74$, $p > .05$. This finding adds to the validity of the CRT by demonstrating that the intensities selected by the participants are based on the revengeful motivation to harm the partner instead of an instrumental motivation to succeed at the competitive task. The main effect of violence was still significant after controlling for revenge motivation [$F(1, 98) = 4.14$, $p < .05$, $d = .41$] and instrumental aggression, $F(1, 98) = 5.21$, $p < .05$, $d = .46$.

Violent video game participants were not significantly higher in revenge motivation [*Ms* = 1.79 & 1.59, $F(1, 99) = 2.57$, $p > .10$, $d = .32$] or instrumental motivation [*Ms* = 1.99 & 1.76, $F(1, 99) = 1.99$, $p > .15$, $d = .28$] than nonviolent video game participants. Men were not higher in revenge motivation [*Ms* = 1.73 & 1.65, $F(1, 99) = 0.35$, $p > .55$, $d = .12$] or instrumental motivation [*Ms* = 1.84 & 1.91, $F(1, 99) = 0.16$, $p > .65$, $d = .081$] than women. Violence X sex interactions were nonsignificant for both revenge motivation and instrumental motivation [*Fs*(1, 99) = 0.14 & 0.85, *ps* > .35, *ds* = .076 & .19], respectively.

EXPERIMENT 4 DISCUSSION

Experiment 4 once again tested the competition-only hypothesis against the violent-content hypothesis. This experiment examined whether exposure to a violent sports video game would increase aggressive behavior compared to a nonviolent sports video game. Because the violent and nonviolent games were matched by sport, the competition-only hypothesis predicted no difference between groups on aggressive behavior. However, because the violent sports game contained more violence, the violent-content hypothesis predicted that violent sports game players would be higher in aggressive behavior compared to nonviolent game players. Similar to the results of Experiments 2 and 3, the results of Experiment 4 supported the violent-content hypothesis and failed to support competition-only hypothesis.

Hypothesis 1 predicted that violent game players would be more aggressive compared to nonviolent game players. This hypothesis was consistent with the violent-content hypothesis and not consistent with the competition-only hypothesis. Results demonstrated support for Hypothesis 1. Violent game players issued 75% more high intensities toward their partner than nonviolent game players, demonstrating higher levels of aggressive behavior. These results support the violent-content hypothesis and fail to support the competition-only hypothesis.

Finally, Hypothesis 2 was also supported by the results of Experiment 4. Hypothesis 2 stated that the interactions between the manipulated video game violence exposure and the individual difference variables on aggressive behavior would be nonsignificant, except for possibly trait aggression. Results supported this hypothesis. There was a significant violence X trait aggression interaction. However,

upon further investigation, the regression slopes between trait aggression and laboratory aggressive behavior were not significantly different from zero for either the nonviolent or violent video game groups. This is such a weak interaction between manipulated violence exposure and trait aggression that little attention should be paid. Results also verified that the remaining interactions were not statistically significant, demonstrating that the individual differences variables did not moderate the violence effect.

Finally, results demonstrated that aggression on the CRT would relate positively to revenge motivation. When a participant behaved more aggressively, the more likely they were to state they issued the intensities they selected because they wanted to hurt their partner and pay them back for intensities they received. This finding helps demonstrate that the CRT is actually measuring intentionally aggressive behavior.

CORRELATIONAL STUDY OVERVIEW

Before the experimental manipulation, all of the participants (245 men, 232 women) in the four previous experiments completed questionnaires that assessed trait aggression, past violent video game exposure, past violent sports video game exposure, past nonviolent sports video game exposure, past sports playing, and past sports viewing. Correlational and regressional analyses were conducted to examine the relationships among these variables.

There were two hypotheses concerning the relationships between these variables. **Hypothesis 1** stated that the best predictor of trait aggression would be past violent video game exposure. Past research (e.g., Anderson & Dill, 2000; Carnagey & Anderson, 2005) has shown that violent video game exposure and trait aggression are correlated approximately $r = .30$.

