2015-06-01

Does Video Game Content Matter? An Examination of Two Competing Ideas

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Does Video Game Content Matter? An Examination of

Two Competing Ideas

Nathan J. Smith

A dissertation submitted to the faculty of
Brigham Young University
in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

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June 2015

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ABSTRACT

Does Video Game Content Matter? An Examination of Two Competing Ideas

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The current paper addresses the associations between video game content (i.e., physically aggressive, relationally aggressive, and prosocial) and physical aggression, relational aggression, and prosocial behavior in two distinct developmental periods. The purpose of the paper is to test whether playing video games with a particular type of content influences behaviors over time, or whether individuals who have higher levels of physical aggression, relational aggression, or prosocial behavior prefer to play games with similar content. Two theories will be simultaneously examined and tested in order to determine the relative merit in using each in research examining the relationships between video game content and positive and negative behaviors. More specifically, this paper will address the General Aggression Model/General Learning Model (GAM/GLM) and the Uses and Gratification Theory. The GAM/GLM, at their core, predict that exposure to video game content will build a cognitive schema which will guide how an individual should behave when confronted with a later social encounter (Anderson & Bushman, 2002). Contrarily, Uses and Gratification would suggest that a person chooses to play video games with a particular type of content, and that video games should not influence behavior. Specifically, according to the theory, individuals should seek out video games in order to fulfill their inward feelings and motivations (e.g., an individual with aggressive tendencies would play games with more violent and aggressive content) (Katz, Blumler, & Gurevitch, 1973; Whiting & Williams, 2013).

A careful analysis showed a significant relationship between each type of video game content and its’ corresponding behavior among adolescents, which supports the assumptions of the GAM and GLM. There was no relationship between video game content and behavior among preschoolers. With the exception of relational aggression of physically aggressive content, there was no support for Uses and Gratification Theory, in that preschoolers’ and adolescents’ levels of physical aggression, relational aggression, and prosocial behavior were not related to the preference for video games with different types of content. The analysis adds significantly to the current literature by showing a relationship between video game content and behavior over a four year period.

Keywords: physical aggression, relational aggression, prosocial behavior, general aggression model, uses and gratification theory, video game/s, video game content, panel data, longitudinal
ACKNOWLEDGEMENTS

The author would like to acknowledge his advisor, Sarah Coyne, for her mentorship and friendship. A special thanks to my committee members: Laura Walker, David Nelson, Robert Ridge, and Mark Callister for their support and advice. The author would especially like to acknowledge the support of his family: Nicole, Rae, Stella, and he/she who is yet to be named. My family has been my rock, and this dissertation and degree belong to them as much as it does to me.
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Introduction

The world as a whole spends billions of dollars each year in order to play the next latest and greatest video game. The use of video games is continually becoming one of the most popular activities of youth and emerging adults. Prevalence rates for occasional video game use are estimated to be as high as 80% to 90% for children and adolescents (Gentile, Choo, et al., 2011; Gentile, 2009) and between 50% to 60% for emerging adults (Mentzoni et al., 2011; Thomas & Martin, 2010). Individuals who play video games tend to do so fairly regularly, with the average amount of time played per week ranging between 13 and 30 hours (Charlton & Danforth, 2007; Gentile, 2009; Gentile et al., 2011). Numerous researchers have studied the effects of playing video games on behaviors (Fraser, Padilla-Walker, Coyne, Nelson, & Stockdale, 2012; D. a. Gentile et al., 2009; Douglas a. Gentile, 2011; Greitemeyer & Osswald, 2009), and the vast majority of published research on the effects of video games has shown that the content present in video games is related to subsequent behavior. However, despite this solid research, many individuals (often gamers themselves) consider the notion of video games having an effect outside of the living room entirely preposterous. Consider the comments of one man discussing a news story that attributes some violent behavior with violent video game play:

Video games cause violence. Ridiculous. I'm in my late 30's. I've played video games my entire life. I've never even received a speeding ticket. The reality is that there's a gap of understanding between people older than about 45 and the rest of the world. To those too old to have played games, they seem alien, dangerous. To anyone who's played video games (and that's pretty much every male under 35 years old), this entire conversation is preposterous (Carey, B., 2013).
To these naysayers, video games can’t possibly influence behavior because they personally have played video games their entire lives, and they themselves are not violent. The counter argument posed by some is that violent individuals simply seek out violent video games. Doing so serves as an outlet for aggression and violent behavior, and reduces their overall aggression. It is this argument that the current paper hopes to address—the opposing viewpoints of two competing arguments. Does video game content have an influence on behavior, or are individuals simply seeking out video games in order to fulfill their inner gratifications?

On that note, it would be useful to define the behaviors of interest in the current paper. Physical aggression (PA) is defined as any physical behavior intended to do harm to another person (Anderson & Bushman, 2002; Bushman & Huesmann, 2010; DeWall, Anderson, & Bushman, 2011). For example, a child who pushes another child for playing with a toy that he/she wanted would be considered an act of PA. Relational aggression (RA), in contrast, is defined as behavior aimed at harming others through purposeful manipulation and damage of a peer relationship (Crick & Grotpeter, 1995). An adolescent who purposefully excludes someone from an activity, knowing that the person would want to participate, would be considered relationally aggressive. Prosocial behavior (PB) is defined as any voluntary behavior meant to help or benefit others (Padilla-Walker & Carlo, 2014). One example would be a child who helps another child gather a stack of books or papers that have fallen.

**General Aggression Model and General Learning Model**

The GAM was developed in hopes of integrating several existing micro-theories (e.g., Social Learning Theory and Script Theory) into a unified model that could be used to explain aggressive behavior (Anderson & Bushman, 2002). The GAM is useful in explaining both short and long-term effects of exposure to media violence. In the short term, aggression can be
determined in part by the influence on inputs, routes, and outcomes (see Figure 1). Inputs are related to the individual person in the situation and the various traits they carry with them (e.g., beliefs, attitudes, goals) as well as the situational factors that are present at a particular instance (e.g., being provoked or frustrated). Media is one type of input that is examined in the current study. For example, a father might come home from work and decide to play a video game. The type of game that he chooses to play will determine what types of things he is exposed to for the duration of his play. The inputs influence routes (i.e., cognition, affect, and general arousal) which can be described as a persons’ present internal state. When the father chooses to play a violent video game, the content of the game will change what he is thinking and feeling at that moment. The internal state guides the outcome, or whether the person will use thoughtful action or impulsive action in reacting to the situation (Anderson & Bushman, 2002). After playing the violent video game for several hours, the father’s internal state and overall mood is different than what it would be had he played a game with non-violent content, or no video game at all. In the short term, the effects of playing a violent video game might be experienced by the father when he becomes testy or impatient with his children during or immediately after playing a violent video game, or may be manifested toward a driver when he becomes enraged when someone cuts in front of him on the freeway after playing a violent video game.

The GAM also suggests that exposure to media violence may have a long-term effect on aggressive behavior (See Figure 2). For example, an adolescent who exposes himself/herself to violent media consistently over a period of time may continue to alter his or her perspective about other people's intentions, attributing more hostile and/or aggressive intentions to seemingly innocuous situations. According to the GAM, when an individual plays or views aggressive video game content, they develop internal biases (i.e., beliefs about what is normal
and expected) and personality traits that can serve as a guide about appropriate behavior in later situations. For example, playing violent and aggressive video games can increase aggressive beliefs and attitudes (e.g., perceiving road rage as normal), aggressive expectations (i.e., believing that others’ actions are meant to hurt/insult you), perceptual schemata (i.e., how we identify everyday things), aggressive behavioral scripts (i.e., pieces of knowledge that serve as a guide for appropriate behavior), and desensitize people to aggression and violence generally. The GAM would predict these aggressive changes to influence individuals’ aggressive personality, and thus influence their behaviors in various situations (Bushman & Anderson, 2002). Put more simply, playing video games with violent and aggressive content can prime an individual about the appropriate way to behave in various situations as well as fundamentally change an individuals’ aggressive personality. According to the GAM, frequent or prolonged exposure to the violent and aggressive content will magnify and solidify these effects (Bushman & Anderson, 2002). Accordingly, exposure to video games with violent content would be expected to increase an individuals’ aggressive and violent biases and personality, in both the short- and long-term. For example Bösche (2010) found that individuals who played a violent video game had increased aggressive concepts primed, and Bushman and Anderson (2002) found that individuals who played violent video games were more aggressive, had higher expectations for aggression, and were more likely to expect others to have aggressive feelings. Moreover, a number of studies have shown that violent video games are associated with increased aggression over time (e.g., increased aggression days and months later (see Anderson, Sakamoto, & Gentile, 2008; Gentile & Gentile, 2007; Hasan, Bègue, Scharkow, & Bushman, 2013).

The GAM is an appropriate model to examine the effects of video game content with RA as well. There are hundreds of studies on the effect of playing violent video games on PA, but
very little research has examined the influence of video games with relationally aggressive content. The GAM is likely the most useful model when considering those effects as well. Moreover, it is possible that there may be some cross-over between different forms of aggression. For example, Coyne et al. (2008) found that viewing physically aggressive media was not only related to participant’s PA, but also to their RA. The authors also showed that viewing relationally aggressive media was related to both RA and PA, a relationship that researchers have called “the cross over effect.” The cross-over effect occurs when a particular type of media content is related to more than just the same type of behavior. For example, we might expect that playing a video game with physically aggressive content to be related to increases in PA, as well as increases in RA and decreases in PB. We hope to test these possibilities in the current research. To date, there is a considerable amount of research that shows that physically aggressive media are negatively related to individuals’ PB (Chambers & Ascione, 1987; Gentile et al., 2009; Saleem, Anderson, & Gentile, 2012). Moreover, a number of studies have found that individuals’ use of prosocial media is associated with decreases in aggression (Gentile et al., 2009; Greitemeyer & Agthe, 2012; Greitemeyer, Osswald, & Brauer, 2010), evidence of different types of cross-over.

While the GAM is appropriate for explaining the development of aggressive tendencies and behaviors after playing a video game with some kind of aggressive content (e.g., physical or relational), its very name implies a restricted focus on aggressive behaviors. As such, the General Learning Model (GLM) was developed in order to explain the processes in which individuals learn a variety of tendencies and behaviors (Buckley & Anderson, 2006). The GLM suggests that people can learn any concept that is present in a video game, even behaviors that are not aggressive (see Figure 1). In fact, the process used in the GLM is identical to the process in the
GAM, in that individuals are influenced by the media that they view through inputs, routes, and outcomes (Buckley & Anderson, 2006). The GLM is appropriate in explaining the process behind individuals learning various types of positive behaviors and thoughts from positive and prosocial video game content. The GLM would predict that a child who is exposed to media and video games with prosocial content and messages to develop more PB and personality compared to a child who is not exposed to prosocial content. For example, a preschooler who gets a regular dose of Sesame Street would be expected to mimic and develop the positive behaviors and attitudes that are portrayed (Collins & Getz, 1976; Saleem et al., 2012). The GLM would also explain how individuals may become increasingly prosocial through repeated exposure to prosocial media and video games (see Figure 3).

