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IS IT THE PLAYER OR THE GAME: A METANALYTIC STUDY OF VIDEO GAMES AND AGGRESSION

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ABSTRACT

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The present study is a comprehensive meta-analytic investigation exploring the relationship between exposure to violent video games and aggressive behavior. The present study explores the underlying effects of violent video game exposure and individuals' aggressive behavior. The literature review examines previous research; including contradictory findings on the influence of violent video games on aggression, the significance of social learning theory in behavior comprehension, and the impact of age on aggressive behaviors. Furthermore, it explores the Buss-Perry model of trait aggression and its application to video game studies. The study outlines its methods which encompass literature search strategies, inclusion criteria, variables, moderator coding and analysis, and meta-analytic procedures. The findings and discussion further extend the literature on the relationship between exposure to violent video games and aggressive behavior; exploring the necessity for future investigations to explore age-related effects and intercultural influences and the formulation of a more coherent conceptual framework for aggressive behavior and violence pertaining specifically to video games.

The present study offers a thorough examination of the relationship between exposure to violent video games and aggressive behavior, advocating for continued exploration into research focused on video games and aggressive behavior. Video games have become a staple of society, and the necessity exists to explore the continued effects they may have on individuals.

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LIST OF ABBREVIATIONS

GAM	General Aggression Model
SLT	Social Learning Theory
TCRTT	Taylor Competitive Reaction Time Test
FPS	First Person Shooter
OLS	Ordinary Least Squares

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Chapter One Introduction

Video games have a visible presence in modern culture, with an audience of two-thirds of Americans (Snider, 2021). However, alongside the popularity, concerns exist about the association between violent video games and aggressive behavior (Brockmyer, 2022). The concern about exposure to violent video game play becomes exacerbated by the prevalence of violence in best-selling games such as *Grand Theft Auto V* (Sirani, 2022). In *Grand Theft Auto V*, extreme acts of violence are central to game play (e.g., gun violence, automobile violence, hitting, robberies, act of violence towards public settings) and the player must perform violent actions to accomplish goals in the game.

The literature on the effects of violent video games and aggression yields conflicting conclusions (Nowak et al., 2008; Sherry, 2001). Anderson et al. (2010), a known leader in research associated with violent media exposure and acts of aggression, conducted a meta-analysis that expanded results from an earlier meta-analysis by Sherry (2001) that found longer playing times resulted in lower levels of aggression. Contrary to Sherry's findings, Anderson et al. reported that violent game exposure is positively associated with aggressive behavior. The difference in results around individuals' experiences of aggression and game play interaction caused researchers to continue to search for a definitive answer as video games evolve (Burkhardt & Lenhard, 2021; Kersten & Greitemeyer, 2022). Recent studies from Kersten and Greitemeyer (2022) have begun to view aggressive game play as a potential cathartic experience. As the discussion on video games exposure and aggressive behavior expands, it becomes imperative to dissect the past research to analyze the nuanced relationship between exposure to video game violence and aggressive behaviors.

The present dissertation utilizes a meta-analysis to understand whether exposure to violent video games causes an increase in aggressive behaviors or if individuals with pre-existing violent tendencies gravitate towards such games. Past studies have explored various outcomes, aggressive behavior, cognition, and exposure to violent media (Anderson et al., 2010; Gentile et al., 2014, Greitemeyer, 2014, 2022; Krahe & Moller, 2010). However, a gap remains in understanding the underlying causes of aggressive behaviors. Is it influenced by individuals' exposure to the game or by inherent violent personality tendencies?

To contextualize the analysis, Anderson and Bushman's (2002) definition of human aggression as, "any behavior directed toward another individual that is carried out with the proximate (immediate) intent to cause harm" (p. 28). The present study included verbal and physical displays of aggression as examples of, "aggression" directed toward causing harm. The study examines the conflicting perspectives regarding aggressive acts as a product of social learning theory (Sherry, 2001) or a manifestation of trait aggression theory (Bluemke et al., 2010). Social learning explains that individuals model behavior represented in their lives (Bandura, 1969). Trait aggression theory explains that aggressive tendencies can become stable enough to be considered a personality trait in individuals (Chester & DeWall, 2013). Social learning theory and trait aggression theory were selected based on the popularity of their use in quantitative video game research associated with aggression.

The present study aims to clarify what factors influence aggressive behavior following exposure to violent video games. A meta-analytic review was selected because it allows the researcher to synthesize the data from a collection of independent studies through calculations and an average estimate of the relationship between variables (Hunter & Schmidt, 2004). The

advantage of meta-analysis over a single study analysis is the ability to utilize more advanced

statistical analysis techniques (Hunter & Schmidt, 2004). Understanding what impacts

individuals' aggressive behaviors could provide additional information to improve the studies

on video games relationship to aggression along with possible intervention measures to

prevent negative effects of exposure.

The literature review first explains the inconsistency of past findings producing varied

results. Then the literature review discusses how the present meta-analysis could yield different

results. Next, the justification for social learning theory and why individuals can be influenced

by video games are discussed along with an analysis of how age may play a role. Next,

aggressive behavior is coded and analyzed in the present video game literature and the issues

that exist. Furthermore, examples of what types of aggression are coded as in the studies along

with explaining the impact different genres of games and player age have on various studies are

discussed. The final section of the literature review explains how aggressive behavior and

exposure to violent video games could be correlated to trait aggression, and not individual

exposure to violent video games. Following the literature review, an explanation of the

methodological procedures of the meta-analysis occurs. Finally, the results will be shared with a

discussion, limitation, and future research sections following that.

Chapter Two Literature Review

Past Findings

Video game violence research started when video game home consoles emerged in

1972 with Odyssey (History, 2022). Individuals play games on a variety of consoles from

computers, video game systems, and handheld devices. Video game play becomes possible

virtually anywhere in today's technologically advanced society. Due to the ease of accessibility

to video games, an increased focus on video game research has occurred. A significant amount

of the research has focused on how the increase in video game exposure is affecting

individuals' displays of aggression (Anderson et al., 2010). This has caused research to be

inconsistent as, "Research has remained inconsistent regarding the effect of violent video game

exposure on cognition" (Liu et al., 2017, p.1).

Early work by Sherry's (2001) meta-analysis found a small effect size related to video

game play and aggressive behavior. The type of violence individuals were exposed to was a

predictor of violence in the meta-analysis. The unweighted effect size found from Sherry (2001)

was (r = .16) the weighted mean ranged from r = .13 to r = .16. Sherry (2001) did include a

difference between human violence and fantasy violence. The difference across decades could

not be accounted in their meta-analysis due to the lack of studies in early years of research,

which was noted in the meta-analysis. The present study examined the type of violence and

distinguished between human, fantasy, and inanimate objects to address the previously

mentioned concerns from Sherry (2001). Research into exposure of video games continued

with Ferguson and Rueda (2010) who later found exposure to violent video games showcasing a

strong relationship to aggression. Hasan et al. (2012) provided support through a report on a

link between individuals playing violent video games and individuals' expectations of others to

behave aggressively in the game. Hasan et al.'s study explains that the individuals exposed may

behave in hostile or aggressive behavior. Greitemeyer (2019) conducted a longitudinal study

that found that individuals playing violent video games report more aggression toward

members of the individual's social network. Exposure to video games could shape individuals' personalities to display more aggressive behaviors.

On one side of the argument, exposure to violent video games results in an increase of aggressive behaviors. On the other hand, Ferguson et al. (2008) report two studies finding no causal or correlational link between violent video games and aggressive acts. This finding was supported in research by Velez et al. (2016), where individuals playing violent video games with other people offset the negative effects of playing violent video games. Most popular violent video games permit a multiplayer option requiring a reconsideration of the effects of exposure to violent video games. The lack of consistent support over the years surrounding the effects of video game exposure has led researchers to explore other possibilities.

As time has passed, current research presented by Kerson and Greitemeyer (2022) concludes that playing violent video games can provide a cathartic effect to the players based on belief in that effect. Individuals experiencing a cathartic effect could provide a possible explanation for individuals using the violence within the game to offset their own aggression. Kerson and Greitemeyer (2022) reported that the amount of game violence demonstrates a positive relationship with the player's aggressive feelings. The discovery made by Kerson and Greitemeyer (2022) could mean that people with violent tendencies might be seeking an outlet for aggressive actions. Individuals who already have violent tendencies may seek out violent video games as a medium to express that anger in a supposed safe place.

To summarize, this research has spanned over decades starting with the presence of home consoles such as the Odyssey in 1972 (History, 2022). Game technology continues to evolve, and individuals have increased accessibility to games leading to the widespread

presence of video games. However, the literature displayed above showcases numerous studies that yield mixed results about the relationship between exposure to violent video games and aggressive behavior. Marthur and VanderWeele (2019) attempted to end this debate by combining Anderson et al. (2010), Ferguson (2015), and Prescott et al. (2018) meta-analysis findings and found, "the effects of violent video games on aggressive behavior are nearly always detrimental in direction but are rarely stronger than a standardized effect size of 0.20" (p. 707). With such a small effect size it is important to continue to add to the literature by focusing on key studies with significant findings. This is why several articles in this section were identified that initially sparked the interest in this study. Anderson and Bushman (2001) meta-analysis, Anderson et al. (2010) meta-analysis, Ferguson and Rueda (2010) independent study, and Sherry (2001) meta-analysis identified a significant association between violent video game exposure and aggression. Burkhardt and Lenhard (2021) meta-analysis, Hasan et al. (2012) independent study, and Greitemeyer's (2019) longitudinal study further support the link, indicating that exposure to violent video games may cultivate aggressive tendencies and impact individuals' social interactions.