Hypothesis 2 states that sports viewing and sports playing should be more highly related to nonviolent sports video game exposure than violent sports video game exposure. Because nonviolent sports games realistically depict how sports are actually played, people who enjoy watching and playing sports should also enjoy nonviolent sports games over violent sports games.

CORRELATIONAL STUDY RESULTS

Preliminary Analyses

The survey data from the four previous experiments were combined for correlational analyses. These variables included sex, trait aggression, past violent video game exposure, past violent sports video game exposure, past nonviolent sports video game exposure, past sports viewing, and past sports playing. All these variables, except for sex, were converted to z-scores. To simplify analyses, a new variable of sports interest was created by combining the z-scores of sports playing and past sports together.

Second, ANOVAs were conducted on all the primary variables to determine whether participants' scores differed by study. Because all of these variables were measured before any experimental manipulations and all were collected on samples from the same university population (though in different semesters), it was expected that there would be no differences between the means of the four studies. There were no significant differences between participants in the four studies on trait aggression and past nonviolent sports video game exposure, $F(3, 468) = 1.23$, $p < .25$ and $F(3, 466) = 1.47$, $p > .20$, respectively. The composite past sports interest measure did differ by study, $F(3, 469) = 4.68$, $p < .005$. Participants in Experiment 1 scored lower on past sports interest than participants in Experiment 2 [*Ms* = -0.72 & 0.19, $F(1, 469) = 7.34$, $p < .01$, $d = .25$] and participants in Experiment 3 [*Ms* = -0.72 & 0.17, $F(1, 469) = 7.24$, $p < .01$, $d = .25$], but not significantly lower than participants in Experiment 4, *Ms* = -0.72 & -0.39, $F(1, 469) = 0.88$, $p > .30$, $d = .09$. Participants in Experiment 4 scored lower on past sports interest than participants in Experiment

2 [*Ms* = -0.39 & 0.19, $F(1, 469) = 6.55$, $p < .05$, $d = .24$] and participants in Experiment 3, *Ms* = -0.39 & 0.17, $F(1, 469) = 6.60$, $p < .05$, $d = .24$. Participants in Experiment 2 did not differ from participants in Experiment 3 on past sports interest, *Ms* = 0.19 & 0.17, $F(1, 469) = 0.01$, $p > .90$, $d = .01$.

Past violent video game exposure also differed by study, $F(3, 466) = 3.69$, $p < .05$. Participants in Experiment 1 were higher in past violent video game exposure than participants in Experiment 2 [*Ms* = 0.63 & -0.030, $F(1, 466) = 6.55$, $p < .05$, $d = .24$], participants in Experiment 3 [*Ms* = 0.63 & 0.025, $F(1, 466) = 5.71$, $p < .05$, $d = .22$], and participants in Experiment 4, *Ms* = 0.63 & -0.26, $F(1, 466) = 10.82$, $p < .01$, $d = .30$. There were no differences in past violent video game exposure among participants Experiments 2, 3, and 4, *Fs*(1, 466) < 2.90, *ps* > .08, *ds* < .16. Because of these differences, study was entered as a covariate for all further regression analyses.

Main Analyses

Correlational analyses demonstrated that trait aggression was positively related to sex (males greater than females), violent video game exposure, nonviolent sports video game exposure, and sports interest (see Table 1). Except for sex [$r(467) = .38$], the strongest correlation with trait aggression was violent video game exposure, $r(464) = .32$. A regression analysis was conducted with trait aggression as the criterion variable and all other variables (sex, past violent video game exposure, nonviolent sports video game exposure, and sports interest) as predictor variables. In this analysis, sports interest was no longer a significant predictor of trait aggression, $F(1, 465) = 0.27$, $b = .14$, $p > .05$. Past nonviolent sports video game

exposure remained a significant positive predictor of trait aggression, $F(1, 465) = 6.44$, $b = 1.36$, $p < .05$. Past violent video game exposure remained as a stronger significant positive predictor of trait aggression, $F(1, 465) = 16.18$, $b = 2.01$, $p < .0001$. Men were also higher in trait aggression than women, *Ms* = 2.14 & -2.20, $F(1, 465) = 16.70$, $p < .0001$, $d = .38$.