To date, several studies have successfully used the GAM and GLM as guiding theories to explain the increased aggression after playing a violent video game, or increased PB after playing a prosocial game (e.g., Bösche, 2010; Bushman & Anderson, 2002; Prot et al., 2014).

**Uses and Gratification Theory**

Uses and gratification theory takes a different, though somewhat complementary viewpoint concerning the relationship between media use and various behaviors/personalities. Katz, Blumler, & Gurewitch (1973) note that individuals are not influenced by the media, but rather, individuals are active participants in using media (see also Rubin, 2002; Whiting & Williams, 2013). The underlying idea behind a uses and gratification approach is that every person has his/her own individual needs, and that they will knowingly seek out and use media in order to fulfill those needs (Lometti, Reeves, & Bybee, 1977; Swanson, 1987; See Figure 2). Accordingly, different individuals with different needs may find that different types of media and content may fulfill their needs more appropriately and quickly than others (Lichtenstein &
Rosenfeld, 1983). For example, a uses and gratification model would predict that an individual who comes home from work after a stressful work day, who needs time to unwind and relax, may seek out some form of media (e.g., television, books, news, or video games) as a means of gratifying that need (Swanson, 1987). In fact, one study questioned video gamers about why they play video games, and one of the most popular response options was to seek arousal (e.g., stimulation or excitement). This validates the general assumption of the theory by showing that many video gamers play in order to alter or fulfill their mood (Sherry, Lucas, Greenberg, & Lachlan, 2006). The key premise of the uses and gratification approach is the idea that research need not focus on the ways that viewing media directly effects an individual, but rather focus on the ways in which differing types of individuals use different types of media (Rubin, 2002). Proponents of uses and gratification theory would reason that an individual’s PA, RA, and PB are fairly stable (Hartmann & Klimmt, 2006; Huesmann, Eron, Lefkowitz, & Walder, 1984). For example, it would be argued that any long term change in behaviors due to video game use is rather unlikely, and uses and gratification proponents could cite the numerous studies that have found short-term correlations between video game use and behavioral changes, with no real evidence that video game use has significantly changed an individual’s behaviors (Ferguson et al., 2008; Ferguson, San Miguel, Garza, & Jerabeck, 2012; Ferguson & Garza, 2011; Ferguson & Rueda, 2010; Valadez & Ferguson, 2012). However, a few longitudinal studies show the stability of some behaviors (i.e., aggression) to differ between different subsets of individuals in samples of young children (Côté, Vaillancourt, Barker, Nagin, & Tremblay, 2007) and adolescents (Lynne-Landsman, Graber, Nichols, & Botvin, 2011; Xie, Drabick, & Chen, 2011). For some, PA, RA, and PB are stable. For others, there are steady increases or decreases in these same behaviors. Specific to the current study, the uses and gratification model would expect
individuals with higher levels of aggressive behaviors and more aggressive personalities to seek out and play video games that are more violent and aggressive over time. Similarly, individuals with higher levels of PB and a more prosocial personality would be expected to seek out video games with the same type of content. This would be done as a means to express and gratify their intrinsic traits, rather than shaping their behavior across time (Bushman, 1995).
Review of Literature

Aggression

Violent or aggressive media are defined as any media that depict intentional attempts by someone to inflict harm on or hurt others (Anderson & Bushman, 2001). Two separate content analyses examined the percentage of Teen and Mature-rated video games that contained violence. In Teen-rated games, 98% contained intentional acts of violence in roughly 1/3 of the gameplay, 90% of the games required the player to injure other characters, and 69% required the player to kill others (Thompson, Tepichin, & Haninger, 2006b). In Mature-rated games, 98% contained acts of violence, and 94% contained depictions of blood (Thompson, Tepichin, & Haninger, 2006a). Interestingly, the same percentage of Teen and Mature-rated games contained violence. To date, numerous studies have shown a significant relation between individual’s violent and aggressive video game use and their own aggression (C. Anderson & Dill, 2000; Anderson & Carnagey, 2009; Barlett, Branch, Rodeheffer, & Harris, 2009). However, a large number of these studies merely show a correlation between violent video game content and aggression (Anderson & Dill, 2000; Anderson & Carnagey, 2009; DeLisi, Vaughn, Gentile, Anderson, & Shook, 2012; Engelhardt, Bartholow, & Saults, 2011). As a result, the media and much of society has raised concerns about the appropriateness of attributing blame to media violence as a cause of increased aggression. To combat these concerns, a number of studies have used controlled laboratory experiments as a means of assessing the effect of video game violence on aggression. For example, numerous studies have shown a cause-and-effect relationship between playing a violent video game and increased aggression (thoughts, feelings, and behaviors) (Barlett et al., 2009; Barlett et al., 2007; Barlett, Harris, & Bruey, 2008; Bösche, 2010; Bushman & Gibson, 2010; Fischer, Kastenmüller, & Greitemeyer, 2010; Gabbiadini, Riva,
Andrighetto, Volpato, & Bushman, 2013; Greitemeyer & McLatchie, 2011; Hasan, Bègue, & Bushman, 2013; Krcmar, Farrar, & McGloin, 2011; Lin, 2013; Polman, de Castro, & van Aken, 2008; Sestir & Bartholow, 2010), increased desensitization to violence (Carnagey, Anderson, & Bushman, 2007; Engelhardt, Bartholow, Kerr, & Bushman, 2011), increased hostility (Arriaga, Esteves, Carneiro, & Monteiro, 2006; Barlett et al., 2007; Saleem, Anderson, & Gentile, 2012), and decreased PB (Anderson & Bushman, 2001; Chambers & Ascione, 1987). This is ample evidence to conclude that violent video games have a causal effect on a variety of behaviors, and each provides evidence to support the GAM’s assumptions that video games have a direct influence on behaviors. More recently, it was found that the effects of media violence might be even stronger if a participant is actively involved in carrying out the violence in a video game as compared to simply watching the violence, as an observer might (Lin, 2013). However, there is still some skepticism about how long the effects of violent video games actually last. If the effects of video games do not last longer than 5 or 10 minutes, as suggested by Barlett et al. (2009), then then there really should not be any concern about longer term effects and actual changes to individuals’ behaviors and personalities. However, Bushman and Gibson (2010) showed that playing a violent video game, and continuing rumination and thinking about the game, were associated with increases in aggression, even 24 hours later. Moreover, Teng, Chong, Siew, and Skoric (2011) showed that individuals who played Grand Theft Auto for 3 weeks had significant changes in their attitudes about violence.

Both correlational and experimental studies have shown that there is a relationship between video game violence and changes in aggressive attitudes, affect, behaviors, and thoughts. A number of longitudinal studies have found a consistent long-term association between viewing media violence and aggression (Huesmann, Moise-Titus, Podolski, & Eron,
2003), however, comparatively less research has examined longitudinal relationships between physically aggressive video games and PA. The strength of most longitudinal studies is their ability to track changes in various behaviors, and test whether earlier use of violent video games played a role in those changes. For example, a few studies to date have shown longitudinal associations between violent video game content and later increased aggressive behavior (Anderson, Sakamoto, & Gentile, 2008; Gentile, Coyne, & Walsh, 2011; Gentile & Bushman, 2012; Gentile & Gentile, 2007; Krahé & Möller, 2010, 2011; Willoughby, Adachi, & Good, 2012), increased trait anger (Gentile & Gentile, 2007), increased hostile attribution bias and hostile expectations (Gentile et al., 2011; Gentile & Gentile, 2007; Hasan, Bègue, Scharkow, et al., 2013), and lowered empathy and PB (Krahé & Möller, 2010). These studies showed changes in the various behavior anywhere from a few days, to 6 months, and upwards of four years later.

These longitudinal studies, in particular, support the assumptions of the GAM/GLM. Not only was there a relationship between playing violent video games and increased aggression, arousal, hostility, etc., but the effects held over time. This supports the idea that video game violence is likely inducing long-term, and possibly permanent, changes to individuals’ behaviors and personality. However, what many of these studies fail to examine is the opposite possibility: that prior aggressiveness predicts later violent video game play, as uses and gratification theory would suggest. In the current study, both possibilities will be examined.

Relational Aggression

Though many studies have examined the effect of playing violent video games, very little research has empirically examined relationally aggressive media and its associations with various behaviors, particularly in the area of RA in video games. However, a number of content analyses show that RA is commonly portrayed in different types of media, including television
Unfortunately, a content analysis of RA in video games has not been done, to date. RA in video games certainly does exist, but it is not as “in your face” as violent video game content. A careful analysis of video game scripts and story lines would likely yield evidence of content that is relationally aggressive.

A few studies have examined the relationship between relationally aggressive media content and behavioral outcomes. For example, viewing TV with relationally aggressive content was associated with higher levels of RA in both peer and romantic relationships (Coyne & Archer, 2005; Coyne, et al., 2011; Coyne, Nelson, Graham-Kevan, Keister, & Grant, 2010; Gentile, Mathieson, & Crick, 2011). Other experiments have shown causal effects of viewing relationally aggressive TV on participants’ RA (Coyne, Archer, & Eslea, 2004; Coyne, Linder, Nelson, & Gentile, 2012). One study even found a longitudinal relationship between relationally aggressive content and RA norms one year later (Linder & Werner, 2012).

A great deal is still left unknown about the relationship between RA and media consumption, particularly when it comes to video game use. There is some evidence to support the hypothesis that relationally aggressive content will have an influence on RA, given the assumptions of the GAM, and the few empirical studies cited above. In a variety of articles examined, no research has used a uses and gratification approach to examine whether individuals who have higher levels of RA tend to view/play media that has more relationally aggressive content. Given the almost complete lack of research examining the effects of relationally aggressive content in video games and various behaviors, any research with any age group of participants would be a welcomed addition to the media aggression literature. In particular, pre-
school age children are just beginning to develop and display RA (Ostrov & Keating, 2004; Ostrov, Woods, Jansen, Casas, & Crick, 2004), and RA peaks in adolescence (Karriker-Jaffe, Foshee, Ennett, & Suchindran, 2008). Pre-school age children and adolescents have more access to media and video games than ever before with the introduction of tablets and hand-held devices, as well as opportunities to play video games on computers and video gaming systems. It is important that we begin to understand if relationally aggressive content may be influencing these individuals’ development of various behaviors.