Conversely, Ferguson et al. (2008) multi-study and Velez et al. (2016) independent study found no direct correlation between violent game exposure and aggressive acts. Kerson and Greitemeyer (2022) contribute to the argument by proposing the notion of a cathartic effect associated with playing violent video games. The divergent research underscores just how complex the relationship between violent video games and aggressive behavior is, further supporting a need for research to flush out the underlying mechanisms and determine moderating factors. Another example would be Greitemeyer and Mugge (2014) meta-analysis

which found that if individuals engaged in nonviolent games, they would experience an

increase in prosocial outcomes.

Now that the potential effects of video games have been discussed, a shift to focus on a

theory of how individuals learn and develop behaviors will be explored, known as social

learning theory (SLT). SLT explains how people learn behaviors, including aggressive tendencies,

through means of observations and imitations of others in social contexts (Bandura, 1969).

Social Learning Theory (SLT)

Social learning theory (SLT) was introduced by Albert Bandura to explain how social

observation (vicarious), and reinforcement (direct) influence human behaviors (Bandura, 1969).

Bandura (1969) explains that observers of an enacted behavior respond with behavior

consistent with previous exposure to the behavior. The key principles of the theory involve (a)

observational learning, (b) modeling, and (c) the importance of reinforcement.

Observational learning can be defined as how, "individuals directly and indirectly

interact and identify with others to learn a behavior" (Gong et al., 2020, p. 684). Observational

learning combines two different types of processes: irrational and rational. Irrational

observational learning is based on actions of peers through social interaction (Celen et al.,

2010). Irrational learning is showcased in video games when individuals are observed engaging

in behavior without use of rational reasoning or typical thought processes. An example is if they

watch everyone jump off the boat, they imitate, similar to groupthink. Groupthink is when

members of the group give up on their own beliefs to adopt the group's beliefs (Janis, 1972). In

the video game world, observational learning can be displayed through people playing a similar

appearing avatar. The avatars act as symbolic models of themselves that the players can model

behavior (Thompson, 2012). Rational observation is when learning is done by seeking advice of others (Gong et al., 2020). The rational system of observation is focused on how players learn the plot, player motivations, and the impacts of the environment (Krcmar & Eden, 2017). Ervin et al. (2018) utilized the rational system of observation in classrooms by rehearsing actions to train children how to respond to appropriate behavior and found a positive increase in positive feedback to peers after the training period.

Reinforcement learning is defined as, "the amount, frequency, and probability of rewards and punishments related to a behavior" (Gong et al., 2020, p. 684). If rewards were positive in the game and reinforced individuals', behaviors could begin to reflect those actions (Lowry et al., 2016). If outcomes (rewards) were negative and receive reinforcement, behavior would diminish or stop (Lowry et al., 2016). A player consistently rewarded for harming individuals in a game should create positive expectations for those actions. In *Grand Theft Auto 5*, a player needs significant in-game money. Players are told the best way to make money in the game is to rob banks and people. A large majority of missions center around requiring the player to kill someone to advance to the next objective of the game. The player then learns that aggressive behaviors are positively rewarded and begin to understand engaging in anti-social actions may lead to rewards.

Social learning theory over the years evolved and has been used to explain why individuals display aggressive behavior in video games (Sherry, 2001). Individuals engaged with video games have an increased focus and active nature, which can increase the effects of the video games (Sherry, 2001). Social learning theory has been used in video game research to

examine how individual's interactivity within the game can impact the level of aggressive behavior (Alman, 1992).

As researchers began to realize the similarities between television and video game consumption, research started to shift to the newer medium (Sherry, 2001). Recent legislation has attempted to link video game violence to the presence of school shootings (Scutti, 2018). Understanding the effect of exposure (participation) in games generates on individuals may prove critical to the future of the nation. If gun violence continues to increase in schools, the possibility of links to video games may need to be explored.

Video games encourage and reward violent acts guiding individual interpretation of the effects in the real world (Sherry, 2001). Continued exposure to video games can lead to increases in physical aggression (Anderson, 2008). SLT posits that adolescent brains are different than adults due to biological changes (Willoughby et al., 2012). The present meta-analysis collects works from both studies of children and studies of adults and attempts to identify how those effects impact individuals' behaviors.

Age

Age is a potential moderator on the relationship between SLT and video game exposure. Developmental differences exist within cognitive abilities, and SLT can provide evidence for the possible relationship between individuals' video game exposure and their perception and internalization of the content in violent video games (Ferguson, 2015). Age is treated as a potential moderator in the current meta-analysis to understand the possible differences that may be due to cognitive development in regard to SLT.

A significant impact of age on the display of aggression is related to how individuals grow and develop emotional regulation. "Emotional regulation processes may be automatic or controlled, conscious or unconscious" (Gross & Thompson, 2007, p. 8). Younger children could exhibit less emotion regulation strategies due to the differences in adults' cognition after exposure to violent video games (Burkhardt & Lenhard, 2021). In contrast, older adults may develop emotional regulation skills, which enable individuals to mitigate the effects of exposure to violent video games more easily (Burkhardt & Lenhard, 2021).

As individuals age, cognitive development occurs and shapes their ability to understand and interpret the content within video games (Olson et al., 2008). Younger children may lack the ability to differentiate between a game and reality, which could lead to greater frequency to imitate behaviors observed in violent video games (Huesmann, 2010). Children develop a level of aggressiveness that remains stable into adulthood; limiting that effect is key to reducing aggressive behaviors (Huesmann, 1988). Adults possess more developed cognitive skills and can critically evaluate the content they encounter in violent video games.

Younger individuals may be more susceptible to social learning processes due to cognitive vulnerabilities, while older individuals may exhibit critical thinking skills in interpreting and responding to violent video game content (Bushman & Huesmann, 2006). Integrating age considerations into the framework of SLT and violent video games addresses Calvert et al.'s (2017) concerns related to their meta-analysis. Calvert et al.'s (2017) meta-analysis lacked enough variance in participant age to identify a link between variation of age groups. Calvert et al. (2017) attempted to answer the question if violent video game use effects stronger at particular ages or developmental stages. The researchers failed to find evidence that examined

the variation of patterns across age groups. They concluded that not enough variance in participant age existed to evaluate a possible link.

Over time, SLT has evolved to explain aggressive behavior in video games, with more research focused on how individuals who were exposed to violent video game play can heighten their effects (Salisch et al., 2011). Video games continue to draw legislative and societal scrutiny (Scutti, 2018). It is imperative to understand the relationship between video game exposure and real-world aggression. The study will employ SLT to examine the impact of violent game exposure and the impacts of age on the displays of aggressive behaviors. The meta-analysis will collect samples of various ages to address the nuanced effects of exposure to violent video games and the resulting actions related to the exposure. The findings could help identify and promote healthy gaming habits by highlighting the negative effects that children should attempt to avoid.

Throughout the research, there were possible linkages between aggressive/violent behavior and violent video game exposure. To explore the topic in more detail, the present study will examine how aggressive behavior is measured in the current video game research.

This section explores how aggressive behavior is reflected in the present video game literature, discuss emerging issues that have been brought to light, and provides examples of the types of aggression that were being coded in the studies. The section also addresses age and how game genres impact research outcomes.

Defining Aggressive Behaviors

This meta-analysis focuses on the utilization of Anderson and Bushman's (2002) definition of human aggression as, "any behavior directed toward another individual that is

carried out with the proximate (immediate) intent to cause harm" (p. 28). Anderson and Bushman's definition may not reflect the gamer's definition of aggression. The displays of aggressive behaviors in video games falling outside the definition becomes referred to by gamers as rage or tilt (Moreau et al., 2023). Moreau et al. (2023) explain that rage is, "defined by players as the expression of violent and impulsive reactions through excessive frustration or bad faith while gaming" (p. 2). Moreau et al. (2023) conducted qualitative interviews to understand how individuals traditionally display aggressive behaviors after exposure to violent video games. Moreau et al. (2023) reported identifying five tactics: "quitting the game either to calm down, or to express emotions by crying, shouting, and breaking the material, or finally by doing nothing and accepting the rage episode" (p. 2). Moreau et al. (2023) encompasses the standard ways individuals express aggressive behaviors outside of video games. Moreau et al. (2023) list was a combination of results from interviews with individuals who experienced rage in video games.

An important issue in this body of research is that variables were not operationalized in the same ways across studies. Ferguson et al. (2008) and Velez et al. (2016) utilize the Taylor Competitive Reaction Time Test (TCRTT) to measure aggressive behavior. Individuals in the Velez et al. (2016) study were asked to set a noise blast that acts as a punishment the level of the blast ranged from 10 decibels to 130 decibels. If they lose, they would be subjected to the noise blast set by the competitor. The blast would increase in 20 decibel increments. To put the level of decibels into context, a concert averages around 105 decibels (Tereping, 2016).