Another regression was conducted to see whether past nonviolent or violent sports video game exposure was a better predictor for sports interest. In this regression analysis, sports interest was treated as the criterion variable. The predictor variables included sex, past nonviolent sports video game exposure, and past violent sports video game exposure.[6] Past violent sports video game exposure was moderately related to past sports interest, $F(1, 465) = 5.16$, $b = .19$, $p < .05$. Past nonviolent sports video game exposure was a much stronger positive predictor of past sports interest, $F(1, 465) = 89.01$, $b = .80$, $p < .0001$.

[6] The past violent video game exposure variable was not used in this analysis. Because the analysis was intended to determine if illicit violence in sports video games is preferred by sports fans, the past violent sports video game exposure variable was used instead.

Table 1. *Correlations among the possible moderator variables for all participants*

Variable	SEX	TA	VGV	NSG	INTEREST
1. SEX	1.00	.38**	.51**	.41**	.20**
2. TA		1.00	.34**	.27**	.13*
3. VGV			1.00	.19**	.04
4. NSG				1.00	.48**
5. INTEREST					1.00

Note. *$p < .01$. **$p < .001$. Ns range from 466 to 477.

SEX = participant sex (women coded as 0 & men coded as 1), TA = Trait Aggression, VGV = past video game violence exposure, NSG = past nonviolent sport game exposure, INTEREST = sports interest

CORRELATIONAL STUDY DISCUSSION

These correlational data tested two primary hypotheses. Both of these hypotheses were supported by the data. Hypothesis 1 predicted that past violent video game exposure would be a strong predictor of trait aggression. Results demonstrated such a relation, even after controlling for all other predictor variables. This finding is consistent with previous research (e.g., Anderson & Dill, 2000; Carnagey & Anderson, 2005).

Hypothesis 2 predicted that nonviolent sports video game exposure would be positively related to sports interest. This hypothesis was also supported, even after controlling for violent sports video game exposure. Violent sports video game exposure was moderately related to sports interest. These findings demonstrate that people interested in actual sports prefer realistic nonviolent sports video games compared to violent sports video games.

GENERAL DISCUSSION

Four experiments were conducted to test the competition-only hypothesis against the violent-content hypothesis. Experiment 1 investigated whether violent sports video games and nonviolent sport video games differed in the amount violence, but were equal in competition. Participants played and rated both a violent video game and a nonviolent video game, both depicting the same sport. Results showed that the violent sports video games were more violent than the nonviolent sports video games, but equally competitive. These results demonstrated that the selected stimuli were appropriate to test the competition-only hypothesis against the violent-content hypothesis.

The remaining three experiments examined these hypotheses by exposing participants to either a violent sports video game or a matched-sport nonviolent video game. The competition-only hypothesis predicted that violent and nonviolent sports video games should yield no differences in any aggression-related variables measured after gameplay. The violent-content hypothesis predicted that participants exposed to a violent sports video game would be higher in aggression-related variables compared to those exposed to a matched-sport nonviolent video game. All three experiments rejected the competition-only hypothesis by demonstrating that violent content increases aggressive cognitions (Experiment 2), aggressive affect (Experiment 3), acceptability of violence in certain sports (Experiment 3), and aggressive behavior (Experiment 4). These studies also demonstrated that these main results were not attributable to differences in arousal or various nonviolent

video game characteristics. In sum, the violent-content hypothesis was strongly supported.