**Prosocial Behavior**

Recently, research has begun to examine prosocial content in video games. Relatively few content analyses have examined the ways in which PB is portrayed in the media, with the few that do focusing only on television and movies. For example, Lee (1988) found that prosocial acts were depicted in the vast majority of television shows at least once, with nearly 25 percent of the shows containing prosocial themes (see also Potter & Ware, 1989). Using a more overarching and multidimensional perspective of PB, Padilla-Walker, Coyne, Fraser, and Stockdale (2013) found that PB were quite prevalent in a content analysis of Disney films. Unfortunately, a content analysis of PB in video games has not been done. In spite of the large amounts of violent and aggressive acts portrayed in so many games, video games are likely full of prosocial themes and behaviors. And according to the GLM, individuals should be influenced by the prosocial content they play in video games. Thus, individuals who spend their time playing and/or watching prosocial video game and media content, should evidence higher levels of PB. Early on, a number of studies found that viewing prosocial content on television was associated with PB (Collins & Getz, 1976; Drabman & Thomas, 1977; Friedrich & Stein, 1975; Friedrich & Stein, 1973) and fewer aggressive behaviors (Bankart & Anderson, 1979; Collins &
Getz, 1976). However, until recently, research had not examined effects of playing prosocial content in video games, especially in children. The vast majority of the research has examined the effects of playing a prosocial video game on prosocial and aggressive behaviors in emerging adult samples. The majority of these experimental studies have examined whether playing a prosocial video game will cause participants to become more prosocial and/or less aggressive. For example, a number of studies with emerging adults have shown that playing a prosocial video game, compared to a neutral and/or an aggressive video game is causally related to increased PB (Ewoldsen et al., 2012; Gentile et al., 2009; Greitemeyer & Agthe, 2012; Greitemeyer, Osswald, & Brauer, 2010; Greitemeyer & Osswald, 2009, 2010, 2011; Saleem et al., 2012; Whitaker & Bushman, 2011), increased empathy (Greitemeyer et al., 2010; Prot et al., 2014), and decreased aggressive behaviors and cognitions (Gentile et al., 2009; Greitemeyer & Agthe, 2012; Greitemeyer et al., 2010; Greitemeyer & Osswald, 2009, 2010, 2011; Saleem et al., 2012; Whitaker & Bushman, 2011).

Prot et al. (2014) analyzed the effect of prosocial video game play on PB in a sample of older children and adolescents, and whether the relationship was mediated by empathy. The analyses were done with both cross-sectional and longitudinal data, and their results showed a significant indirect relationship between prosocial video game use and PB through increased empathy, both cross-sectionally and longitudinally. A recent meta-analysis by Greitemeyer and Mügge (2014) found that, taken together, prosocial video game content is reliably associated with increases in PB and decreases in aggressive behaviors across cross-sectional, longitudinal, and experimental studies.

One paper to date has examined the effects of prosocial video game content in a sample of younger children (Gentile et al., 2009). This is important, because the vast majority of
research has considered the effect of prosocial video game content on various behaviors in samples of emerging adults. The authors used cross-sectional, experimental, and longitudinal analysis to examine the effect of prosocial video games. Cross-sectionally, they found that exposure to prosocial video games was positively correlated with PB, and negatively correlated with aggressive cognitions and hostile attribution bias. In the experimental condition, those who played a prosocial video game were more prosocial compared to those who played a different game. Moreover, Gentile et al. (2009) used an auto-regressive cross-lag regression model to examine the relationship between prosocial video game play and PB. They found that prosocial video game exposure was associated with increased PB 3 to 4 months later, and PB were associated with increased prosocial video game exposure later as well. This lends support to both GLM and uses and gratification theoretical models.

Given the amount of research considering the effects of prosocial video games on various behavioral outcomes, there is evidence to support both GLM and uses and gratification approaches. However, there is still much more that needs to be considered. For example, research needs to continue analyzing the effects of prosocial content in samples of varying ages, particularly pre-school age, children, and adolescents. Additionally, Gentile et al (2009) suggests that there is a longitudinal effect of playing prosocial games; however, the time lag in their study was only a maximum of four months. Research should examine the longer-term impact of playing prosocial video games in young gamers. Additionally, cross-over effects could be examined beyond PA.

**Cross-over Effects**

A cross-over effect occurs when a particular type of video game content is associated with increases in different behaviors than those displayed (Coyne et al., 2008). For example, it
would be worth noting if playing a violent video game not only has an effect on PA, but also whether the violent video game is related to decreases in PB. A number of studies have examined cross-over effects for a variety of media (e.g., Fraser, Padilla-Walker, Coyne, Nelson, & Stockdale, 2012; Greitemeyer, Traut-mattausch, & Osswald, 2012). For example, in terms of aggression, a number of studies, including a recent content analysis, reveal that playing violent video games is related to decreased PB (Greitemeyer & Mügge, 2014), and reduced positive affect (Saleem et al., 2012). Other studies have examined the relationship between physically aggressive media content on RA. Coyne et al. (2012) found that participants who viewed a physically aggressive video clip showed increased PA and RA (Coyne, Linder, et al., 2012; Coyne, Busby, et al., 2012; Gentile et al., 2011), while another study found that exposure to violent media was unrelated to RA (Möller & Krahé, 2009).

Cross-over effects have also been examined with prosocial media. For example, Gentile et al. (2009) found that exposure to prosocial video games was related to lowered aggressive cognitions and hostile attribution bias. A number of experimental studies have also shown effects of prosocial video games on participants’ decreased PA and RA (Greitemeyer & Agthe, 2012). The meta-analysis by Greitemeyer & Mügge (2014) showed that playing prosocial video games is consistently related to decreased aggressive behaviors, cognitions, and affect.

To date, only one study has examined the relationship between relationally aggressive media and cross-over effects. In an experimental study where participants viewed media with relationally aggressive content, viewing was related to increases in both RA and PA (Coyne et al., 2008). The current study will consider the effects all types of video game content (i.e., physically aggressive, relationally aggressive, and prosocial) on all types of behavior, and vice-versa.
Preschoolers and Adolescents

Given the breadth of studies previously cited, there are different purposes to studying the relationship between video game content and PA, RA, and PB among preschoolers and adolescents. However, the GAM and GLM would predict that the content played in video games will influence preschoolers and adolescents in the same ways. We know very little about the video game habits of preschoolers, but with the shift in video gaming to handheld tablets and cell phones, it is likely that young children are exposed to, and play more video games than they would otherwise. Even in preschool age samples, researchers have found evidence for physically aggressive behaviors (Casas et al., 2006; Crick, Casas, & Mosher, 1997; Juliano, Stetson Werner, & Wright Cassidy, 2006), relationally aggressive behaviors (Crick et al., 1997; Juliano et al., 2006), and PB (Bankart & Anderson, 1979; Drabman & Thomas, 1977). Children’s aggression early on in life is related to their aggression later in life, as well as to their overall agreeableness and conscientiousness in early adulthood (Asendorpf, Denissen, & van Aken, 2008). Thus, any environmental exposure that serves as a risk factor for increased aggression should be cause of concern.

On average, adolescents age 8 to 18 spend over an hour playing video games each day (Rideout, Foehr, & Roberts, 2010). According to Rideout et al. (2010), approximately half of all video-gaming takes place with a console hooked up to a TV, with the rest of gaming taking place on a handheld player or cell phone. The amount of time that adolescents spend playing video games has jumped over the years, from 26 minutes per day in 1999, to 49 minutes in 2004, to 73 minutes in 2010 (Rideout et al., 2010). Moreover, it is reported that about half of all 8- to 18-year olds have played highly violent games like Grand Theft Auto and Halo (Rideout et al., 2010). Among adolescents, PA has been found to be at its highest at around 15 years old, with a decline
thereafter (Karriker-Jaffe et al., 2008), and PB tends to decrease, with the lowest levels noticed at
around age 17 (Luengo Kanacri, Pastorelli, Eisenberg, Zuffianò, & Caprara, 2013). It is
important to understand the ways in which media content may be a factor in this development.
Longitudinal studies that can track the development of aggressive and PB over time, as well as
the development of media and video game usage over time, are much needed.

Aims

The general purpose of the current research is to empirically test the basic assumptions of
the GAM/GLM and Uses and Gratification theories against one another in one statistical model.
Both the GAM/GLM presume that regular video game use has the potential to teach and alter
various behaviors. Conversely, uses and gratification assumes that behavior is fixed, and that any
changes in behaviors stemming from video game use would be in the short-term only. Uses and
gratification theory would expect individuals high in various aggressive or PB to seek out that
type of medium. As such, two sets of competing hypotheses will be tested simultaneously.

It should be acknowledged, that while the current study aims to test the assumptions of
two different theories, the results do not necessarily have to be a win/lose situation, with one
theory declared the winner. It is possible and probable that both theories will have merit. In other
words, it would not be surprising to see a spiraling relationship, with various behaviors
predicting increasing amounts of content specific video game play, and content specific video
game play influencing various behaviors (Gentile et al., 2009).

Current Study

The current study examines the longitudinal relationship between different types of video
game content (e.g., violent, relationally aggressive, prosocial) and various behavioral outcomes.
The intent is to use two separate samples, one sample of pre-school age children with two waves of data, and another sample of adolescents with four waves of data. It is proposed that we use an auto-regressive cross-lag longitudinal model to analyze the effects of video game content on different behaviors, while simultaneously modeling the effects of the various behaviors on the content of participants’ favorite video games. The strength of the analysis is the ability to model each relationship concurrently, while purposefully controlling for the same variable measured at an earlier time period. Given the number of behaviors and concerns about multicolinearity between the behaviors, we will analyze multiple models separately for the different outcomes (e.g., measuring the effects of all kinds of media content on one type of behavior; see Figures 1-3 for the preschool sample and Figures 4-6 for the adolescent sample). For example, one analysis would look at the longitudinal effects of prosocial content, relationally aggressive content, and violent content on PA, while also looking at the effects of PA on the video game content variables. This same analysis would be run separately for the preschool and adolescent samples. This will add substantially to current research by considering the effects of different types of video game content on different behaviors longitudinally in both preschool children (Study 1) and adolescents (Study 2); this study will also test the assumptions of two opposing media theories. By examining the effects of video game content on different behaviors, as well as the effect of behaviors on types of video games played, we can begin to answer the questions pertaining to the potential effects of various video game content and how it is related to changes in human behaviors.

**Hypotheses**

Given the competing assumptions of both theories, we will generate hypotheses for each. For example, we will have one hypothesis relevant to the effects of violent/aggressive video
game content as predicted by the assumptions of the GAM/GLM, and we will have a second hypothesis relevant to the effects of aggressive behaviors on preferred video game content, as predicted by uses and gratification theory. Given the nature of both theories, we do not expect differences between the pre-school and adolescent age samples.

**H1**: The type of content will be associated with changes in the behavioral attributes over time. More specifically, playing video games with PA and RA content will be associated with increases in PA and RA and decreases in PB, and playing video games with prosocial content will be associated with increases in PB and decreases in PA and RA.