Greitemeyer (2014) utilized the administration of hot chili sauce to determine aggressive behavior. The participants in the study played a violent video game and then were

asked to administer hot chili sauce to people. The participants were provided details about the people and had to choose between six bottles ranging from 5ml to 100ml of hot sauce to have someone consume.

Arriaga et al. (2011) used a unique method to monitor emotional responses specifically focused on verbal and physiological. Arriaga et al. (2011) used a skin conductive and tonic mixture, and measured conductivity levels during the experimental session. Arriaga et al. (2011) analysis was able to show individuals' emotional responses towards different photographs of real-life scenarios after video game play to measure physical responses.

Some of the studies utilized multiple tools described above in conjunction with one another. An example is Engelhardt et al. (2011) study which utilized electroencephalogram (EEG) recording with an application of scalp electrodes in conjunction with noise blasts and photo analysis to analyze individuals' aggressive behavior. Ballard and Wiest (1996) used analysis of systolic and diastolic blood pressure, heart rate, and self-reported surveys during their experimental condition to define individuals' level of aggression. The combination of multiple analyses drastically alters the operational definitions from study to study. The section describes various methods used in a variety of different studies to operationalize and measure aggressive behavior.

Genre

Genre plays a significant role in defining the impact exposure can have on players. In this study only genres that typically have levels of violence were recorded; shooter, fighting, role-playing games (RPG), and sport games. The genres reported were not all-encompassing; there were twenty-five game genres for video games (Simpson, 2024). Some game genres were

removed due to the lack of violent content within. The genres above were chosen based on the reporting in the studies included in the meta-analysis. Shooter-based games make the object of the game to have players shoot objects (Simpson, 2024). Fighting games have an individual pitted against another and the player must either fight them until death or knockout occurs (Simpson, 2024). Role-playing games is when a character gains abilities by engaging with in-game requests and usually contain fantasy-based objects to battle (Simpson, 2024). Sports games included hockey, football, soccer, boxing, tennis, bowling, golf, basketball, and any other sports (Simpson, 2024).

A popular platform for individuals to play games is *Steam*, SteamDB (2024) lists the top five most competitive games as *PUBG*, *Counter-Strike 2*, *Dota 2*, *Counter-Strike*, and *Destiny 2*. The selected games include violence and four of the five were considered first-person shooter (FPS). First-person shooter is when a player has a first-person view as they shoot objects. Shafer (2012) discusses that individuals who play highly competitive games spark a greater increase in individual hostility. When the game is an FPS, it increases individuals' hostility effect even greater (Shafer, 2012). Video games with violent content were not always shooter-based, but the majority of players report playing FPS games (Statista, 2023). The genre of the game contributes to understanding the level of violence present in the game, meaning FPS has the highest level of violence. The present meta-analysis tests the following hypothesis:

H1: Video game exposure creates violent people, resulting in aggressive behavior (See Appendix A).

Trait Aggression

Chester and DeWall (2013) have broadly defined trait aggression as aggressive tendencies stable enough to be considered a personality trait. In the present study trait aggression was used to understand individuals' tendencies towards violence as a personality tendency. Buss and Perry (1992) separate trait aggression into four different factors: (a) anger, (b) hostility, (c) physical, and (d) verbal aggression. The present section of the paper explains the difference that exists between aggression and violence, how the Buss-Perry model functions, and what video game research finds related to the disposition.

Aggression vs. Violence

The difference between aggression and violence is difficult to understand at times, but the present study operates under the assumption that, "including lethal violence, is aggression, but not all aggression is violence" (American Psychological Association, 2020, p.2). There has been a debate in the literature about the definition of aggression and violence Allen & Anderson (2017) study brings cohesive definitions to the literature. Aggression is an, "observable behavior not a thought or feeling" (Allen & Anderson, 2017, p. 2) For someone to display aggression, the aggressive act needs to be something intentional with a goal to harm another (Allen & Anderson, 2017). Violence provides an extreme form of aggression with the primary focus on causing some form of significant harm to someone (Allen & Anderson, 2017).

In the present research, examples of harm have been to noise blast to someone or administering hot sauce. A noise blast causes discomfort to individuals in the form of possible earaches while hot sauce can cause disruptions to individuals' bodily functions. Institutional Review Boards limit extreme harm to individuals but the act of causing moderate harm in an

experimental situation is cause for concern about an individual's actions in the real world with no limitations.

Buss-Perry Model

The Buss and Perry (1992) questionnaire provides one of the most recognized ways of measuring aggressive behavior (Chester & West, 2020). Buss and Perry (1992) identified four sub traits of aggression. The first is anger which involves an individual experiencing physiological arousal and preparation for aggression (Buss & Perry, 1992). The second is hostility or the notion of ill will representing the cognitive component of behavior (Buss & Perry, 1992). The third element involves physical aggression, the act of causing harm towards someone physically (Buss & Perry, 1992). The final component involves verbal aggression where someone causes injury with the use of words (Buss & Perry, 1992). Buss and Perry (1992) aggression questionnaire has been cited 10,650 times according to the National Institute of Health (2024), providing evidence of widespread use of its terms and definitions.

Measuring Trait Aggression in Video Game Research

The increased prevalence of youth violence in America has prompted extensive research into the potential role of video game consumption, particularly games with violent content (Anderson et al., 2008; American Psychological Association, 2020). The section aims to explore the relationship between video games, trait aggression, and gender.

Trait aggression represents the tendency for aggressive behaviors and hostile cognitions toward other people (Buss & Perry, 1992). Chester (2013) found support for the conclusion that individual aggressive behaviors are pre-ingrained within genetic makeup which makes, "trait aggression a heritable condition" (p. 4). State aggression is defined as, "a transitory, conscious

feeling of aggression, often expressed in overtly aggressive acts against a human target"

(Oxford Reference, 2007, para. 1). The present study focuses on trait aggression acting as a

personality trait (Santos et al., 2022). Studies have shown that individuals with hostile

tendencies were prone to experiencing anger and engaging in aggressive behavior in response

to emotions (Tiedens, 2001).

A key feature of video games compared to traditional media is how individuals actively

consume them compared to passive consumption (Polman et al. 2008). In active media

consumption, an individual must select which game to play and actively play it themselves,

which requires them to make a conscious decision about what they choose to engage with.

Individuals who display violent characteristics actively seek out content that coincides with that

belief, as evidenced by the downward spiral model and uses and gratifications theory (Slater et

al., 2003). The downward spiral model explains that as violent media use occurs it is mutually

reinforcing an increase in violent media use and increased aggressiveness (Slater et al., 2023).

Uses and gratifications theory explains that users can choose to seek out media based upon

their own decisions (Lin, 1999). The continued exposure to violent video games could affect

users with pre-existing predisposition to violence. The tendencies that were commonly

associated with aggression were neuroticism and hostility (Bartholow et al., 2006; Markey &

Markey, 2010).

Research has examined how individuals' level of trait aggression impacts the display of

aggression during video game play (Triberti et al., 2015). Studies suggest that the ability to

understand the emotions of others play a crucial role in determining whether individuals

choose to act violently in video games (Denson et al., 2020; Triberti et al., 2015). Exposure to

violent video games may affect individuals with higher levels of trait aggression tendencies by altering individuals' perceptions of facial expressions and toughness (Denson et al., 2020). Studies explain that individuals with higher trait aggressiveness were more hostile after exposure to violent video games compared to nonviolent video games (Arriaga et al., 2006). Anderson and Dill (2000) add support to the argument with findings that individuals playing violent video games increase in delinquency and aggressive behaviors.

Gender

Gender plays a significant role in individual tendencies to express aggressive behaviors, as men generationally display more violent tendencies than women (Buss & Perry, 1992). Males operate at a higher risk than females for perpetrating physical violence (FBI, 2022). Men also interact with more violent video games than females (Statista, 2023). Bonnaire and Conan (2022) found a link between male individuals that were sensation-seekers and a preference for violent video games. The current meta-analysis examines gender because gender differences were not commonly covered in video game meta-analyses (Calvert et al., 2017). Calvert et al. (2017) team has identified gender as a moderator risk variable that needs further analysis. This study attempts to fill the gap present in the literature.

To understand the implications of aggression and video game play, the following hypothesis was posed to understand if individuals' personality tendencies were leading them to continue to seek out violent video games resulting in more aggressive behavior.

H2: People with violent tendencies seek out violent video games, resulting in aggressive behavior (See Appendix A).