Experiment 2 demonstrated that violent sports video game exposure, when compared to nonviolent sports video game exposure matched by sport, increases aggressive cognition accessibility on a word pronunciation task. This same effect was not found on the word fragment task. Because previous research on violent video games has shown that violence exposure increases aggressive cognition, it is more likely that the word pronunciation task results demonstrate the actual effect of violent video game exposure. Also, for the same reasons mentioned earlier, the word pronunciation task appears to be a less suspicious measure and is much more difficult for participants to voluntarily alter the results.

Experiment 3 demonstrated that exposure to a violent sports video game, compared to a nonviolent video game match by sport, can increase aggressive affect and alter some attitudes towards aggression in sports. Violent video game players score significantly higher on the State Hostility Scale than nonviolent video game players. Violent video game players also were higher than nonviolent video game players in acceptance of aggressive acts in hockey. This difference did not occur for basketball, baseball, or football. Of all of these sports, the rules of hockey permit the most aggressive actions. Because there is more ambiguity of what aggressive acts will be tolerated in hockey, it makes sense that attitudes towards this sport would be the most malleable. Another possible explanation as to why attitudes towards all sports weren't affected was that all participants completed the State Hostility Scale before the attitudes questionnaire. Past research has shown

that a small exposure to violent media typically has a short-term effect. It's possible that if participants completed the attitudes questionnaire directly after playing a video game, stronger results would be found.

Experiment 4 demonstrated that the same violent sports video games used in the previous experiments also increased aggressive behavior compared to exposure to a matched-sport nonviolent video game. Violent sports video game players issued more than 75% more high intensity noise blasts to a partner than nonviolent sports video game players. Also, aggressive behavior was positively related to revenge motivation. Those participants who were the most aggressive also reported wanting to hurt their opponent for a means of revenge. This relationship helps validate the behavior on the Competitive Reaction Time Task as a measure of non-instrumental aggression.

In addition, numerous individual difference variables were examined to determine if there was any moderation of the violent video game effect. Although there were significant game X trait aggression interactions on the word pronunciation task (Experiment 2) and on aggressive behavior (Experiment 4), further examination of these relationships showed no significant relationship between trait aggression and the dependent variables. These moderation analyses partially demonstrate, though not as cleanly as one would hope, that these results are fairly generalizable across the population regardless of past violent video game exposure, sports experience, or trait aggression.

It should be noted that the violence effect on aggressive affect (Experiment 3) was somewhat different than the violence effect on aggressive cognition

(Experiment 1) and aggressive behavior (Experiment 4). First, the violence effect on affect was smaller than the violence effect on either cognition or behavior. Also, controlling for covariates (e.g., game difficulty, past violent video game exposure) reduced the violence effect even more, sometimes to nonsignificance. As noted earlier, past research has suggested that the violence effect primarily occurs through the cognitive route (e.g., Carnagey & Anderson, 2005). By demonstrating similar patterns between the cognitive and behavioral results, this series of studies informally supports the hypothesis that media violence effect is primarily working through the cognitive route rather than the affective route.

Finally, the supplemental correlational analysis demonstrated the potential long-term implications of violent video game exposure. Past violent video game exposure was positively correlated with trait aggression, even after controlling for sex, nonviolent sports video game exposure, past sports viewing, and past sports playing. Although these are only correlational data and causal inferences are risky, this is a finding that has been repeatedly shown throughout the violent video game literature. The correlational data also demonstrated that people who enjoy sports are more likely to play nonviolent sports video games than violent sports video games. This relationship suggests that violent sports games are more likely to appeal to players who enjoy violence instead of enjoying the sport being depicted.

Theoretical Interpretation

The results from these three experiments provide strong support the violent-content hypothesis and for the GAM-based interpretation of the effect of violent video game exposure on aggressive behavior. These experiments contribute to our

understanding of human aggression from both personality and situational perspectives.

Situational effects

The primary situational finding in this series of experiments was that brief violent sports video game exposure increased aggression-related variables compared to matched-sport nonviolent video game exposure. More specifically, these studies demonstrate that this process occurs because the violent-content in video games primes aggressive thoughts and feelings in the individual, which makes aggressive-knowledge structures more accessible in the player's memory. These activated aggressive-knowledge structures make aggressive scripts also more accessible, resulting in the player to be more likely to engage in an aggressive action.