**H2**: Participant’s behavioral attributes will be associated with preference for video games with different content. Specifically, participants with higher levels of PA and RA will prefer video games with higher levels of PA and RA content and lower prosocial content, and participants with higher levels of PB will prefer video games with higher levels of prosocial content and lower levels of PA and RA.

**Study 1**

**Methods**

**Participants and Procedure**

Preschool data were collected from preschooler’s parents from four separate pre-school/early education centers: a Western University early education center \((n = 149)\), a Pacific-Western college early education center \((n = 36)\), a Pacific-western city pre-school \((n = 12)\), as well as a Midwestern city’s Head Start early education center \((n = 43)\) (67 children had missing data from which school they attended). The total sample consisted of data from 305 parents of pre-school age children. Child’s age was measured in months \((M = 57.34, SD = 10.35)\). There
were no differences between boys’ ($M = 56.74$, $SD = 11.52$) and girls’ ($M = 57.92$, $SD = 9.09$) ages. Approximately 80% of the sample were White, with approximately 12% identifying as Hispanic, 1% identifying as African American, and 3% identifying as other (e.g., Asian or Native American). Parent’s education was measured on a 7-point Likert-scale with options (1 = less than high school), (2 = high school graduate), (3 = some college), (4 = Associates degree), (5 = Bachelor’s degree), (6 = Master’s degree), and (7 = Advanced degree). On average, the sample was highly educated ($M = 4.47$, $SD = 1.47$).

Participant families for the child sample were asked to fill out a survey about their child’s media habits and behaviors two times, approximately one year apart. Parents were able to participate in the survey online, or written. Written surveys were sent home in children’s bags, and later mailed to their home in order to increase the response rate. Parents were able to fill out the survey at their own convenience, and written surveys were collected from the children’s pre-school teacher. Consent and participation rates at all schools exceeded 70%. There was an 83.5% retention rate from Time 1 to Time 2.

**Measures**

**Video game content.** Parents were asked what their child’s three favorite video games were on any electronic device (including console, computer, tablet, cell phones, etc). Each game was then rated by at least five expert raters from a pool of 17 raters (30% male, $M_{age} = 23.00$) for PA, RA, and PB, using a Likert scale of 1 = no aggression/prosocial behavior to 5 = extremely high levels of aggression/prosocial behavior. Expert raters were given complete definitions and examples for each type of behavior. Physical aggression was defined as any behavior involved to harm another person through physical means. Examples include shooting, stabbing, punching, biting, etc. Relational aggression was defined as a mean and often secret
type of aggression that hurts others’ relationships or friendships. Examples include gossiping, spreading rumors, backbiting, destroying relationships, social exclusion, giving dirty looks, leaving mean phone calls, “stealing” another person’s friend, etc. Prosocial behavior was defined as any voluntary behavior that benefits other people or society as a whole. Examples include sharing, cooperating, helping others, telling the truth, defending others, supporting others, etc. For each game, they watched videos of gameplay online and consulted with a media website (commonsensemedia.org) which gives detailed information regarding each game. Interclass correlations were calculated for each of the content ratings, and found to be very high for PA (α = .95), fairly low for RA (α = .49), and acceptable for prosocial content (α = .75). A total of 381 games were rated. An average score of the child’s three favorite video games was subsequently created for each type of video game content (i.e., PA, RA, and PB) with higher scores representing higher levels of aggression and PB. Overall, relatively low scores were reported by raters for physically aggressive content (M = 1.83, SD = .81), relationally aggressive content (M = 1.09, SD = .16), and prosocial content (M = 1.56, SD = .47).

**Time playing video games.** Time spent playing video games was measured by asking parents (98% mothers) to report “on average, how many minutes does your child spend using video games each day?” on an 8-point Likert-scale with options (1 = none), (2 = 1 to 30 minutes), (3 = 31 to 60 minutes), (4 = 61 to 90 minutes), (5 = 91 to 120 minutes), (6 = 121 to 150 minutes), (7 = 151 to 180 minutes), and (8 = more than 3 hours). On average, parents reported very little time spent playing video games each day (M = 1.97, SD = 1.03). Overall, parents reported that boys played video games for higher amounts of time than girls (M = 2.24, SD = 1.18; M = 1.71, SD = .80; t(230) = -3.99, p < .001).
**Physical aggression.** At both wave 1 and wave 2, PA was reported by the child’s mother from the Parent Adaptation of the Preschool Social Behavior Survey (PSBS) that asked them to report how frequently their child engages in PA (Crick, Casas & Mosher, 1997). The measure consisted of seven items with responses measured on a 5-point Likert-scale with options (1 = never or almost never true), (2 = not often), (3 = sometimes), (4 = often), and (5 = always or almost always true). A couple of sample items were “your child kicks or hits others” and “your child hurts others by pinching them.” Because of little to no responses at the higher levels of the PA scale, responses options were collapsed into three categories (Muthen, 1984). Response items 1 and 2 were left unchanged, but response options 4 (often) and 5 (always or almost always true) were combined with response option 3 (sometimes). For descriptive purposes only, an average of the 7 items was created. On average, there was very little PA reported at both time 1 ($M = 1.47, SD = .48$) and time 2 ($M = 1.38, SD = .44$). The reliability of the 7-item PA measure was .80 at wave 1 and .81 at wave 2. Successive analyses were done using the 3-point categorical scales. A confirmatory factor analysis (CFA) (Kline, 2011) was performed to assess the factor structure of the PA construct at wave 1 and 2. Loadings ranged from .62 (item 5) to .84 (item 3) at wave 1 and from .70 (item 7) to .87 (item 4) at wave 2 on the PA scale. Following the CFA, factor scores were saved, and these scores were subsequently used in all regression analyses.

**Relational aggression.** At both waves 1 and 2, each child’s RA was reported by the child’s parent. The measure consisted of ten items (Crick et al., 1997) with response options measured on a 5-point Likert-scale (1 = never or almost never true), (2 = not often), (3 = sometimes), (4 = often), and (5 = always or almost always true). A couple sample items were “your child ignores a peer or refuses to listen (e.g., may cover his/her ears) if he/she is mad at that peer” and “your child gives mean looks to others to make them feel bad.” Two items from
both waves 1 and 2 (“your child tries to embarrass peers by making fun of them in front of other kids” and “your child tries to get others to dislike a peer (e.g., by whispering mean things about the child behind his/her back”) were only responded to on two response options, and were not subsequently used in analysis due to lack of variance. Due to little to no responses at the higher levels of the RA scale, response options for the remaining 8 items were collapsed into three categories. Response items 1 and 2 were left unchanged, but response options 4 (often) and 5 (always or almost always true) were combined with response option 3 (sometimes). Successive analyses were done using the 3-point categorical scales. The reliability of the RA scale was .73 at wave 1 and .78 at wave 2. A CFA was performed to assess the factor structure of the RA construct at wave 1 and 2. Loadings ranged from .43 (item 1) to .82 (item 10) at wave 1 and from .52 (items 1 and 8) to .88 (item 7) at wave 2 on the RA scale. Following the CFA, factor scores were saved, and these scores were subsequently used in all regression analyses.

Prosocial behavior. At both waves 1 and 2, each child’s PB was reported by the child’s parent. The measure consisted of five items (Crick et al., 1997) with response items measured on a 5-point Likert-scale (1 = never or almost never true), (2 = not often), (3 = sometimes), (4 = often), and (5 = always or almost always true). Sample items included “your child is good at sharing and taking turns” and “your child is helpful to peers.” Due to little to no response at the lower levels of the PB scale, the response options were collapsed into three categories (Muthen, 1984). Response options 1 (never or almost never true) and 2 (not often) were combined with response option 3 (sometimes), and response options 4 and 5 were left unchanged. Successive analyses were done using the 3-point categorical scales. The reliability for the PB score was .80 at wave 1 and .76 at wave 2. A CFA was performed to assess the factor structure of the PB construct at wave 1 and wave 2. Factor loadings ranged from .58 (item 5) to .82 (item 2) at wave
1 and from .45 (item 1) to .83 (item 2) at wave 2. Following the CFA, factor scores were saved, and these scores were subsequently used in all regression analyses.

**Controls.** Each child’s age was measured in months, with response options ranging from 36 to 80 months old at wave 1. Ethnicity was dummy-coded into two response options, white (coded as 0) vs. nonwhite (coded as 1). Parent’s education was measured by asking mother’s to report the number of years of school they had completed using a 7-point Likert scale, with response options varying from 1 (Less than high school) to 7 (Advanced degree). The child’s sex was measured by asking the parent to report their sex. Response options were female (coded as 1) and male (coded as 0). Parents’ marital status by asking mothers to report on the status of their familial relationship. All response options were collapsed and dummy coded with response options two-parent family (coded as 1) and single-parent family (coded as 0). Finally, because data were collected from two different locations, we controlled for this in our analysis.

**Analysis Plan**

Data manipulation and descriptive statistics were done using SPSS version 21. CFA’s and Structural Equation Modeling were done using Mplus version 7.11. For both samples, three separate Auto-regressive cross-lag models will be estimated. Each model will include the longitudinal associations between VG content (i.e., relationally aggressive, physically aggressive, and prosocial) and the different behaviors across time. For example, one model would estimate the relationship between the various VG content variables and PA across time. One strength of the auto-regressive cross-lag model is the ability to control for earlier levels of each dependent variable, as well as the ability to measure each direction of the model simultaneously. In all models, the child’s age, ethnicity, parent’s education, geographic location,
single-parent vs. two-parent status, and the child’s biological sex will be used as statistical controls.

Due to missing data on a number of the variables, the actual sample size was substantially reduced in each of the models. Overall, the final analytical sample consisted of 128 preschool age children who did not have missing data on the behavioral or video game content measures, or on every independent variable.

Due to concerns about multicollinearity between each of the behavioral variables (PA, RA, and Prosocial), colinearity statistics were analyzed (see Hoffman, 2005). Variable inflation factor (VIF) scores showed multicollinearity between each of the variables (i.e., each of the scores were above 10). Consequently, subsequent models were analyzed with only the matched behaviors at earlier waves with its outcome at Wave 2 (e.g., only controlling for PA at Wave 1 when predicting PA at Wave 2). An additional concern with analyzing each of the behavioral variables simultaneously is the sample size and complexity of the model. Small samples are limited by the number of parameters that can be reliably estimated, and given the complexity of cross-lag panel models it was determined that it would be more reliable to split the analysis into three distinct models.

Results

Descriptive Statistics

A full summary of descriptive statistics can be found in Table 1, and sample correlations can be found in Table 2. An analysis showed that none of the behaviors were significantly correlated with any of the video game content items, both cross-sectionally and between the two measurement waves. Overall, the sample of preschoolers displayed very low levels of PA ($M =$
1.47, $SD = .48$) and RA ($M = 1.67, SD = .41$), and relatively high levels of PB ($M = 3.94, SD = .56$) at time 1. There were also low levels of analyzed content in the games for PA content ($M = 1.83, SD = .81$), prosocial content ($M = 1.56, SD = .47$), and RA content ($M = 1.09, SD = .16$).