Chapter Three Methods

Literature Search

The search occurred between August 2022 and October 2023. The electronic databases that were searched included PyscInfo, PubMed, and Google Scholar. The following keywords were used: violent video games, anti-social video games, prosocial video games, video game hostility, aggressive computer games, video game behavior, aggressive game behavior, personality traits in video games, prosocial behavior in video games, video game cognition, video game empathy, video game anger, video game arousal, video game violent exposure, dispositional traits in video games, and trait aggression in video games. Meta-analysis was also included and the articles the studies utilized were searched (Anderson et al., 2010; Burkhardt, & Lenhard, 2021; Ferguson, 2015; Greitemeyer, & Mugge, 2014; Sherry, 2001). The initial searches returned a vast number of articles. After screening for articles that appeared to be relevant based on titles, the article collection resulted in 482 articles. Those 482 articles were then judged against the inclusion criteria after removing articles that were not applicable. Data collected from 114 studies were selected for analysis. The inclusion criteria will be described below, but a large number of articles that were removed were due to not being written in English, having a qualitative approach, and the focus on prosocial results the present study was focused on the negative effects of video game play. The present study included 114 studies, some of which were meta-analysis, which included a variety of studies as well. The overall sample size of the participants is N = 432,583. The studies included were quantitative.

Inclusion Criteria for Empirical Research The manuscripts that were identified were obtained through available research databases. The references of previous meta-analyses were searched to identify additional articles for analysis. To be considered an appropriate measurement it had to be able to be converted to a correlation statistic for analysis to occur. The inclusion criteria was defined based on Greitemeyer and Mugge's (2014) past meta-analysis research. Primary criteria was also in place; those were that the data had to be accessible to the researcher through free methods, had to be written in English, and had to focus on the negative effects of video game play. There were three primary variables examined in this study therefore, two of the three must be present to be considered for the present analysis. The fourth inclusion criteria of quantitative data was included for data analysis. Qualitative data is not able to be converted to a correlation coefficient typically. To be included in the analysis, the manuscript had to meet various combinations equaling three of the four following conditions:

(a)   Participant exposure to violent video game play

(b)   Analysis of aggression/violence

(c)   A measure of personality tendencies

(d)   Use of quantitative data that can permit the estimation of an effect size.

Outcomes/Variables

Model one (see Appendix A) relies on past work from Bandura's (1962) social learning theory and specifies that individuals' repeated exposure to violence leads to increases in individuals' violent tendencies which can result in aggressive behavior. Bandura's work is utilized in the literature over the years with use by Anderson et al. (2003), Gong et al. (2018), Huesmann (2010), and Nowak et al.(2008). Model two (see Appendix A) predicts that

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individuals with violent tendencies will seek out violent video game exposure, resulting in those users producing more aggressive behaviors (Buss & Perry, 1993, Chester, 2013, and Konjin et al., 2007). The prediction is based on past research studies related to trait aggression theory. Three main components were analyzed for the study: (a) Violent video game exposure, (b) individuals with violent tendencies, and (c) aggressive behavior.

Violent video game exposure in studies analyzing violent video game exposure is typically measured by the amount of time spent playing violent games (Anderson et al., 2010). In the current research, exposure is commonly assessed through self-reported measures, with participants indicating engagement with either violent or nonviolent game content (Ferguson et al., 2008). Exposure can also be manipulated within an experimental design (Velez et al., 2016). For analysis, only studies with the active violent game play were considered, excluding those where participants passively observed video game play. Active game play would be a user playing the video game on a handheld or console-based device. Passive game play would be if a user was watching someone play a video game through a video platform; a common form of this is Twitch (Zsila et al., 2023). Twitch is a video streaming service for individuals playing a game to stream (Zsila et al., 2023). If a study did not specify the game's title, the game was categorized generally as involving violent video game play. Categorization accounts for individuals' self-reported levels of violent video game exposure present in previous studies categorization was conducted in the present study through coding of video game genres' different levels of violence.

Individuals with violent tendencies were measured by using the four-factor Buss-Perry (1992) trait aggression model: Anger (physical arousal), hostility (hostile affect/hostile

thoughts/scripts), physical, and verbal aggression. Anger is measured as physically harming

others by hitting someone in the game or in the game world (Buss & Perry, 1992). Hostility was

measured in the present study as hostile affect, hostile thoughts, and scripts. Hostile affect is

defined as, "makes demeaning comments about others in their absence" (Matlock & Aman,

2011, p. 133). For example, Ferguson and Rueda (2010) utilized the Adult Scale of Hostility and

Aggression Reactive-Proactive (A-SHARP), which includes 58 items split into five subscales

verbal aggression, physical aggression, hostile affect, covert aggression, and bullying (Matlock &

Aman, 2011). Hostile thoughts were used by Greitemeyer (2014) utilizing the State Hostility

Scale created by Anderson and Dill (2000). The SHS utilizes the definition for hostile thoughts

from Berkowitz and LePage (1967) that the presence of a firearm can elicit an intense

aggressive reaction. Cognitive scripts are defined as guides for behavior that can be stored in an

individual's memory (Huesmann, 1988). Scripts have been applied by Ferguson and Rueda

(2010) to explain how individuals respond to violent acts in video games through the SHS. The

following were examples of variables that were coded as people violent with violent

tendencies: desensitization to violence (Bartholow et al., 2006), impulsiveness (Bluemke et al.,

2010), bullying (Ferguson & Olson, 2014), dehumanization (Anderson et al., 2010), feeling mean

or violent (Saleem et al., 2012), willingness to engage in violent crimes (Ferguson et al., 2008),

delinquency (Ferguson & Olson, 2014), and lack of morality (Gabbiadini et al., 2013).

Aggressive Behavior was measured by using the following variables based on the

analysis of the studies in the paper: Aggressive behavior, aggressive cognition, and aggressive

feelings. Aggressive behavior becomes operationalized in experimental situations through

enacting violence on others via noise (Arriaga et al., 2011; Hasan et al., 2012), chili sauce

(Greitemeyer, 2014), and shock (Berkowitz & LePage, 1967), along with self-reported measures

through surveys (Konijn et al., 2007). Aggressive cognition is measured by understanding facial

reactions, story simulations, and self-reported measures through survey questions (Diaz et al.,

2016; Hartman, & Vorderer, 2010). Aggressive feelings were measured through story

simulations (individuals would be given pre and post-analysis of simulations after exposure to

violent video game play) and self-reported measures through surveys identifying: provocation,

frustration, pain/discomfort, incentives, mood/emotion, and arousal (Engelhardt et al. 2011;

Diaz et al., 2016). The following were examples of variables that were coded as aggressive

behavior: Cathartic release through engaging in aggressive acts in video games (Ferguson &

Olson, 2013), number of headshots (individuals shoot individuals' heads with a gun in a game

versus body shots) (Bushman, 2018), irritability (Baldaro et al., 2004), aggravation, noise blast

(Arriaga et al., 2011; Hasan et al., 2012), chili sauce (Greitemeyer, 2014), and peer-reported

aggression (Salisch et al., 2011.

Moderator Coding and Analysis

Genre of game and level of violence associated

Genre coding in the study was largely dependent on self-reported measures of exposure

to violent video games. Individual studies that did not specify a genre were coded as general

violent game play only studies that reported violent video game play were examined. The

frequencies of the genres are reported as follows: Sports 5 of 114 studies (4.4%), General

Violent Games 64 of 114 studies (56.1%), 6 of 114 studies Role Playing Games (5.3%), Fighting 4

of 114 studies (3.5%), and Shooter 35 of 114 studies (30.7%). Sports games were games that

had individuals play hockey, football, boxing, soccer, and basketball all physical-based sports.

Role-playing games (RPG) were games that had individuals play as a character and level that character up through quests which may include battling creatures or humans. Fighting games were games where an individual fights another person or a non-playable computer player until death or knockout is achieved. Shooter games contained both first-person shooter and third-person shooter games. It is understood that all video games are not mutually exclusive to only one of these categories. They may represent the major differences amongst games and the functions individuals perform within them. The genre then was categorically ordered by level of violence. Ranking it from 5 most violent (Shooter), 4 violent/gore (Fighting), 3 mild/fantasy violence (Role Playing Games), 2 unspecified violence (General Violent Game), and 1 least violent (Sports). The ranking was defined based on the video game community notions of violence. Wilson (2013) defines the most violent video games of all time; the top three games were defined as shooter-based games. Following that was *Mortal Kombat* which is classified as a fighting game. In eleventh place is *God of War*, a role-playing game (Wilson, 2013). Unspecified violence was ranked lower than the first three genres because it could contain any of the above. Sports was ranked as least violent because it is not generally recognized in the video game industry as being explicitly violent, but academic research does classify it as violent (Anderson & Carnagey, 2009).

Gender

Gender was reported in terms of number of each sex (male or female) or percentage of sample size in the studies collected. It was then coded into a variable to be able to be used in statistical analysis. Gender was transformed from raw values into a proportion value in order to account for both males and females in a study, where the number of males was divided by the

number of females. Values from 0.0 to 0.99 indicated a greater proportion of females in the

study, values at 1.0 indicated an exactly equal number of males to females, and values above

1.0 indicated a greater proportion of males in the study. Studies that had only males (an

undefinable proportion as it would be divided by 0) received an automatic coding of 1, which

was manually examined after the creation of the proportion variable. The proportion value was

then further transformed into a dichotomous variable where the majority gender for a study

was presented in a binary fashion. Studies that had a greater proportion of females were coded

as a "0," and studies with a greater proportion of males were coded at a "1." The final

dichotomized variable of gender was used in the final analysis as one of the moderating

variables predicted to influence the causal models. The process of analyzing gender was done

within the limits of the researcher and supported by other meta-analytic approaches to

measuring gender (Mackey et al., 2019).