The present empirical results in combination with our theoretical analysis also lend support to the concern that repeated exposure to violent video games (or other violent media) might lead to numerous long-term implications for the individual. When one is repeatedly exposed to violent video game content, the player is repeatedly thinking about violent actions, choosing to engage in such actions, and being rewarded for those violent actions. This process can be conceived as a series of learning trials leading to the development and automatization of a host of aggression-related knowledge structures. Violent video games may well teach players to become more aggressive people.

Personality effects

In direct relation to potential long-term effects of violent video game exposure, this experiment also provides a small contribution to the issue of personality processes. Correlational data demonstrated the existence of a strong positive relationship between violent video game exposure and trait aggression, even after controlling for sex and other related variables. This relationship suggests that repeated exposure to violent video games might lead to the development of an increasingly aggressive personality. The finding supports an increasingly compelling line of research on media violence exposure (e.g., Anderson et al., 2003; Bushman & Anderson, 2001). These correlational results provide some support for GAM's long-term predictions of violent media exposure. This finding supports the prediction that repeated exposure to violent video games does create more aggressive individuals. It is also consistent with prior research designed to test such effects (e.g., Anderson & Dill, Study 1, 2000).

Strengths and Limitations

Violent and nonviolent versions of two sports video games were investigated in all three studies: baseball and football. As noted earlier, our original intent was to have three or four different sports represented to maximize generalizability (e.g., Wells & Windschitl, 1999). However, pilot testing revealed that paired samples of more and less violent hockey, golf, soccer, and basketball games were either too similar in violent content, too difficult to play, or differed in other respects that made them unsuitable for the present line of research. Nonetheless, the use of two pairs of sports games (versus one) increases our confidence in the generalizability of these

results, as do other unreported analyses examining the relative effect sizes of the two sports.

Future Research

As noted earlier, the competition hypothesis, a less stringent version of the competition-only hypothesis, is consistent with GAM and does not contradict the violent-content hypothesis. Anderson and Morrow (1995) demonstrated that the concept of competition is cognitively linked to aggression concepts, and that competitive instructions can increase aggressive gameplay behaviors. Therefore, it would be interesting to test whether competitive instructions prior to playing a video game (even a nonviolent game) can increase later aggressive thoughts, feelings, and behavior. Conversely, can adding a cooperative component to violent video games reduce the effects of violent content on aggressive variables? There are a host of team-oriented video games that require cooperation. However, there is no research on the short-term or long-term effects of playing such games. It is possible that the cooperative component might serve as a type of protective factor.

CONCLUSION

Four experiments examined the competition-only hypothesis and the violent-content hypothesis by examining the impact of illicit violence in sport video games on aggression-related variables. Experiment 1 demonstrated that the selected violent sports video games were higher in violence than the selected nonviolent sports video games, but were equal on competition. In the remaining experiments, participants played either a nonviolent simulation-based sports video game (baseball or football) or a matched illicitly violent sports video game. Participants then completed measures assessing aggressive cognitions, aggressive affect, attitudes towards aggression in sports, or aggressive behavior. Illicitly violent sports video games increased aggressive affect, aggressive cognition, aggressive behavior, and some positive attitudes towards aggression in sports. Because all games were competitive, these findings support the violent-content hypothesis and fail to support the competition-only hypothesis.

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APPENDIX: SURVEY INSTRUMENTS

Video Game Violence Exposure Questionnaire

Please think of the five video games that you have played for the greatest amount of time from when you were in 7th grade until the present. Include computer, console/TV, arcade games, and hand held games. **Please write the titles of these shows below.** If you have never played a video game in your life, please leave the questions blank.