Each of the variables was also examined to see if there were differences between boys and girls. There were significant differences between boys’ and girls’ time spent playing video games ($M = 2.24, SD = 1.18; M = 1.71, SD = .80; t = -3.99, p < .001$), PA at time 1 ($M = 1.57, SD = .53; M = 1.38, SD = .42; t = -2.99, p < .01$), prosocial at time 1 ($M = 3.82, SD = .54; M = 4.06, SD = .56; t = 3.26, p < .001$), and RA at time 1 ($M = 1.61, SD = .36; M = 1.73, SD = .45; t = 2.11, p < .05$). These differences were accounted for by controlling for sex in the analysis.

**Measurement Model**

A confirmatory factor analysis (CFA) was estimated for each of the latent variables (PA, RA, and PB). Because each construct was measured at two measurement occasions, measurement invariance was tested at the level of the factor loadings. This was done by first estimating a freely estimated model for each construct, and placing subsequent constraints on each factor loading at each time point. Measurement invariance was established using the $\chi^2$ difference test. For each of the latent variables (PA, RA, and PB) constraining the factor loadings to be equal across time did not significantly worsen model fit, and the factor loadings were constrained in subsequent models.

**Physical Aggression**

For full model summary, see Figure 11. In the first model we tested the cross-lag relationship between PA and the three video game content variables. The overall model fit the data well ($\chi^2(20) = 17.50; RMSEA = .00; CFI = 1.0$). The stability path was not significant for
PA between time one and two, nor was it significant for the RA content between time one and two. This indicates that the stability of these measures did not hold over time, which shows fluctuation in these variables over time. The stability paths between PA content at time 1 and PA content at time 2 were significant ($\beta = .34, p < .001$), the stability paths between prosocial content at time 1 and prosocial content at time 2 were significant ($\beta = .28, p < .05$). None of the cross-lag paths (i.e., paths between VG content and behavior) were significant. This indicates that the content of the video games that the children played was not related to their PA one year later, neither was PA related to changes in preference for video games with various content.

**Prosocial Behavior**

For a full model summary, see Figure 12. This model tested the relationship between PB and the three video game content variables. The overall model fit the data well ($\chi^2 (20) = 18.45; \text{RMSEA} = .00; \text{CFI} = 1.0$). Identical to the PA and RA models, the stability path between PB at time one and two was not significant, nor was the path between RA content between time one and two. The stability path between PA content at time one and two was significant ($\beta = .33, p < .001$), as was the stability path between prosocial content between time one and two ($\beta = .26, p < .05$). None of the cross-lag paths were significant, indicating that changes in PB was not related the content of video games played one year earlier, neither was preference for different video game content influenced by PB.

**Relational Aggression**

For a full model summary, see Figure 13. This model tested the relationship between RA and the three video game content variables. The overall model fit the data well ($\chi^2 (20) = 15.65; \text{RMSEA} = .00; \text{CFI} = 1.0$). Identical to the two previous models, the stability path between RA at
time one and two was not significant, nor was the path between RA content between time one and two. The stability path between PA content at time one and two was significant ($\beta = .32, p < .001$), as was the stability path between prosocial content between time one and two ($\beta = .27, p < .05$). None of the cross-lag paths were significant, indicating that RA was not related to the content of video games played one year earlier, neither was RA related to changes in preference of video game content.

**Discussion**

It was hypothesized that the PA, RA, and prosocial content of video games preferred by preschoolers would be related to changes in their behaviors one year later, as predicted by the GAM and GLM. Our analysis did not support this hypothesis. Moreover, the hypotheses for Uses and Gratification Theory were not supported either. The results of this study seem to contradict the logical assertions made by both the GAM/GLM and Uses and Gratification Theory among the preschoolers in the sample, levels of PA, RA, and PB were not related to preference for video games with various content. It is worth considering potential explanations for why no relationship was found, assuming that one does exist in the population.

Interestingly, the stability coefficients were highly unstable, indicating that there was tremendous fluctuation in parent’s ratings of their children’s behaviors between the two years of measurement. This artifact could merit one possible explanation for why there were no significant findings, attributable to the possible bias inherent in parental reports of children’s behaviors (Gray, Clancy, & King, 1981). Assuming that preschoolers’ video game habits and preferences are related to their behaviors, it is possible that using parental reports of the children’s behaviors masks the relationship that may be apparent when using teachers’ reports of the children’s behaviors. For example, it is possible that parents inaccurately report their
children’s problem behaviors in order to alter the perception of their children so that it aligns with socially accepted norms. For the current study, this could reflect parents’ desires to make their children appear less physically and relationally aggressive, and more prosocial in order to keep up with the appearance that their children are well-behaved. Parental bias may also be a factor if parents do not see the way their children behave when playing with other children, as they would when attending preschool. Parents may see their children as well-behaved in their own home and around other family, but fail to see different behaviors that may be more evident to a teacher. Though we have teacher report of behavior at Time 1 we do not have it at Time 2 as all the children left the preschool and were enrolled at multiple different elementary schools across the various states.

Another possible explanation why there was no relationship between video game content and behavior is that the content of the games played was generally lacking all kinds of PA, RA, and Prosocial content, with the average content scores close to one. Most of the games played by the preschoolers in the current sample were those targeted for young children on handheld devices and tablets/cell phones (e.g., coloring games or learning games on a LeapPad). It is likely that these games include very little, if any, of the content that was measured for the analysis. Another factor that could explain preschoolers’ use of video games lacking behavioral themes is parental mediation of their children’s media use. When parents are actively involved in monitoring the types of games that their kids play, the effects of the video game content are diminished (Gentile, Reimer, Nathanson, Walsh, & Eisenmann, 2014; Linder & Werner, 2012). Given the high SES and religiosity in the current sample, this may be one reason why there were no effects.
Of course, it is entirely possible that there is no long-term relationship between preference for video games with PA, RA, and prosocial content and the various behaviors in preschool age children, as has been seen in a few other studies in samples with older children/adolescents (Ferguson et al., 2008; Ferguson et al., 2012; Ferguson & Garza, 2011). We would be hesitant to make many generalizations from the current study outside of the population from which it was drawn. The sample was drawn from two highly affluent areas of the country, one of which is home to a highly religious population, both of which could be protective factors for the children in the sample against PA, RA, and lowered PB.

It is notable that the interclass correlations of the content ratings of video games with RA content was .49. Higher interclass correlations would indicated higher levels of inter-rater agreement on the levels of content prevalent in the rated video games. The lower coefficient suggests that the raters were much less likely to agree on the level of RA content in each of the rated games. This could imply at least two things. One, RA may not prevalent enough in video games to accurately measure. Two, RA video game content may be difficult to recognize in video games. It is possible that the modus used to measure RA content in other types of media may not accurately identify a different manner of RA content that may or not be prevalent in children’s video games. It is important that researchers make an effort to uniquely identify the ways in which RA is prevalent in video games. Using the methods outlined in the RA research in television and movies showed that very little of the content was displayed in children’s video games.
Study 2

Methods

Participants and Procedure

The participants for the adolescent sample were taken from wave 3 through wave 6 of the \textit{Flourishing Families Project (FFP)}, a longitudinal study of inner-family life involving families with a child between the ages of 11 and 16. The sample consists of 681 families (91.8\% retention from wave 1) with a child within the target range of 10 to 13 years old at the first wave of data collection (495 two-parent families and 186 single-parent families). Participant children averaged 13.3 years of age, while mothers averaged 45.2 years and fathers average 47.3 years in age. The ethnic make-up of the sample was 65\% European American, 12\% African American, fewer than 1\% were Hispanics or Asian Americans, and approximately 20\% of the families are categorized as multi-ethnic, based on a combination of two or more ethnicities among family members. In terms of parental education, 60.9\% of mothers and approximately 69.7\% of fathers had a bachelor’s degree or higher. Related to yearly family income, 22.6\% of families reported making less than $59,000; 32.8\% reported income in the $60,000-99,000 range; 29.9\% reported income in the $100,000-149,000, with another 14.7\% making $150,000 or more per year. Approximately thirty-two percent of single parents had never been married, 8.7\% were separated, 49.3\% were divorced, and 4.3\% were widowed.

Participant families for the FFP were selected from a large northwestern city and a moderate size city in the western United States and were interviewed at yearly intervals. Families were primarily recruited using a purchased national telephone survey database (Polk Directories/InfoUSA). This database claimed to contain 82 million households across the United
States and had detailed information about each household, including presence and age of children. Families identified using the Polk Directory were randomly selected from targeted census tracts that mirrored the socio-economic and racial stratification of reports of local school districts. All families with a child between the ages of 10 and 14 living within target census tracts were deemed eligible to participate in the FFP. Overall, 61% of those contacted responded to the survey. However, the Polk Directory national database was generated using telephone, magazine, and internet subscription reports; so families of lower socio-economic status were under-represented. Therefore, in an attempt to more closely mirror the demographics of the local area, a limited number of families were recruited into the study through other means (e.g., referrals, fliers; \( n = 77, 15\% \)). By broadening the approach, the social-economic and ethnic diversity of the sample was increased.

All families were contacted directly using a multi-stage recruitment protocol. First, a letter of introduction was sent to potentially eligible families (this step was skipped for the 15 families who responded to fliers). Second, interviewers made home visits and phone calls to confirm eligibility and willingness to participate in the study. Once eligibility and consent were established, interviewers made an appointment to come to the family’s home to conduct an assessment interview that included video-taped interactions, as well as questionnaires that were completed in the home. The most frequent reasons cited by families for not wanting to participate in the study were lack of time and concerns about privacy. It is important to note that there were very little missing data. As interviewers collected each segment of the in-home interview, questionnaires were screened for missing answers and double marking.
A large percentage of the youth respondents in our sample are transitioning out of the home and leaving to go to college or live on their own. As a result, the entire survey questionnaire for both parent and youth respondents was placed online for Wave 6.

**Measures**

**Video game content.** Self-reports were used to assess children’s media preferences at each wave of data collection using items taken from the measure developed by Coyne, Meng, Harper, Nelson, and Keister (2008). Participants were asked to list their three favorite video games and were asked to rate how frequently they played each game listed based on a response scale ranging from 1 (once a month) to 5 (more than once a day).

