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The Association Video Gameplay has with College Students Academic Achievement and Aggression

La Asociación que el Uso de Videojuegos tiene con el Aprovechamiento Académico y la Agresión de Estudiantes Universitarios

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ABSTRACT

This study examined the association playing video games has with college students' academic achievement and aggression. Researchers used a cross-sectional research design with convenience sampling using an online survey. The sample consisted of 173 students from colleges in Puerto Rico. For the first objective, researchers performed a multiple linear regression with time spent playing video games, employment status, and hours worked as predictors of students' grade point average (GPA). The proposed model predicted five percent of the variance related to GPA, $F(3, 167) = 3.13$, $p = .03$, $r^2 = .05$. However, the only significant predictor was time spent playing video games. The results suggest that playing video games had a small negative effect on surveyed students' academic performance. Researchers performed a Pearson correlation between playing violent games and the Buss and Perry Aggression Questionnaire for the second objective. The results suggest no significant correlation exists between playing violent games and college students' aggression, $r(157) = .10$, $p = .23$. In conclusion, playing video games had a small negative effect on this study participants' academic achievement, but not on their aggression. Implications of these findings recommendations for future studies are discussed.

Keywords: video games, academic achievement, college students, aggression

RESUMEN

Este estudio examinó la asociación que tiene el uso de videojuegos con el rendimiento académico y la agresión de una muestra de 173 estudiantes universitarios. Los investigadores utilizaron un diseño transversal con muestreo

por conveniencia a través de una encuesta en línea. Para el primer objetivo, los investigadores desarrollaron un modelo de regresión lineal múltiple que incluía las variables de uso de videojuegos, situación laboral y horas trabajadas como predictores del promedio académico de los estudiantes. El modelo predijo significativamente el cinco por ciento de la varianza relacionada a las calificaciones de los estudiantes, $F(3, 167) = 3{,}13$, $p < 0{,}05$, $r^2 = 0.05$. A pesar de esto, el único predictor significativo fue el tiempo dedicado a jugar videojuegos. Los resultados sigieren que el uso de videojuegos tuvo un efecto pequeño y negativo en el aprovechamiento académico de los estudiantes encuestados. El segundo objetivo exploro a través de una correlación de Pearson la relación entre el uso de videojuegos violentos y la Escala de Agresión de Buss and Perry. Los resultados de este estudio sugieren que no existe una correlación significativa entre el uso de juegos violentos y la agresión r (157) = .10, p = .23. En conclusión, el uso de videojuegos tuvo un efecto pequeño y negativo en el rendimiento académico de los participantes del estudio, pero no en su agresión.

Palabras Claves: videojuegos, aprovechamiento académico, estudiantes universitarios, agresión

INTRODUCTION

The video game industry has expressed unprecedented growth in the last 30 years. According to a report by Newzoo, in 2021, this industry generated approximately 190.3 billion USD, 1.4% more than the previous year (Wijman, 2021). This is expected to increase to 545.98 billion USD by 2028. More and more people engage with these technologies every day due to their easy access to multiple platforms and inherently engaging capabilities. A report by the Entertainment Software Association in 2021 revealed that approximately 227 million people in the U.S identify as gamers, a 6% increase from the previous year. The popularity of these technologies has raised questions about the possible effects continuous engagement can have on players. Video games have been proven to be a highly engaging activity, evidenced by the steady increase in hours played (6.76 hours a week average by 2020) in the last decades (Limelight Networks, 2020). In one of the few video game studies in Puerto Rico, Rodriguez (2015) found that most gamers like to play between 5 to 15 hours a week. This has encouraged the scientific community to explore the possible detrimental effects of using these technologies. Among the most common adverse effects found in the literature are the impacts of gaming on players' academic performance and aggression.

Despite an abundance of literature, there is still no consensus on the potential effect video game can have on players' academic achievement and behavior. While some studies claim that video games can positively affect academic achievement (Concepcion et al., 2016; Ku et al., 2014; Hartanto et al., 2019), others have found negative associations between these variables (Hartanto et al., 2018). Some researchers claim video games provide engaging and cognitively stimulating experiences that promote development (Kuhn et al., 2019), while others have stated that playing video games can affect studying habits that, in turn, influence students' academic performance (Zahra et al., 2020). Similarly, there is much contention regarding the relationship playing violent video games has with aggressive or antisocial behavior. While some researchers claim that violent video games promote aggression (Anderson et al., 2010), others argue that this effect is overstated (Ferguson & Killbourne, 2010). It is important to assess how these technologies might affect college students' academic achievement and behavior. Therefore, this study explores if playing video games is associated with college students' academic achievement and aggression.