Age

Age was coded in the studies by collecting the reported average. If there was no

reported average age and just a range of age, age was not assumed and was not included in the

analysis. 79 of the 114 studies included in this meta-analysis reported age. The range of ages

ranged from 5.5 to 79 years old. Then, a correlation analysis was ran to determine the

relationship with the main variables in the causal model. If correlations occurred, it could

identify a relationship between age and aggressive behavior or exposure.

Meta-Analytic Procedures

To begin the meta-analysis, a dive into past meta-analyses was conducted (Anderson et

al., 2010; Burkhardt, & Lenhard, 2021; Ferguson, 2015; Greitemeyer, & Mugge, 2014; Sherry,

2001). After identification of gaps in current research, a research topic was narrowed, and a literature search occurred as described above and studies were collected that met the identified criteria. The data was then inputed into the statistical package IBM SPSS V.29 for analysis. The data was converted from all studies to correlation coefficients associated with exposure, violent tendencies, and aggressive behaviors in order to record individual *r* values for each component of the model. The data was then synthesized and condensed to create a variable for the overall measure of effect, which was the mean *r* value. The mean *r* value combined all studies present in the meta-analysis via their statistical findings. The hypothesized models were tested against the theoretical models through an ordinary least squares (OLS) technique to compare models (See Appendix A).

Data on the moderator variables was also collected and transformed to numerical indicators. Gender was assigned dummy codes, where 0 indicated a female-dominated study and 1 indicated a male-dominated study. Genre was assigned as a type of ordinal variable ranked by perceived level of violence, with studies utilizing the most violent videogames (shooter games) being coded as five, and those with indiscriminate violence (sports games) being coded as 1. Finally, age was recorded as a mean age variable as reported by the studies. Various statistical procedures were utilized to analyze the various moderating variables in order to account for their numeric value style; these analyses include t-tests, ANOVAs, and correlations. For consideration as true moderator variable, the variable will need to affect both the strength of the relation between the predictor variable and criterion variable (Baron & Kenny, 1986).

Model 1 represents the model in which factors predict that violent video game exposure, or use, creates more people who express more violent tendencies (See Appendix A). Model 2 represents the model in which factors predict individuals with violent tendencies seek out violent video games (See Appendix A). The model test compares the predicted correlations with the observed correlations as a result of a meta-analysis using chi-square procedures (Song et al., 2014). If the outcomes of our observed model via the chi-square analysis were not statistically significant, it would suggest that the model aligns with the hypothesized model produced from the meta-analysis (Allen et al., 2006), indicating support for our hypothesis, in that there are relationships amongst the variables under interest. Regardless of the model analysis, the moderator analysis did proceed in order to further explore the theoretical implications.

Figure 1: Hypothetical & Observed Model Social Learning Theory

Hypothetical Model Social Learning Theory

| Violent Video Game Exposure | + → | Individuals Violent Tendencies | + → | Aggressive Behavior |

Observed Model Social Learning Theory

| Violent Video Game Exposure | .19 → | Individuals Violent Tendencies | .27 → | Aggressive Behavior |
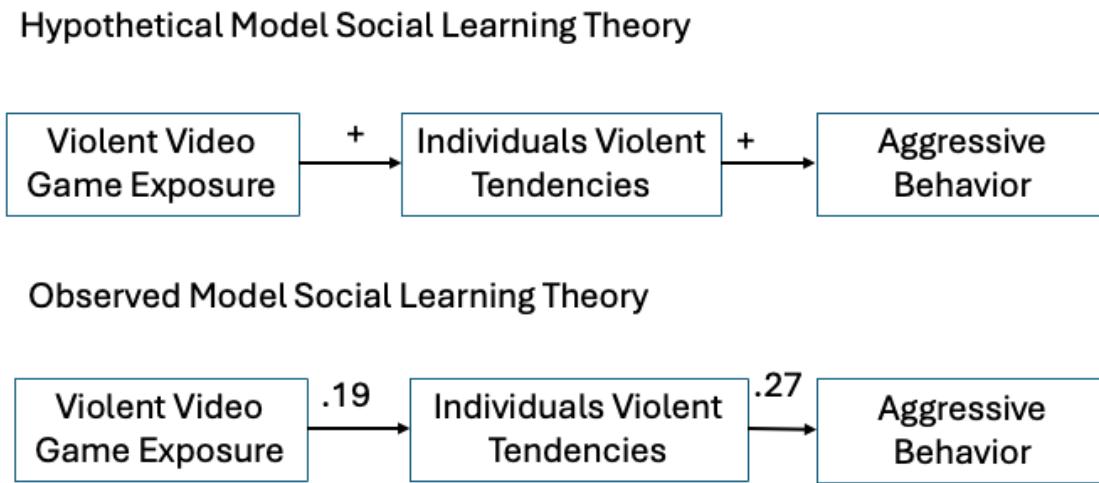
Model 1 Social Learning Theory

The main analysis model effects tested two different causal models using a chi-square goodness of fit test. The first causal model tested violent video game exposure and violent traits by aggressive behaviors, and violent traits against the hypothetical model, which was statistically significant χ^2 (df = 1, N = 111,037) = 9.36, $p < .01$. The significant finding indicates the observed model departs from theoretical model, meaning that the data does not support the hypothesized model.

Figure 2: Hypothetical & Observed Model Trait

Hypothetical Model Trait Theory

| Individuals with Violent Tendencies | + → | Seek out Violent Video Game Exposure | + → | Aggressive Behavior |

Observed Model Trait Theory

| Individuals with Violent Tendencies | .19 → | Seek out Violent Video Game Exposure | .22 → | Aggressive Behavior |
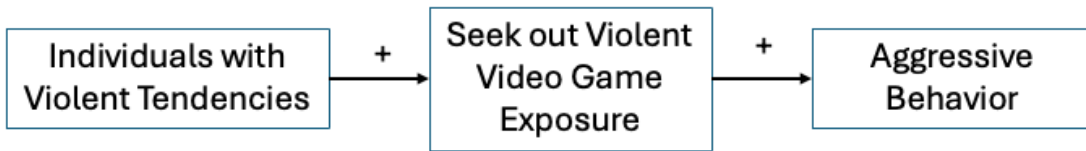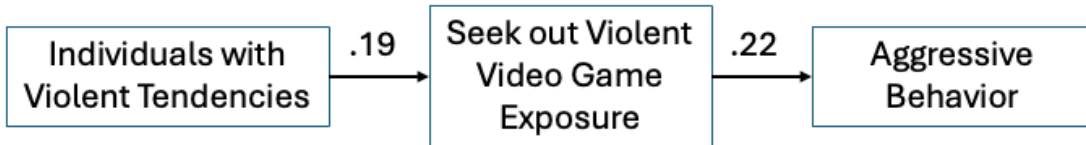
Model 2 Trait Theory

The second causal model tests the relationship between aggressive behavior and violent traits by aggressive behaviors and violent video game exposure against the hypothetical model, which was statistically significant χ^2 (df = 1, N = 426,862) = 18.00, p < .001. The significant finding indicates the observed model departs from theoretical model, meaning that the data does not support the hypothesized model.

Moderator Analyses

Despite the significant findings in model analyses, moderator analyses proceeded. Video game genre was examined using a one-way between subjects ANOVA testing against the overall index of effect. The model was found to not be statistically significant, F(4, 109) = 0.24, p = .913, indicating that genre was not an influencer of the observed model index measure. Age was then analyzed as a moderating variable using correlational analysis, which was significant, r = -.359, p < .05, where the analysis identified that the younger the individuals are, the more violent video game exposure affects the presence of violent tendencies. Finally, we analyzed gender using an independent samples t-test, which was not statistically significant t = 1.79, p =

.08, indicating that gender was not a significant influencer of the hypothesized models (See Appendix B for articles and effect sizes).

Summary

The present meta-analysis tests whether an individual's trait tendencies or individual exposure to violence affects an individual's tendency to engage in aggressive acts. The results of the two hypothesized models were inconsistent with the observed data, meaning that the models cannot be accepted as an adequate explanation for the proposed phenomenon under study. Overall, the meta-analysis finds that the models were likely far more complex than suggested in the present research. Aggression is an advanced construct that has many different expressions and that it cannot all possibly be measured by one meta-analysis alone. The studies included in the meta-analysis observe video game exposure, violent tendencies, and aggression very differently. The models were not able to pinpoint the specific variable that affected individuals engaging in aggressive behavior. The models were not able to identify a detectable relationship, suggesting that there were other linkages to be discovered. The present study paves the way for future research to examine other variables and possible influences that were not included in the present study (See Appendix B for articles and effect sizes).