All the games identified by at least 1% of participants were then distributed to 320 independent raters (58% male, \(M\) age = 22.50, \(SD = 4.40\)) who were recruited from middle schools, undergraduate and graduate classes from four different states, all located in different areas of the United States. Coders were asked to rate how much PA, RA, and PB was in each game they were familiar with (played regularly). Full definitions, including several examples, of each type of content were provided to participants in seeking to aid the accuracy of ratings. Physical aggression was defined as any behavior involved to harm another person through physical means. Examples include shooting, stabbing, punching, biting, etc. Relational aggression was defined as a mean and often secret type of aggression that hurts others’ relationships or friendships. Examples include gossiping, spreading rumors, backbiting, destroying relationships, social exclusion, giving dirty looks, leaving mean phone calls, “stealing” another person’s friend, etc. Prosocial behavior was defined as any voluntary behavior that benefits other people or society as a whole. Examples include sharing, cooperating, helping others, telling the truth, defending others, supporting others, etc. Raters completed the ratings on
their own. This method has been used frequently in media research (e.g., Huesmann et al., 2003) and is considered superior to self-ratings of media content, given the multi-informant methodology. Certain raters worked better for certain types of content compared to others. Accordingly, to achieve reliability, we conducted separate reliability analyses for each type of content. Ratings were based on a 1 (e.g., not physically aggressive) to 7 (e.g., extremely physically aggressive) Likert scale. The raters evaluated a total of 97 different games. The mean ratings of all raters for a particular game (at least two raters per game) were determined. Intercoder reliability was then assessed with two different methods, consistent with the method set by Huesmann, Moise, and Eron (2003). In particular, we determined the means of the inter-rater correlations and averaged absolute discrepancies from the mean. Raters with a high number of consistent negative correlations (suggesting lack of care or quality in rating) were omitted. The resulting means and inter-rater correlations were acceptable (PA: $z = 1.50$, $r = .90$, $SD = 1.59$; RA: $z = .76$, $r = .64$, $SD = 1.47$; PB: $z = 1.02$, $r = .77$, $SD = 3.54$).

**Physical aggression.** Physically aggressive behavior was assessed using items taken from Weinberger, Schwartz and Davidson (1979). Participants rated the degree to which items described them using a five-point Likert scale ranging from 1 (*does not describe me*) to 5 (*describes me very well*). Sample items included, “If someone tries to hurt me, I make sure I get even with them,” and “I lose my temper and let people have it when I’m angry.” Reliability coefficients (Cronbach’s alpha) for the current sample were found to be .88 (wave 3), .87 (wave 4), .87 (wave 5), and .88 (wave 6).

**Relational aggression.** A six-item measure was created for the FFP in order to assess the child’s own relationally aggressive behaviors. Items were modified from other assessments of RA (e.g., Morales and Crick, 1998) that were focused on a younger, pre-adolescent population.
Sample items include “I do not invite everyone to a party or other social event, even if I know that others would want to go” and “When mad at a person, I try to make sure that the person is left out from group activities.” Cronbach’s Alpha coefficient was found to be .74 (wave 4), .72 (wave 5), and .71 (wave 6). The measure was introduced into the FFP beginning at wave 4.

**Prosocial behavior.** PB was measured using 9 items based on the Inventory of Strengths (Peterson & Seligman, 2004). The measure assesses PB directed toward others/strangers (a modified version of the Peterson and Seligman original measure), Respondents answered on a 5-point Likert-type scale, ranging from 1 (*not like me at all*) to 5 (*very much like me*) in terms of how much they disagreed or agreed with statements about themselves. Sample statements included: “I help people I don’t know, even if it is not easy for me,” and “I voluntarily help my neighbors.” These and other questions were adapted to apply to their actions toward friends and family as well. Higher scores indicate greater levels of kindness and generosity toward strangers, family, and friends. Cronbach’s Alpha reliability coefficients were found to be .83 (wave 3), .85 (wave 4), .85 (wave 5), and .84 (wave 6).

**Controls.** Adolescent’s age was measured in years, with response options ranging from 11 to 16 years old at wave 3. Ethnicity was dummy-coded into two response options, white (coded as 1) vs. nonwhite (coded as 0). Parent’s education was measured by asking mother’s to report the number of years of school they had completed using a 7-point Likert scale, with response options varying from 1 (Less than high school) to 7 (Advanced degree). Adolescents’ sex was measured by asking the adolescent to report their sex. Response options were female (coded as 1) and male (coded as 0). Parents’ marital status by asking mothers to report on the status of their familial relationship. All response options were collapsed and dummy coded with response options two-parent family (coded as 1) and single-parent family (coded as 0). We also
controlled for the amount of time that adolescents’ reported playing video games. Adolescents reported how often they played video games each day on a 9-point Likert scale with response options from 1 (None) to 9 (More than 8 hours). Finally, because data were collected from two different locations, we controlled for this in our analysis.

**Analysis Plan**

Data manipulation and descriptive statistics were done using SPSS version 21. CFA’s and Structural Equation Modeling were done using Mplus version 7.11. For the adolescent sample, three separate Auto-regressive cross-lag models will be estimated. Each model will include the longitudinal associations between VG content (i.e., relationally aggressive, physically aggressive, and prosocial) and one behavior across time. For example, one model would estimate the relationship between the various VG content variables and PA across time. One strength of the auto-regressive cross-lag model is the ability to control for earlier levels of each dependent variable, as well as the ability to measure each direction of the model simultaneously (e.g., test the effect of content on behavior and the effect of behavior on content). In all models, the adolescent’s age, ethnicity, parent’s education, geographic location, single-parent vs. two-parent status, and the child’s biological sex were used as statistical controls.

Due to missing data on a number of the variables, the actual sample size was substantially reduced in each of the models. Overall, the final analytical sample consisted of 387 adolescents who did not have missing data on the behavioral or video game content measures, or on every independent variable.

**Results**
Descriptive Statistics

Descriptive statistics for each of the main study variables can be seen in Table 3. The descriptives were analyzed separately for both males and females. Males spent more time playing video games than did girls ($t = 11.61, p < .001$), played video games with higher levels of PA and RA content ($t = 11.08, p < .001; t = 4.24, p < .001$), and had higher levels of PA ($t = 3.25, p < .001$). Contrarily, males had lower levels of PB ($t = -4.01, p < .001$). Males and females were not different in the levels of prosocial content that they played, nor were they different in their levels of RA. These differences were accounted for by controlling for sex in our analyses.

Correlations between all main variables can be seen in Table 4.

Measurement Model

A confirmatory factor analysis (CFA) was estimated for each of the latent variables (PA, RA, and PB). Because each construct was measured across time, measurement invariance was tested at the level of the factor loadings across the different time points. This was done by first estimating a freely estimated model for each construct, and placing subsequent constraints on each factor loading at each time point. Measurement invariance was established using the $\chi^2$ difference test. For PA constraining the factor loadings to be equal across time did not significantly worsen model fit, and the factor loadings were constrained in subsequent models. Each of the items loaded highly on the PA factor, ranging from .71 (item 5) to .90 (item 4). For PB, constraining the factor loadings to be equal across time did not significantly worsen model fit, and the factor loadings were constrained in subsequent models. Each of the items also loaded highly on the prosocial factor, ranging from .51 (item 4) to .78 (item 1). However, for RA, constraining the factor loadings to be equal did worsen model fit, indicating that RA factor loadings could not be constrained to be equal. This implies that any potential differences in the
structural paths cannot be fully attributed to the relationship between the two variables, as the effects may be attributable to differences in the measurement of RA across time. However, each of the items loaded highly on the RA factor, ranging from .55 (item 4) to .90 (item 3).

Overall, the latent variable indicators loaded well on each of the constructs, with factor loadings between .66 (item 5) and .90 (item 4) for PA, between .54 (item 4) and .91 (item 3) for RA, and between .47 (item 7) and .75 (item 1) for PB.

**Structural Model**

In order to simplify the overall models, structural paths were constrained across time in order and tested to see if the constraints worsened model fit. When structural paths are able to be constrained across time, it frees up model degrees of freedom and allows for a more parsimonious model to be estimated. This was done by first estimating a model with all paths free, and then placing equality constraints on each set of paths (e.g., auto-regressive path for PA). We used the $\chi^2$ difference test to determine whether placing the constraints worsened model fit. For all three of our structural models, all of the stability and cross-lag paths could be constrained to be equal without worsening model fit, with the exception of auto-regressive paths of PA. Subsequently, all of the regression paths (except PA) were constrained to be equal across time. The advantage of this is that interpreting the unstandardized regression paths does not change over time, and in our case, adding many of the constraints made the overall model fit better. It should be noted that equality constraints were only placed on the paths main variables of interest. In other words, we allowed each of the paths between the control variables to be freely estimated, and did not test for structural invariance because they did not related to questions of interest.
As part of the structural model, the first-order error terms were correlated between each of the items in each latent factor. For example, the first item in the PA scale at wave 4 was correlated with the first item of the PA scale at wave 5, etc. Correlating these error terms helps deal with auto-correlation. The video game content variables were also correlated. For example we correlated the individual ratings for each video games’ PA content, RA content, and prosocial content. PA video game content was positively correlated with RA video game content and prosocial video game content, and RA video game content was also positively correlated with prosocial video game content.

**Physical Aggression and Video Game Content**

In this model the effect of video game content and PA were estimated across four measurement occasions. The overall model fit was very good ($\chi^2(626) = 952.39; \text{RMSEA} = .037; \text{CFI} = .97$) (see Figure 14). The auto-regressive paths for PA could not be constrained to be equal across time. However, the stability of PA over time was high across the four waves of measurement ($\beta = .68$ to .82). The video game content auto-regressive paths were constrained across time, and were fairly stable as well. The stability coefficients were ($\beta = .54$ to .56) for PA video game content, ($\beta = .30$ to .33) for prosocial video game content, and ($\beta = .48$ to .58) for RA video game content. Stability coefficients are a representation of the relative ordering of participants on a construct and how constant that is over time (Pitts, West, & Tein, 1996). Thus, stability coefficients closer to 1 correspond to constructs that are more stable across time.

The cross-lag parameters are representative of the effects of one variable on another across time. Our analysis found that preference for video games with relationally aggressive and prosocial content was unrelated to changes in PA over time. However, preference for video games with PA content was positively related to changes in PA over time ($\beta = .08, p = .054$).
While the relationship did not reach the threshold for statistical significance, a p-value of less than .10 is indicative of a relationship, and the directionality was as hypothesized. In the other direction, with PA predicting preference for video games with various content, PA was associated with changes in preferences for video games with RA content ($\beta = .06, p < .05$), but it was not associated with changes in preference for PA or prosocial content.

**Relational Aggression and Video Game Content**

In this model the effect of video game content and RA were estimated across three measurement occasions. The overall fit for this model was very good ($\chi^2 (301) = 509.84; \text{RMSEA} = .034; \text{CFI} = .96$) (see Figure 15). Each of the auto-aggressive paths were constrained to be equal across time. For RA, the stability of the construct was ($\beta = .57$ to .71) over the three waves, indicating that it is a highly stable behavior. For the cross-lag paths, preference for video games with RA content was related to increases in RA over time ($\beta = .06, p = .07$), which is indicative of a significant relationship, and in the direction as hypothesized. PA and prosocial content were not associated with changes in RA. In the other direction, RA was not related with preference for video games with PA, RA, or prosocial content.