1) Title of your "most played" game: _____
2) Title of your "2nd most played" game: _____
3) Title of your "3rd most played" game: _____
4) Title of your "4th most played" game: _____
5) Title of your "5th most played" game: _____

Now, please rate each game by answering the questions that follow.

For the following items, rate the game you listed as your "most played" game:

_____1. How often have you played this game?

1	2	3	4	5	6	7
Rarely			Occasionally			Often

_____2. How violent is the content of this game?

1	2	3	4	5	6	7
Little or No Violent Content						Extremely Violent Content

_____3. How often do characters tease each other or say sarcastic things in this game?

1	2	3	4	5	6	7
Never						Often

_____4. How often are people helping each other or being nice in this game?

1	2	3	4	5	6	7
Never						Often

Sports Video Game Exposure Questionnaire

Video Game Use

Please rate how often you play each of the following video games according to the scale provided.

1	2	3	4	5	6	7
Never			Occasionally			Often

_____1. EA Sports Madden Football

_____2. EA Sports NHL

_____3. EA Sports MVP Baseball

_____4. EA Sports FIFA Soccer

_____5. ESPN Basketball

_____6. Midway NFL Blitz

_____7. Midway NHL Hitz

_____8. Midway MLV SlugFest

_____9. Midway RedCard

_____10. Midway NBA Hoopz

Sports Experience Questionnaire

Sports Viewing

Please rate how often you watch each of the following sports according to the scale provided.

1	2	3	4	5	6	7
Never			Occasionally			Often

_____1. Football

_____2. Hockey

_____3. Baseball/Softball

_____4. Soccer

_____5. Basketball

Sports Experience

Please rate how much experience you have playing the following sports according to the scale provided.

1	2	3	4	5	6	7
Never			A Little			A Lot

_____1. Football

_____2. Hockey

_____3. Baseball/Softball

_____4. Soccer

_____5. Basketball

Buss-Perry Aggression Questionnaire, Physical Aggression Subscale

Please rate each of the following items in terms of how characteristic they are of you. Use the following scale for answering these items.

1	2	3	4	5
Extremely Uncharacteristic Of Me				**Extremely Characteristic Of Me**

_____1. Once in a while I can't control the urge to strike another person.

_____2. Given enough provocation, I may hit another person.

_____3. If somebody hits me, I hit back.

_____4. I get into fights a little more than the average person.

_____5. If I have to resort to violence to protect my rights, I will.

_____6. There are people who pushed me so far that we came to blows.

_____7. I can think of no good reason for ever hitting a person.

_____8. I have threatened people I know.

_____9. I have become so mad that I have broken things.

Video Game Evaluation Questionnaire

Please answer the following questions about the *single player video* game you played earlier in this session.

****

Please rate the video game you played on the following dimensions.