Table 1: Correlation Matrix

	Aggression Behavior	Violent Traits	Exposure
Aggression Behavior	1.00	.27	.22
Violent Traits	.27	1.00	.19
Exposure	.22	.19	1.00

Chapter Four Discussion

Violent video games dominate the video game industry (Sirani, 2022). The inclusion of violence in video games rather than fading continues to increase in presence and popularity. The current study examined PyscInfo, PubMed, and Google Scholar databases and the quantitative data published within the papers about violent video game exposure and aggressive behaviors. The study explored the relationships between exposure to violent video games, individuals' violent tendencies, and aggressive behaviors generating data to compare two causal models. The results show a link between violent video game exposure and aggressive behavior, but fails to identify the specific model predicting the outcome. Model 1 (See Above Observed Model) focused on individuals with violent tendencies seeking out exposure to violent video games failed to receive support. Model 2 (See Above Observed Model) focused on how exposure to violent video games creates individuals employing aggressive behaviors failed to receive support. Essentially, the meta-analysis confirms the relationship of exposure to video games to aggression but fails to provide an adequate explanation for the relationship.

These results extend the knowledge of violent video game exposure and aggressive behavior. The results reaffirm a connection between the variables, but the causal chain remains unclear. These connections not being clear opens several avenues of future research. Possible aspects would focus on sociological demographical data and ranking the level of violence individuals choose when collecting information about exposure to games. This study ranked the level of violence within genres of games, but observed studies did not report exposure in terms of level of violence.

Not all articles report the same demographical data limiting the access of potential links. Many studies included age, gender, and geographical location. Geographical data was coded for, but 24% of the studies did not report the sample's geographic statistics, therefore analysis was not ran due to geography not being a focus of analysis for the present study. Missing data existed for sociological demographics: education levels, occupation, income, and relational information. Relational information could be the culmination of relational status, amount of time, satisfaction within the relationship, and level of engagement with friends, parents, and peers. Relational information could be helpful with identifying possible causes of aggression in youth. Imtiaz, et al. (2010) found that "unsatisfactory relationships with peer group have been found a more significant factor in causing aggression among youth" (p. 107).

Sociological demographical information could help showcase the possible relationship that exists in the research between video games and aggression. After a review of the present video game literature, studies report minimal demographical data. Imtiaz et al. (2010) found support that individuals' aggressive behavior, "stem from the unfavorable family environment, unhealthy peer group, unsatisfactory attitude regarding educational institution, and rigid behavior regarding religious sect. Currently, studies were not collecting the above data in video game literature. It may not be the exposure to the video game that is causing increases in aggression; it could be tied to the sociological demographical data. The present study did not have an emphasis on sociological data due to the scope and limits of the researcher. Video game research lacks extensive testing of the social demographics connected to violent video game exposure.

The models not showcasing a link adds to the continued confusion present in the literature. The impact of violent video game exposure happens at varying ages and the psychological impacts of that were not monitored very clearly. Research rarely focuses on children out of the present meta-analysis; only 12.7% of the studies included children under the average age of 12. The present analysis can justify future studies to analyze the ongoing issues present with children's exposure to violent video game and the effects it can have on later in life outcomes. One potential way to measure the relationship would be a longitudinal design with annual tracking of aggression and media exposure levels. Another alternative would be to use multiple age groups and report data by age permitting an examination of change related to age.

Social learning theory (Bandura, 1962) designed to explore the effects of modeling behavior from media still exists as a dominant model. The presence of social learning theory in present research today speaks volumes to the core strength of SLT and its ability to understand individuals' actions based on exposure to media. Video games presented a novel way to consume media and that was to actively consume the media instead of the past passive way of consumption. The research included only articles that had individuals play a game; individuals who watched individuals play were not included in the analysis. The exclusion of passive consumers was to explore the effects of active media exposure (Fischer et al., 2011). Fischer et al. (2011) found that media exposure affects individuals' behavior. The increase in engagement in video games should cause some modicum of fear about the future of violent video games and how the level of violence will continue to increase (Weber et al., 2006). Weber et al. (2006) have evidence that the virtual violence individuals were exposed to in video games results in,

"neural patterns that are considered characteristic for aggressive cognition and behavior" (p. 51).

Behavioral trait theory focuses on individuals' personality tendencies and the impact individual personality on given situations. Individuals handle violent exposure differently based on gender, age, social background, and other socioeconomic factors (Bean & Groth-Marnat, 2016; Bluemke et al., 2010). Though the study cannot specify exactly why the correlation exists, a link still does exist and should cause concern. Specific tendencies suggest a possible link between neuroticism, irritability, and aggressive self-reported measures to the identified traits to violent tendencies (Bartholow et al., 2006; Markey & Markey, 2010). The trend in young adults creates an imperative to understand other factors to help mitigate the increase in aggressive behaviors.

The current meta-analysis did not support our hypothesized model predictions in terms of how exposure to violent video game play could affect individuals with violent tendencies and the display of aggressive behaviors. This could be due to an underlying complex structure of various influences that lead to the development of aggression in individuals, which may be either undetectable, or unmeasurable given the current meta-analytic methods utilized here. Future analyses of the topic may find more success with originally sourced data where more methodological and statistical control is possible. One certain thing is that in a world with technology usage rising, video games do not seem to be going away any time soon; making this topic more pertinent than ever to study.

Limitations

The potential limitations encountered in the present meta-analysis embody a range of factors. The possible limitations include variations in methodological approaches (experimental, self-reported, and observational) across the studies in the analysis, potentially affecting the consistency of findings. Concerns about the generalizability of the results may arise due to the diverse samples from a variety of geographic locations and ages, encompassed within the literature.

The inclusion of studies with diverse methodologies provides unique strengths and limitations. Experimental designs can offer variables and allow for causal inference, but they lack validity (Rutkowski & Delandshere, 2016). Observational studies provide insights into real-world behavior but were susceptible to confounding variables and biases when estimating causal effects (Zawadzki et al., 2023). Self-reported measures were common tools utilized in quantitative research, and were included to take advantage of the respondents being on the same continuum. It also assesses the direct items desired via self-reported measures that cannot be observed outwardly by researchers without direct personal reported internal dialogue (De Ayala, 2009). Agreement between two different methodological approaches permits taking the results of different studies and combining them into a convincing theoretical argument (Herrett-Skjellum & Allen, 1996).

The variability observed in measurement tools utilized across studies poses possible issues when it comes to synthesizing the findings cohesively. The present study analyzed a variety of study designs such as self-reported measures, experimental design, meta-analyses, analytical approaches, samples, and measurement tools such as questionaries, direct

observation, participant observation, mechanical observation, psychological tests, and measures. The inclusion of various methodological tools to convert various measures to an r value for analysis complicated the data analysis portion because of the need to convert a variety of different variables that were not already in a correlation matrix to a correlation value for analysis. Therefore, by acknowledging the possible issues, the benefits of including every possible methodology that could be converted to an r value except interviews reflect a commitment to comprehensiveness. Through replication, researchers strive to provide a more comprehensive perspective on violent video games, aggression, and violent tendencies; identifying a relationship model and not a descriptive study that aims to describe something we aimed to test a relationship.

Generalizability was an issue that is commonly found in quantitative research due to the mass quantity of self-reported measures. In the present study, the samples had a variety of different ages and geographical backgrounds. Individuals from different parts of the world interact with games on varying levels and that could impact the results. In the United States, individuals average 7.71 hours a week compared to China where the average is 12.39 hours a week. The increase in exposure could have impacts that were not clearly defined (Clement, 2023). A possible reason why individuals in China may not experience the same effect from violent video game exposure could be due to the impact of collectivism which focuses on group morality. In China's culture, compared to individualism which focuses on individual morality present in the United States (Teng et al., 2022). The present study only included three studies from China, limiting the capabilities of analysis about the cultural impacts. The present study

failed to account for the cultural factors due to access to information based on language barriers.

Measurement variability was present across the studies and with how studies would code for aggressive behaviors. Experimental studies used codes ranging from sending messages, the application of chili sauce, blasting a loud noise, or verbal aggression. The use of chili sauce administration was uncommon in natural video game play and may not be as applicable as other methods of data collection (Greitemeyer, 2014). The other method of blasting a loud noise could happen with someone banging on a microphone compared to the experimental method of pushing a button that sends a noise blast (Tereping, 2016). The verbal or written aggression acts (swearing, yelling, e.g.) are more common expressions of aggression in natural video game play and may be more applicable to observe. In self-reported measures, the studies relied on similar tests of violent tendencies and aggressive behaviors. Where it differed drastically was the level of exposure to violent video games. In some studies, scholars would ask individuals to play violent games (Carnagey et al., 2007; Engelhardt et al., 2011). Insert authors here report their most played video game (Ferguson & Olson, 2013), and other researchers ask for estimates of the amount of time participants spend on specific games (Holtz & Appel, 2011; Ybarra et al., 2008). Farrar and Krcmar (2006) provide evidence to support that the possible scales that were heavily used, like the aggression questionnaire (Buss & Perry, 1992). This may need editing to understand individuals' state aggression measure and their responses to certain priming agents. Priming is the process by which an individual will be exposed to specific cues that trigger a related response that is either physical or mental (Wyer & Srull, 1986).

A significant issue that is present with self-reported measures is the participant's subjective assessment of individuals' aggressive behaviors. Individuals possessing a social desirability bias might respond in a more socially desirable manner by reducing the level of aggression (Caputo, 2017). Individuals also might not be able to accurately report the amount of time spent on specific games (Adachi & Willoughby, 2016; Kahn et al. 2014).