**Prosocial Behavior and Video Game Content**

In this model the effects of video game content and PB were estimated across four measurement occasions. The overall fit for this model was very good ($\chi^2 (1382) = 1959.59; \text{RMSEA} = .033; \text{CFI} = .94$) (see Figure 16). The auto-regressive paths between PB were strong, ($\beta = .70$ to .77), indicating that it is a highly stable behavior. For the cross-lag paths, preference for video games with PA content was negatively associated with PB one year later ($\beta = -.09, p < .05$), while preference for games with prosocial content was positively related to PB one year
later (β = .07, \( p < .05 \)). Both effects were in the hypothesized directions. RA content was not related to PB. In the other direction, PB was not related to preference for PA, RA, or prosocial content one year later.

**Discussion**

This study is the longest longitudinal analysis of the relationship between video game content and behavioral outcomes to date, with four years of measurement for PA and prosocial, and three years with RA. Only two other studies have studied the effects of violent video games on aggressive over a similar length of time (Möller & Krahé, 2009; Willoughby et al., 2012). Other studies have only measured the effects of video games on behaviors up to one year later (Anderson et al., 2008; Gentile & Gentile, 2007; Hasan, Bègue, Scharkow, et al., 2013). We found partial support for hypothesis 1. Individuals who played games with higher levels of PA content had higher levels of PA one year later, controlling for previous PA and other demographic information. The estimated model points to causal possibilities in the effect of playing games with PA content on changes in PA over time. This finding was just on the edge of statistical significance, but it was in the hypothesized direction, and is indicative of an association. This is in support of the assumptions of the GAM, and contrary to the assumptions of Uses and Gratifications theory. Adolescents who reported preferences for video games with content that is physically aggressive had increasing amounts of PA across the four years. The more aggressive the content was, the more change was seen. This has significant implications for the general understanding about how video games relate to adolescent aggressive behavior. At a period of life when adolescents are going through marked physical and emotional changes, video games account for a significant portion of the change. This aggressiveness could be seen as
adolescents begin to drive, as they interact with others at school and/or work, with family members, with friends, etc.

It is also notable that PA was unrelated to changes in preference for video games with PA and prosocial content, but was related to changes in preferences for video games with RA content, potential evidence for a cross-over effect. This partially supports the assumptions of uses and gratification theory. It was surprising to find this cross-over effect and not a straight effect between PA and PA content. This finding should be interpreted carefully, and further analysis is recommended. The non-significance of PA predicting PA and prosocial content is an important finding of this study. The implication is that having higher levels of aggression did not lead adolescents to play increasingly aggressive games. The directionality was one-way. This is a common argument used to deter the public from buying into the research on aggressive and violent video games. This study answers the question about the directionality of the relationship by showing that PA levels were not related to preference for PA video games, but preference for PA video games was related to increases in PA over time.

Hypothesis 2 was also partially supported for the GAM. Preference for video games with RA content was associated with increases in RA over time, even after controlling for earlier RA and other demographic variables. The finding was only trending significance, but it was in the hypothesized direction. This model points to some causal possibilities in the effect of playing video games with RA content. RA content was not associated with changes in PA or PB over time. There was no support for uses and gratification theory. RA was unrelated to adolescents’ preference for video games with RA content, neither was it related to preferences for video games with PA and prosocial content. Similar to the findings from the model estimating the effects of PA, this model found that adolescents with higher levels of RA did not prefer to play
video games with higher levels of RA content over time. However, playing video games with RA content was related to increases in RA over time. These effects are likely seen and felt by those who are closest the adolescent who displays RA, namely family and close friends. This study is the first to examine the effects of RA video game content, and it was observed that playing games with RA content has an effect on behavioral change.

The most significant findings were in the model with PB (hypothesis 3). There is evidence to support the GLM in reference to the effects of playing video games with prosocial content. Preference for video games with prosocial content was related to an increase in PB over time. Moreover, we found that preference for video games with PA content was related to decreases in PB over time, evidence of a cross-over effect (Coyne et al., 2008). RA content was not related to changes in PB over time. There was no support for the assumptions of uses and gratification theory in this model (i.e., PB was not related to any video game content). This may be the most important finding from the current study, because it provides some evidence to other researchers and policy makers that playing video games with prosocial themes and behaviors can have a significant impact on adolescents’ prosocial development. Moreover, playing video games with PA content is decreasing PB in adolescents. These effects are likely seen in adolescents’ attempts and willingness to help out others: when they help a younger sibling with a difficult homework assignment, when they step in to help someone who is a victim of bullying, or when they stop to assist someone who needs help changing their car tire. Video game makers should make an effort to include themes in their video games that display an array of PB, with the knowledge that doing so has an influence on video gamer’s real lives. They need to create video games with the full knowledge that the violent content in those games will have a negative effect on some people’s lives.
This study adds significantly to the literature by showing that the content in video games is related to changes in behaviors longitudinally. The majority of studies to date have examined the relation between video game content and behavior using correlational analysis (Anderson & Carnagey, 2009; DeLisi, Vaughn, Gentile, Anderson, & Shook, 2012;) or short-term experimental research (Barlett, Harris, & Bruey, 2008; Bösche, 2010; Bushman & Gibson, 2010; Ewoldsen et al., 2012; Gentile et al., 2009;). The longitudinal research of video game content was also limited to a fairly short timeline, with the longest to date at just one year (Anderson, Sakamoto, & Gentile, 2008; Gentile, Coyne, & Walsh, 2011; Gentile & Bushman, 2012; Gentile & Gentile, 2007; Krahé & Möller, 2010, 2011; Willoughby, Adachi, & Good, 2012).

The concern that many parents have about how violent video games influence their children’s behavior is not unwarranted. Violent video game content causes individuals to become more aggressive in laboratory experimental studies (Bushmane & Gibson, 2010). In the real world this may be manifested in the way an adolescent snaps at a younger sibling or parent during or immediately after playing violent video games, or the driver on a crowded road who has learned behavioral cues from playing video games about the appropriate way to react to other “not so kind” drivers. However, it is likely that immediate effect derived from playing violent video games wears off after a period of time. What this study showed, however, was a shift in the trajectory of behavioral change among adolescents depending on the types of video games they prefered to play. Given the change seen in aggressive and prosocial behaviors during adolescence (Karriker-Jaffe et al., 2008; Luengo Kanacri et al., 2013), this study showed that the content of preferred video games has a small, yet significant, effect on the development of various behaviors. What this implies is that an adolescent who begins playing video games during adolescence may shift the trajectory of their behavioral change for the worse if they play
video games with PA or RA content, or for the better if they play video games with prosocial content.

**Overall Discussion**

Overall, we saw marked differences in the results between the preschool and adolescent samples. It is curious that such drastic differences would occur. There are a number of possible explanations for the lack of significant findings in the preschool sample (outlined in the study 1 discussion section), assuming that video games do have an effect on behavior in the population. There was no support for the assumptions of the GAM/GLM or uses and gratification theory in the preschool sample. For the adolescent sample, there was evidence supporting the GAM/GLM when adolescents played video games with PA and prosocial content, but only one instance where uses and gratification theory was partially supported.

The strength of the current study was the ability to test the assumptions of two contrasting theories. From a broad perspective, it appears as though there is much more merit for the GAM and GLM than there is for uses and gratification theory. This is not entirely surprising given the extensiveness of the research to date that has found effects of playing video games on behavioral outcomes (Anderson & Carnagey, 2009; Engelhardt, Bartholow, & Saults, 2011; Ewoldsen et al., 2012; Gentile et al., 2009). The second study is the longest longitudinal analysis of the effects of playing video games with various content on behavioral outcomes. This adds substantially to the literature by showing that there were long-term effects of playing video games with aggressive and prosocial content on adolescents PA, RA, and prosocial development. In adolescence, PA tends to peak at around age 15 (Karriker-Jaffe et al., 2008), and PB shows a gradual decrease throughout adolescence (Luengo Kanacri et al., 2013). Given the changes in aggression and PB throughout adolescence, this study has shown that the types of video games
that adolescents prefer to play has a small but significant impact on the changes in PA, RA, and PB.

It is noteworthy that there were distinct differences between the two current studies. There were no effects seen between preschoolers’ video game preferences and various behaviors, while there were consistent effects seen between adolescents’ media preferences and the behavioral outcomes. The GAM/GLM don’t indicate that media should have a greater influence in adolescence than in young children, so it is difficult to ascertain all of the reasons that may account for the differences. As noted in the first study discussion, it is likely that the lack of significance in preschoolers is due to the sample which was tested. The children in the study played video games with very little of the studied content. We would be very hesitant to generalize the findings beyond the current sample. There are a number of studies that have shown that different types of media have significant effects on preschoolers’ behaviors (Bankart & Anderson, 1979; Coyne & Smith, 2014), which supports the assertions of the GAM and GLM. Another examination of the effects of preschool age children’s media preferences and behavioral outcomes is warranted. It is our presumption that had the children played video games with higher and more varying levels of content, we would a significant effect.

One takeaway message to be gleaned from the current paper is that children and adolescents, and more importantly their parents or caregivers, should exercise judiciary caution in determining which video games children and adolescents play. Video games with RA and PA content can influence individuals to manifest higher levels of those same behaviors and in the case of video games with PA content, can decrease PB. Conversely, playing video games with prosocial content can lead individuals to become more prosocial.

Limitations and Future Directions
This study adds greatly to the literature on the effects of playing video games on various behaviors. However, there are some limitations worth noting. First, the samples used in the study come from relatively affluent populations. While measures were taken to ensure that the sample was ethnically diverse, overall the sample had a very high SES as measured by income and education. Given that constraint, it is prudent that generalizations from this study are not made onto a population not represented by these samples. It is possible that the effects could be entirely different were they measured in a more diverse sample drawn from a nationally representative population. This is probably especially true for the preschool sample that was analyzed.

Another limitation of this study is its lack of experimental manipulation. Because the information were collected from surveys over a number of years, it is possible that the effects seen here could be biased by a number of factors that influence participants’ survey responses. Because of this constraint, it would be unwise to assume that the effects seen from the analyses is indicative of a causal relationship. While the longitudinal design used for the analysis does help to circumvent the gap between purely correlational and experimental studies, it is impossible to know which other factors may have contributed to changes in behaviors. As with any study, the current analyses were limited to the number of variables available to it.