_____ 1. How difficult was the game?

1	2	3	4	5	6	7
Easy						Difficult

_____ 2. How enjoyable was the game?

1	2	3	4	5	6	7
Not Enjoyable						Enjoyable

_____ 3. How frustrating was the game?

1	2	3	4	5	6	7
Not Frustrating						Frustrating

_____ 4. How exciting was the game?

1	2	3	4	5	6	7
Not Exciting						Exciting

_____ 5. How fast was the action of the game?

1	2	3	4	5	6	7
Slow Action						Hectic Action

_____ 6. How violent was the content of the game?

1	2	3	4	5	6	7
No violent Content						Very Violent Content

_____ 7. My abilities on the video game task were:

1	2	3	4	5	6	7
Well Below Average			Average			Well Above Average

_____ 8. How much did your abilities improve from the first five minutes to the last five minutes:

1	2	3	4	5	6	7
No Improvement						Extreme Improvement

_____ 9. To what extent did you feel like you were competing with the other team?

1	2	3	4	5	6	7
Not Competing At All						Strongly Competing

_____ 10. How hard were you trying to win the game?

1	2	3	4	5	6	7
Not Trying At All						Trying Extremely Hard

_____ 11. How competitive was this video game?

1	2	3	4	5	6	7
Not Competitive						Extremely Competitive

_____ 12. How realistic was this game?

1	2	3	4	5	6	7
Not Realistic						Very Realistic

_____ 13. To what extent did this game involve strategy?

1	2	3	4	5	6	7
No Strategy						A Lot of Strategy

_____ 14. How stimulating were the sound effects in this video game?

1	2	3	4	5	6	7
Not Stimulating						Very Stimulating

_____ 15. To what extent did this video game involve competition?

1	2	3	4	5	6	7
No Competition						A Lot of Competition

_____ 16. How distracting were the sound effects in this video game?

1	2	3	4	5	6	7
Not Distracting						Very Distracting

_____ 17. What was the level of quality of the graphics in this video game?

1	2	3	4	5	6	7
Low Quality						High Quality

_____ 18. How much action was in this video game?

1	2	3	4	5	6	7
No Action						A Lot of Action

_____ 19. How much <u>sporting action</u> (e.g., athletic behaviors) was in this video game?

1	2	3	4	5	6	7
No Action						A Lot of Action

_____ 20. How much <u>violent action</u> (e.g., attacking other players) was in this video game?

1	2	3	4	5	6	7
No Action						A Lot of Action

Comparison of Both Video Games

First Game_____

Second Game_____

_____ 21. How does the violence in the two video games compare?

1 = The first game had more violence

2 = Both games had about equal amounts of violence

3 = The second game had more violence

_____ 22. Ignoring the violence aspect, how does the level of competition in the two video games compare?

1 = The first game had more competition

2 = Both games had about equal amounts of competition

3 = The second game had more competition

State Hostility Scale

Current Mood

Please indicate the extent to which you agree or disagree with each of the following mood statements. Use the following 5-point rating scale. Write the number corresponding to your rating on the blank line in front of each statement.

1 = Strongly Disagree
2 = Disagree
3 = Neither Agree or Disagree
4 = Agree
5 = Strongly Agree

_____ I feel furious.
_____ I feel willful.
_____ I feel aggravated.
_____ I feel tender.
_____ I feel stormy.
_____ I feel polite.
_____ I feel discontented.
_____ I feel like banging on a table.
_____ I feel irritated.
_____ I feel frustrated.
_____ I feel kindly.
_____ I feel unsociable.
_____ I feel outraged.
_____ I feel agreeable.
_____ I feel angry.
_____ I feel offended.
_____ I feel disgusted.
_____ I feel tame.
_____ I feel like I'm about to explode.
_____ I feel friendly.
_____ I feel understanding.
_____ I feel amiable.
_____ I feel mad.
_____ I feel mean.
_____ I feel bitter.
_____ I feel burned up.
_____ I feel like yelling at somebody.
_____ I feel cooperative.
_____ I feel like swearing.
_____ I feel cruel.
_____ I feel good-natured.
_____ I feel disagreeable.
_____ I feel enraged.
_____ I feel sympathetic.
_____ I feel vexed.

Attitudes Towards Aggression in Sports Questionnaire

Sports Behavior Attitudes

Please rate your level agreement with the statements given according to the scale provided.

1	2	3	4	5	6	7
Strongly Disagree			**Neutral**			**Strongly Agree**

It is sometime appropriate for a...