The meta-analysis's primary focus was to determine the driving force of aggressive behaviors related to violent video game play and to determine if it was the exposure or an individual's violent tendencies. During the literature search portion of the study, all articles that contained only prosocial behavior were removed from the analysis. Prosocial behaviors were not included in the present study because the goal was not to find the benefits of video game exposure, but to expose what the possible negative effects of video game exposure could hold. This is a limitation because the researcher had access to the articles but chose to not code for prosocial behavior. There could have been a possible relationship between prosocial behavior and individuals' violent tendencies.

Future Research

Areas for future research in the study are centered around determining possible factors that are underlying the models presented. The expansion should focus on the impacts of age, intercultural aspects, and more coherent conceptualization of terms. An in-depth analysis of age could lead to researchers identifying generational differences and the societal impacts of that time. Focusing on more longitudinal research allows researchers to explore how exposure to video games changes through individuals' ages. Intercultural aspects are critical to understand the exposure to media due to the differences in rules and regulations related to

media along with the societal differences that exist between cultures, specifically focusing on individualistic versus collectivistic cultures.

Age was hypothesized to play an integral role in explaining the model's variability. The tests involving child participants came primarily from older studies and rarely sampled children under the age of 10 (Calvert et al., 2017). A future meta-analysis should examine the effects on age specifically, focusing on developing further support for the implications of social learning theory on violent video game exposure. Herrett-Skjellum and Allen (1996) provide evidence that the effect of displays of gender stereotypes within media increases as the age of the individual increases. This same effect could be found with the variable of violent game exposure. As children age, the violent game exposure could culminate over time and multiply the impact of violent video game exposure. Individual exposure employed in experimental study comparisons may provide small effects, but the accumulation of exposure across extended years may have an increased impact from violent video games. Future studies should focus on obtaining a more homogenous sample to improve the study's ability to generalize to a larger and more applicable population.

One issue is the lack of generalizability outside of the US population; however, the focus was not on intercultural communication in the present study, limiting exposure to intercultural groups. Intercultural research into video games has focused on content understanding of the media present within video games, perceptions of foreign nations, and how they are articulated within the video game. In recent years while behavior changes were one of the topics least explored (Shliakhovchuk & Garcia, 2020). The present study failed to consider any intercultural effects, but considering the lack of emphasis in the present literature could be a reason for

other researchers to explore the effects. East Asian cultures, e.g., China, that practice

collectivism have a heavy emphasis on accommodation and harmonious relationships with

others, while individualistic countries, e.g., the U.S., encourage being independent and separate

from others (Park et al., 2023). Hofstede (1980) created a model that identifies a country's level

of individualism and out of the 67 countries analyzed, 36 countries practice collectivism, (Braje

et al., 2019) but the primary research on social behaviors has been studied in individualistic

countries more frequently (Teng et al., 2022). The notion of collectivism and individualism could

be integral to understanding the social aspects of aggression in different countries (Teng et al.,

2022). In countries that practice individualism, there is rarely a need for social harmony

compared to collectivistic countries where the desire for social harmony is present in their day-

to-day activities (Teng et al., 2022).

Video game research lacks a consistent or coherent conceptualization of terms used

when analyzing violence and aggression. The terms may not always reflect specific theoretical

implications and not directly observed in the study. Instead, the influences become inferred

from the researcher's perspective by self-reported measures, via secondhand research which is

the nature of the meta-analytic process (Crocker & Algina, 2006). The unobservable properties

operate as potential latent traits, which follows that there is really no gold standard to properly

define nor measure the object of interest (Crocker & Algina, 2006), especially when it is defined

so variably/inconsistently across the meta-analysis.

Presently, the only way to thwart the effects of this inconsistency and reliance on

secondhand knowledge would be to hopefully obtain a large enough sample that the impact of

outside influences would hopefully be negated. One example of these potential confounds

could include desirability bias, for example, which may influence the participant's honest and true answers.

Conclusion

In conclusion, future research into the effects of video game exposure should prioritize investigating the role of age, intercultural aspects, and the development of a more coherent conceptualization of terms related to violence and aggression. Researchers should continue to conduct research to expose the complex relationship between video game exposure and aggressive behavior. The insights into age, intercultural aspects, and conceptualization of aggressive behaviors can help educate society on how to handle the violence present in video games.

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Appendix A: Models

Theoretical Model

Model 1

| Violent Video Game Exposure | → + → | Individuals Violent Tendencies | → + → | Aggressive Behavior |

Model 2

| Individuals with Violent Tendencies | → + → | Seek out Violent Video Game Exposure | → + → | Aggressive Behavior |

Observed Model

Model 1

| Violent Video Game Exposure | → .19 → | Individuals Violent Tendencies | → .27 → | Aggressive Behavior |

Model 2

| Individuals with Violent Tendencies | → .19 → | Seek out Violent Video Game Exposure | → .22 → | Aggressive Behavior |
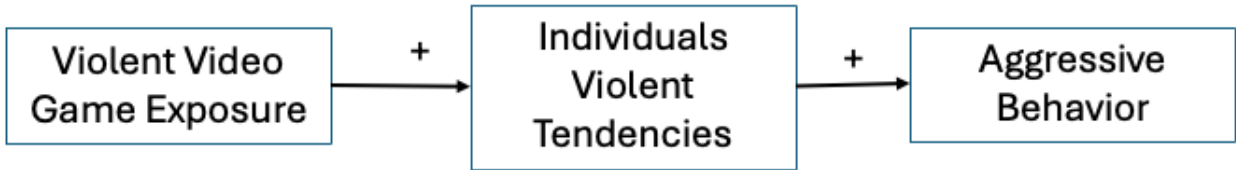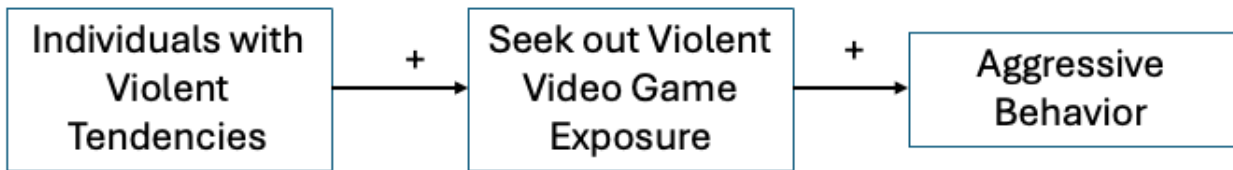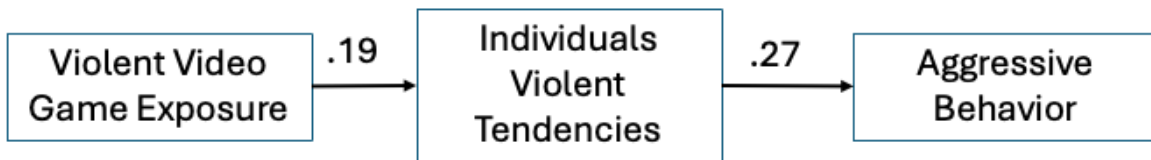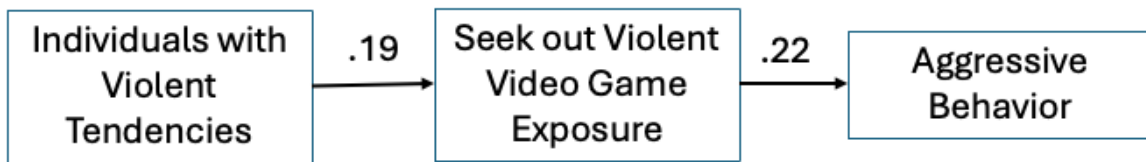
Appendix B: List of Effects Calculated from Studies