In future studies, it is essential that research continue to explore the effects of video game content on various outcomes. A thorough content analysis of RA in video games would be very beneficial for researchers to begin to understand how prevalent those behaviors are. The same could be said of PB in video games. Violence in video games is evidenced in more obvious ways than RA and PB are likely to be seen. Another area of research in need of further examination is with younger samples (i.e. preschool to middle school). With the increasing availability of video
games to children at younger ages, it is important to understand what kinds of behavioral effects are being influenced by the use of video games. Another important area in need of further study involves how the effect of video game content interacts with other variables. For example, a number of previous studies have shown that the effect of video game content differs as a function of gender (Gentile et al., 2011), with stronger effects generally seen for males than for females. Another interaction that has shown significance in previous studies is how time playing video games moderates the strength of the association between video game content and behavioral outcomes (Barlett et al., 2007). Finally, it is likely that most video games are filled with an array of different types of content. Even video games with more extreme levels of violence and aggression could also have varying levels of PB and/or RA content as well. It would be interesting to note how the content in video games interact in predicting various outcomes. It could be that the strongest effects are seen in games with higher levels of one type of content, and less of other types of content. For example, a video game with frequent displays of PA, and relatively few displays of PB may have a stronger effect on behavior than a game with an equal mix of PA and PB behaviors displayed.

In summary, this study is the longest longitudinal analysis of the effects of video game content on various behavioral outcomes. We used two separate theoretical models to predict (1) whether video game content has an influence on behavioral outcomes, (2) whether individuals with higher levels of behavioral attributes would increasingly prefer certain kinds of video game content, or (3) whether both were true. We found no significant relationships between video game content and the behavioral outcomes for the preschool age sample. There were significant relationships between each type of video game content and its’ corresponding behavioral outcome. The results lend support to the assumptions of the GAM and GLM, and very little
support for uses and gratification theory. This study is one additional piece of evidence to show that playing video games has a measurable effect on behaviors over a three-four year period.
References


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http://doi.org/10.1017/S0954579407070034


Table 1. Descriptive Statistics for Study 1.

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*p < .05; **p < .01; ***p < .001
Table 2. Correlations for Study 1.

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* p < .05, ** p < .01, *** p < .001
Table 3. Descriptive Statistics for Study 2

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*** p < .001; ** p < .01; * p < .05
Table 4. Study 2 Correlations

|          | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  | 16  | 17  | 18  | 19  | 20  | 21  | 22  | 23  |
|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1. PA VG 3 | 1   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 2. PA VG 4 | .62*** | 1 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 3. PA VG 5 | .48*** | .65*** | 1 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 4. PA VG 6 | .40*** | .56*** | .56*** | 1 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 5. PB VG 3 | .18*** | .04 | .00 | .00 | .00 | 1 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 6. PB VG 4 | .24*** | .31*** | .2*** | .16** | .33*** | 1 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 7. PB VG 5 | .14* | .19*** | .43*** | .06 | .20*** | .28*** | 1 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 8. PB VG 6 | .12* | .20*** | .21*** | .46*** | .14* | .20*** | .23*** | 1 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 9. RA VG 3 | .43*** | .27*** | .25*** | .16** | .33*** | .17** | .13* | .07 | 1 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 10. RA VG 4 | .35*** | .55*** | .36*** | .34*** | .12* | .35*** | .21*** | .12* | .54*** | 1 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 11. RA VG 5 | .26*** | .38*** | .55*** | .30*** | .02 | .11 | .47*** | .16*** | .35*** | .47*** | 1 |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 12. RA VG 6 | .24*** | .36*** | .34*** | .60*** | .07 | .17** | .11 | .48*** | .21*** | .49*** | .48*** | 1 |     |     |     |     |     |     |     |     |     |     |     |     |
| 13. PA 3 | .15** | .10* | .11* | .05 | .00 | .01 | .03 | .01 | .17*** | .15** | .06 | .14** | 1 |     |     |     |     |     |     |     |     |     |     |     |
| 14. PA 4 | .18*** | .15** | .15** | .09 | .03 | .01 | .01 | .01 | .16** | .23*** | .11* | .16** | .65*** | 1 |     |     |     |     |     |     |     |     |     |     |
| 15. PA 5 | .21*** | .17*** | .14** | .12* | .00 | .02 | .04 | .02 | .15** | .21*** | .20*** | .16** | .57*** | .74*** | 1 |     |     |     |     |     |     |     |     |     |
| 16. PA 6 | .12* | .11* | .13* | .05 | .02 | .02 | .04 | .02 | .13** | .19*** | .15** | .15** | .47*** | .55*** | .63*** | 1 |     |     |     |     |     |     |     |     |     |
| 17. Pros 3 | .20*** | .14* | .10 | .18*** | .03 | .04 | .02 | .12* | .11* | .08 | .08 | .14* | .31*** | .27*** | .32*** | .23*** | 1 |     |     |     |     |     |     |     |     |
| 18. Pros 4 | .19*** | .09 | .10 | .11* | .05 | .06 | .01 | .06 | .06 | .01 | .07 | .10 | .25*** | .25*** | .31*** | .27*** | .73*** | 1 |     |     |     |     |     |     |
| 19. Pros 5 | .23*** | .16*** | .17*** | .21*** | .04 | .03 | .01 | .06 | .13** | .11* | .11* | .16* | .23*** | .25*** | .31*** | .25*** | .64*** | .74*** | 1 |     |     |     |     |     |
| 20. Pros 6 | .12* | .08 | .09 | .12* | .04 | .08 | .00 | .00 | .09 | .08 | .04 | .13* | .17*** | .15*** | .2*** | .22*** | .52*** | .61*** | .70*** | 1 |     |     |     |
| 21. RA 4 | .00 | .00 | .01 | .00 | .01 | .01 | .01 | .07 | .09 | .09 | .05 | .12* | .36*** | .49*** | .43*** | .31*** | .13*** | .15*** | .15*** | .09* | 1 |     |     |
| 22. RA 5 | .02 | .04 | .02 | .01 | .04 | .03 | .03 | .01 | .05 | .14** | .13* | .09 | .27*** | .35*** | .48*** | .29*** | .16*** | .13*** | .16*** | .10* | .56*** | 1 |     |
| 23. RA 6 | .01 | .02 | .02 | .02 | .02 | .03 | .03 | .02 | .08 | .12* | .12* | .11* | .23*** | .3*** | .37*** | .37*** | .06 | .10* | .09* | .13*** | .42*** | .48*** | 1 |     |

*** p < .001; ** p < .01; * p < .05
Figure 1. GAM/GLM and the process of influencing short-term behavioral changes (Anderson & Bushman, 2002)
Figure 2. Effect of repeated video game playing via the GAM (Anderson & Bushman, 2002)
Figure 3. Effect of repeated prosocial video game playing via the GLM (Buckley & Anderson, 2006)
Figure 4. Motivation to play video games with various content as explained by Uses and Gratification Theory. (Hartman & Klimmt, 2006).
Figure 5. Final model between PA and video game content for study 1

$\chi^2 (20) = 17.50, p = .62; \text{RMSEA} = .00; \text{CFI} = 1.0$

Note: All coefficients are standardized, Standard Errors are in parentheses

***$p < .001$, *$p < .05$
Figure 6. Final model between PB and video game content for study 1

\[ \chi^2(20) = 18.50, \ p = .56; \ RMSEA = .00; \ CFI = 1.0 \]

Note: All coefficients are standardized, Standard Errors are in parentheses

***p < .001, *p < .05
Figure 7. Final model between RA and video game content for study 1

\[ \chi^2(20) = 15.65, p = .74; \text{RMSEA} = .00; \text{CFI} = 1.0 \]

Note: All coefficients are standardized, Standard Errors are in parentheses

***p < .001, *p < .05
Figure 8. Final model between PA and video game content for study 2

χ²(647) = 980.98, p < .001; CFI = .97; RMSEA = .037
Note: All coefficients are standardized, Standard Errors are in parentheses
*** p < .001, * p < .05, + p < .10
Figure 9. Final model between RA and video game content for study 2

\[
\chi^2(301) = 509.84, \ p < .001; \ CFI = .96; \ RMSEA = .034
\]

Note: All coefficients are standardized. Standard Errors are in parentheses

***p < .001, **p < .05, + p < .10
Figure 10. Final model between PB and video game content for study 2

χ² (1382) = 1959.59, p < .001; CFI = .94; RMSEA = .033

Note: All coefficients are standardized, Standard Errors are in parentheses

***p < .001, *p < .05, + p < .10
Appendix

Study 1

Physical Aggression Items

1. Your child kicks or hits others.
2. Your child verbally threatens to hit or beat up other children.
3. Your child pushes or shoves other children.
4. Your child verbally threatens to physically harm another peer in order to get what he/she wants.
5. Your child throws things at others when he/she doesn’t get his/her own way.
6. Your child verbally threatens to push a peer off a toy (e.g., tricycle) ruin what the peer is working on (e.g., building blocks) unless the peer shares.
7. Your child hurts others by pinching them.

Relational Aggression Items

1. Your child ignores a peer or refuses to listen (e.g., may cover his/her ears) if he/she is mad at that peer.
2. Your child tells other kids that he/she won’t play with them unless they do what the child wants.
3. Your child gives mean looks to others to make them feel bad.
4. Your child tells others not to play with or be a peers’ friend
5. When mad at a peer, your child keeps that peer from being in the play group.
6. Your child tries to embarrass peers by making fun of them in front of other kids.
7. Your child tells a peer they won’t be invited to his/her birthday party unless he/she does what the child wants.
8. Your child walks away or turns his/her back when he/she is mad at another peer.
9. Your child tries to get others to dislike a peer (e.g., by whispering mean things about the child behind his/her back).
10. Your child verbally threatens to keep a peer out of the play group if the peer doesn’t do what the child says.

Prosocial Behavior Items

1. Your child is good at sharing and taking turns.
2. Your child is helpful to peers.
3. Your child is kind to peers.
4. Your child says or does nice things for other kids.
5. Your child smiles at other kids.

Study 2
**Physical Aggression Items**

1. People who get me angry better watch out.
2. If someone tries to hurt me, I make sure that I get even with them.
3. If someone does something that I really don’t like, I yell at them about it.
4. I lose my temper and “let people have it” when I am angry.
5. I use physical force when angry.

**Relational Aggression Items**

1. I do not invite everyone to a party or other social event, even if I know that others would want to go.
2. When I have been angry at someone, I have tried to damage that person’s reputation by gossiping about them.
3. When mad at a person, I try to make sure that the person is left out from group activities.
4. When angered or provoked by another person, I react by giving that person the “silent treatment.”

**Prosocial Behavior Items**

1. I help people I don’t know, even if it is not easy for me.
2. I really enjoy doing small favors for people I do not know.
3. I go out of my way to cheer up people who seem sad, even if I do not know them.
4. I voluntarily help my neighbors.
5. I help other kids at school (with things like homework, sports, or other activities).
6. I volunteer in programs to help others in need (like food or clothing drives, service groups or other volunteer projects).
7. I am involved in service at my school (such as student council or student government).
8. I enjoy being kind to others, even if I do not know them.
9. I watch out for kids at school, even if I do not know them.