_____1. football player to "clothes line" an opponent.

_____2. football player to hit an opponent after a play is over.

_____3. football player to hit an opponent when they are out of bounds.

_____4. football player to "taunt" an opponent after a good play.

_____5. football player to punch an opponent in order not to be tackled.

_____6. hockey player to fight with an opponent during a game.

_____7. hockey player to knock an opponent down when they are away from the puck.

_____8. hockey player to trip an opponent from behind.

_____9. hockey player to use their stick as a weapon.

_____10. hockey player to knock the goalie down in order to score.

_____11. baseball player break their bat after they strike out.

_____12. baseball player yell at the umpire after a questionable call.

_____13. baseball player knock down a defensive player when they meet on a base path.

_____14. baseball player to attempt to knock the ball from a defensive players' glove.

_____15. baseball player to intentionally hit a batter with a pitch.

_____16. soccer player to knock an opponent down.

_____17. soccer player to intentionally trip an opponent.

_____18. soccer player to attack an opponent when they are away from the ball.

_____19. soccer player to attack the goalie in order to score.

1	2	3	4	5	6	7
Strongly Disagree			**Neutral**			**Strongly Agree**

It is sometime appropriate for a…

_____20. soccer player attack an opponent when they are on the ground.

_____21. basketball player "taunt" an opponent after a good shot.

_____22. basketball player knock an opponent down to steal the ball.

_____23. basketball player knock an opponent down in order to prevent a shot.

_____24. basketball player foul a player that does not have the ball.

_____25. basketball player goal tend in order to prevent a basket.

1	2	3	4	5	6	7
Strongly Disagree			**Neutral**			**Strongly Agree**

_____26. I believe that there is too much violence in modern football.

_____27. I believe that there is too much violence in modern hockey.

_____28. I believe that there is too much violence in modern baseball.

_____29. I believe that there is too much violence in modern soccer.

_____30. I believe that there is too much violence in modern basketball.

Competitive Reaction Time Game Evaluation

Please answer the following questions about the *two player video* game you played earlier in this session.

1. Of the reaction trials, how many do you think you won? (Give percentage) _____

2. Who set higher noise (punishment) levels? (circle one) A)You B)Your Opponent

3. What was the OVERALL AVERAGE noise blast intensity setting that you used on your opponent?
(circle one)

0 1 2 3 4 5 6 7 8 9 10

4. What was the OVERALL AVERAGE noise blast duration setting (in seconds) that you used on your opponent?
(circle one)

0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 more than 2.50

5. What was the LOWEST noise blast intensity that you set for your opponent?
(circle one)

0 1 2 3 4 5 6 7 8 9 10

6. What was the HIGHEST noise blast intensity that you set for your opponent?
(circle one)

0 1 2 3 4 5 6 7 8 9 10

7. What was the LOWEST noise blast duration setting (in seconds) that you used on your opponent? (circle one)

0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 more than 2.50

8. What was the HIGHEST noise blast duration setting (in seconds) that you used on your opponent? (circle one)

0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 more than 2.50

9. Were you ever afraid at any time during the reaction time task?

Not at all	A little bit	Somewhat	Quite a bit	A lot
1	2	3	4	5

10. Were you ever angry at any time during the reaction time task?

Not at all	A little bit	Somewhat	Quite a bit	A lot
1	2	3	4	5

Please use the scale below to indicate the extent to which this motive describes your motive when deciding on where to set the noise levels:

Not at all	A little bit	Somewhat	Quite a bit	A lot
1	2	3	4	5

_____ 11. I wanted to impair my opponent's performance in order to win more.

_____ 12. I wanted to control my opponent's level of responses.

_____ 13. I wanted to make my opponent mad.

_____ 14. I wanted to hurt my opponent.

_____ 15. I wanted to pay back my opponent for the noise levels (s)he set.

_____ 16. I wanted to blast him/her harder than (s)he blasted me.

17. Do you think that the computer handled the competition task as it was programmed to? (circle one)

A) YES B) NO

18. Did you detect any kind of pattern in the noise (punishment) levels that you received? (circle one)

A) YES B) NO

19. Did the pattern of noise levels that you received appear to be increasing, decreasing, or random? (circle one)

A) INCREASING B) DECREASING C) RANDOM

20. Do you think that your opponent took this competition task as serious as you did? (circle one)

A) OPPONENT WAS MORE SERIOUS

B) OPPONENT WAS NOT AS SERIOUS

C) WE WERE EQUALLY SERIOUS

21. What do you think the purpose of this experiment was?

_____

_____

_____

_____

_____

_____

_____

_____