Author Names	N	M Age	Genre	Gender	r AxV	r ExA	r ExV	Mean r
Allahverdipour et al. (2010)	444	-	5	0	0	0.12	0	0.12
Anderson & Bushman (2001a)	4262	-	-	-	0	0.19	0.22	0.21
Anderson & Bushman (2001b)	2722	-	-	-	0	0.15	0	0.15
Anderson & Carnagey (2009a)	55	-	1	0	0	0.24	0	0.24
Anderson & Carnagey (2009b)	145	-	1	0	0	0.02	0.16	0.1
Anderson & Carnagey (2009c)	100	-	1	1	0	0.24	0	0.24
Anderson & Dill (2000)	227	-	2	0	0	0.46	0	0.46
Anderson & Ford (1986)	60	-	5	-	0	0.04	0	0.04
Anderson et al. (2008)	1595	-	2	-	0	0.28	0	0.28
Anderson et al. (2010)	130296	-	-	0	0	0.18	0	0.18
Arriaga et al. (2008)	148	23	5	0	0.25	0	0	0.25
Arriaga et al. (2011)	58	22.6	4	0	0.86	0	0.86	0.86
Arriaga et al. (2015)	121	23.19	5	1	0	0.20	0	0.2
Baldaro et al. (2004)	22	-	5	1	0	0.02	0	0.02
Barlett & Rodeheffer (2009)	74	21.51	5	1	-0.01	0	0.21	0.1
Bartholow et al. (2005)	200	-	2	0	0	0.18	0.13	0.16
Bartholow et al. (2006)	39	19.5	2	0	0	0.57	0	0.57
Bluemke et al. (2010)	89	26.64	2	0	0	0.18	0	0.18
Bowen & Spaniol (2011)	122	19	5	0	0	-0.01	0	-0.01
Breuer et al. (2015a)	76	22.6	1	0	0.24	-0.08	-0.06	0.03
Breuer et al. (2015b)	140	-	2	1	0	0.29	0	0.29
Bucolo (2010)	648	14.165	2	0	0.47	0.45	0.37	0.43
Burkhardt & Lenhard (2021)	15836	15.1	2	0	0	0.21	0	0.21
Bushman (2018)	287	20.87	5	1	0	0.15	0	0.15
Bushman & Huesmann (2006)	80834	-	-	-	0	0.19	0.18	0.19
Buss & Perry (1992)	1253	-	2	0	0.42	0	0	0.42
Colwell & Kato (2005a)	204	12.7	2	0	0	0.24	0	0.24
Colwell & Kato (2005b)	305	12.9	2	1	0	0.26	0	0.26
Colwell & Payne (2000)	204	12.7	2	0	0	0.3	0	0.3
Coyne et al. (2011)	287	13.26	2	1	0.46	0.12	0.15	0.24
Delhove & Greitemeyer (2020)	1871	22.88	2	1	0	0.07	-0.07	0
Dittrick et al. (2013)	432	13.6	2	1	0	0	0.16	0.16
Dominick (1984)	153	-	3	1	0	0.26	0	0.26
Engelhardt et al. (2011)	70	-	5	1	0	0.34	0	0.34
Ferguson (2011a)	603	12.35	2	1	0	-0.07	-0.02	-0.05
Ferguson (2011b)	603	12.34	2	1	0	0.09	0	0.09
Ferguson (2015)	106070	-	2	-	0	0.06	0	0.06
Ferguson & Colwell (2018)	304	12.81	2	1	0	-0.02	0.05	0.02
Ferguson & Olson (2014)	377	12.93	2	0	0	0	0.04	0.04
Ferguson & Rueda (2009)	103	23.6	2	1	0.13	0	0	0.13

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Study	N							
Ferguson & Rueda (2010)	103	23.6	5	1	0.15	0.14	0.27	0.19
Ferguson et al. (2008a)	190	-	2	0	0	0	0.05	0.05
Ferguson et al. (2008b)	428	20.68	2	0	0	0	0.21	0.21
Ferguson et al. (2008c)	136	20.9	5	0	0	0.01	0	0.05
Ferguson et al. (2012)	1771	12.3	2	0	0	0.23	0	0.23
Ferguson et al. (2013)	333	12.76	2	0	0	-0.01	0	-0.01
Ferguson et al. (2015)	133	15.26	4	0	0	0	-0.04	-0.04
Ferguson et al. (2016)	43	15.37	-	-	0	0	0.36	0.36
Ferguson et al. (2020)	-	-	-	-	0	0.09	0	0.09
Fikkers et al. (2013)	499	11.87	2	1	0	0.23	0	0.23
Fikkers et al. (2016)	943	11.8	2	0	0	0.35	0	0.35
Fischer et al. (2010)	66	22.56	1	0	0	0.33	0	0.33
Fleming & Rickwood (2001)	71	10.5	5	1	-0.27	0	0	-0.27
Fling et al. (1992)	250	-	2	0	0	0	0.07	0.07
Funk et al. (2004)	150	9.99	2	1	0	0.3	0	0.3
Gabbiadini et al. (2012)	209	16.2	5	1	0	0	0.28	0.28
Gabbiadini et al. (2013)	172	15.7	5	1	0	0.33	0	0.33
Gabbiadini et al. (2016)	55	16.82	5	0	0	0	0.09	0.1
Gentile D. & Gentile R. (2008)	1441	19.4	2	0	0	0.26	0.1	0.18
Gentile et al. (2011)	430	9.7	2	1	0	0.25	0.16	0.21
Greitemeyer (2014a)	82	21.9	5	0	0	0.19	0	0.19
Greitemeyer (2014a1)	244	23	2	0	0	0	0.1	0.1
Greitemeyer (2014b)	45	31.9	5	0	0	0.36	0	0.36
Greitemeyer (2014b1)	100	22	5	0	0	0.3	0	0.3
Greitemeyer (2019)	980	38.9	2	0	0	0.15	0	0.15
Greitemeyer (2020)	191	22.5	2	1	0	0	0.11	0.11
Greitemeyer & McLatchie (2011)	20	-	5	0	0	0.63	0	0.63
Greitemeyer & Mugge (2014)	39818	-	-	-	0	0.18	0	0.18
Greitemeyer & Sagioglou (2017)	743	35.7	2	0	0	0	0.19	0.19
Greitemeyer et al. (2012)	66	-	4	0	0	0	0.11	0.11
Hasan et al. (2012)	133	21.1	5	0	0	0.1	0	0.1
Hasan et al. (2013)	77	20.1	5	0	0	0.27	0	0.27
Hollingdale & Greitemeyer (2013)	130	21.5	5	0	0	0.24	0	0.24
Hollingdale & Greitemeyer (2014)	101	21.38	5	1	0	0.58	0	0.58
Holtz & Appel (2011)	205	12.71	2	0	0	0.02	0.16	0.09
Hopf et al. (2008)	314	14.7	2	1	0	0.32	0.2	0.26
Hull et al. (2014)	1086	12.3	2	0	0.52	0	0	0.52
Ihori et al. (2007)	780	-	2	0	0	0.39	0	0.39
Kersten & Greitemeyer (2021)	258	23.6	2	1	0	0	0.05	0.05
King et al. (2018)	579	34.1	2	1	-0.38	0	0	-0.38
Konijn et al. (2007)	99	14	5	1	0	0.23	0	0.23
Krahe & Moller (2010)	1237	13.95	2	0	0	0.21	0.4	0.31
Krahe & Moller (2011)	1688	13.4	2	1	0.24	0.17	0.24	0.22

Study	N							
Krcmar & Eden (2019)	94	22.13	5	0	0	0.47	0	0.47
Krcmar & Farrar (2009)	186	19.67	5	0	0	0.12	0.24	0.18
Krcmar & Lachlan (2009)	173	19.95	5	1	0	0.09	0	0.09
Lemmens et al. (2011)	591	-	2	0	0	0	0.32	0.32
Lin (2011)	985	-	2	1	0.52	0.37	0.39	0.43
Lobel et al. (2019)	174	11.16	2	0	0	0	0.21	0.21
Lull & Bushman (2016)	194	-	5	0	0	0.87	0	0.87
Markey & Scherer (2009)	118	19.35	5	1	0	0.29	0.27	0.28
Moller & Krahe (2009)	295	13.34	2	0	-0.02	0.21	0.18	0.12
Montag et al. (2011)	610	19.32	5	1	0	0	0.09	0.09
Nowak et al. (2008)	227	-	5	0	0.19	0.28	0.12	0.19
Prescott et al. (2018)	11763	-	-	-	0	0.14	0	0.14
Przybylski & Weinstein	1004	-	2	1	0	0.1	0.09	0.08
Ross & Weaver (2012)	68	20.84	3	0	0	0.74	0.36	0.55
Saleem et al. (2012) (Children)	56	22.6	5	0	0	0.27	0	0.27
Saleem et al. (2012) (College)	154	11.4	3	1	0	0	0.19	0.19
Salisch et al. (2011)	324	-	2	0	0	0.32	0	0.32
Schutte et al. (1988)	307	19.57	3	1	0	0.14	0	0.14
Sherry (2001)	2722	-	-	-	0	0.16	0	0.16
Shibuya et al. (2008)	540	13.9	2	1	0	0.2	0	0.2
Staude-Muller et al. (2008)	42	22.33	5	1	0.44	0	0	0.44
Teng et al. (2011)	130	21.1	5	0	0	0.17	0.27	0.22
Teng et al. (2022)	774	-	2	1	0	0	0.17	0.17
Thomas & Levant (2012)	168	20.93	2	1	0.87	0.23	0	0.55
Triberti et al. (2015)	224	24.93	3	1	0.10	0	0	0.1
van Schie & Wiegman (1997)	346	11.5	2	0	0	0.07	0	0.07
Whitaker & Bushman (2012)	150	19.6	5	0	0	0.29	0	0.28
Williams & Skoric (2005)	213	27.7	3	1	0	-0.06	0.06	0
Willoughby et al. (2012)	1211	-	2	0	0.36	0.16	0.19	0.24
Zhang et al. (2021)	150	6.38	4	0	0	0.13	0	0.14
Zhen et al. (2011)	795	11.63	2	1	0	0.36	0.65	0.55

Note. N= Total Sample Size, Female Dominated was represented as a 0 Male Dominated was represented as a 1 (Gender), Genre was coded as 1 least violent (Sports), 2 (General Violent Game play), 3 (RPG), 4 (Fighting), 5 most violent (Shooter), r Aggression by Violent Tendencies (rAxV), r Exposure by Aggression (rExA), r Exposure by Violent Tendencies (rExV)