Video Games and Academic Achievement

One of the public's main concerns regarding video games is their potential effect on students' academic performance. Video games provide highly engaging experiences that might affect students' academic commitments. Scholastic activities often compete with these technologies, resulting in students dedicating less time to educational endeavors. A common explanation of this is the time displacement theory, which states that as time spent video games increases, activities such as doing homework, studying, or engaging in academic activities are relegated. This theory has been studied extensively, with most studies presenting adverse outcomes regarding the relationship between playing video games and academic

achievement (Wright, 2011; Burgess, 2012; Hartanto et al., 2018; Hua Chen et al., 2019; Gnambs et al., 2020; Sahin et al., 2014; Yeh & Cheng, 2016; Zahra et al., 2020). A study by Terry and Malik (2018) with 96 ninth-grade students found a significant weak negative correlation between playing video games and academic achievement for both male (*rho* = .27) and female (*rho* = .21) participants.

A similar study by Chen and colleagues (2019) found a small negative association between time spent playing video games and primary school students' academic achievement (r^2= -.13). Despite these findings, researchers did not find a significant association between gaming and academic achievement in secondary school students (r^2 = -.06). The previous study also suggested that playing video games on weekdays is more detrimental to academic achievement than playing on the weekends. Several studies have found similar results where gaming on weekdays seemed to harm academic achievement while paying on weekends had no effect or contributed positively to student development (Hartanto et al., 2018; Chen et al., 2019). Playing video games on weekdays can displace studying hours which explains the negative effects seen in the literature.

The literature regarding the effects of video games on college students' academic achievement is relatively scarce, despite gamers in the 18-34 category being the largest group (ESA, 2020). Studies with college students have found that playing video games negatively correlated with students' GPA and academic achievement (Wright, 2011; Burgess et al., 2012). Ferguson's (2015) meta-analysis revealed that playing video games was negatively correlated with academic achievement. However, the author considered the relationship between the two variables negligible due to the small effect estimated (r = -.01). Boxer and colleagues (2015) criticized Ferguson's study and interpretations and argued that the effect could not be disregarded despite being small.

Most of the studies reviewed presented negative correlations regarding video game use and academic achievement. Despite this, some studies point towards a positive association between gaming and academic achievement (Adachi & Willoughby, 2013; Hamlen, 2013; Concepcion et al., 2016; Ku et al., 2014; Hartanto et al., 2019). Video games have intrinsic engaging capabilities that might compete with students' responsibilities; however, they also can promote learning and cognitive development (Kuhn et al., 2019). Modern video games often consist of complex tasks, puzzles, and problem-solving scenarios that encourage cognitive development, enhancing academic skills. The literature review showed that playing video games was positively correlated with cross-sectional reading, mathematics, problem-solving skills, and GPA (Bowers & Berland, 2013; Adachi & Willoughby, 2013; Hamlen, 2013, Conception et al., 2016).

There is no consensus on the effects that playing video games have on academic achievement. The relationship between video games and academic achievement seems to be moderated by how much studying time is displaced by gaming. Small to moderate playing times have been found to have no effect, or in some cases, contribute to academic performance (Bowers & Berland, 2013; Adachi & Willoughby, 2013), while longer playing times have a negative effect (Hua Chen et al., 2019; Gnambs et al., 2020; Zahra et al., 2020). Another limitation in the current literature is that previous studies have failed to consider how other factors, such as employment situation and hours worked, contribute to understanding students' academic achievement. Adding another activity that can also displace students' academic hours can help us better understand the interaction between gaming and academic performance. College students are often employed to help mitigate higher education costs, further affecting studying hours and academic engagement. A study by Tessema et al. (2008) revealed that working more than 11 hours a week can negatively affect students' grades. Competing responsibilities can have a detrimental effect on college students' academic achievement. Therefore, this study considers how employment, hours worked, and time spent playing video games fit in a regression model to predict academic achievement.

Video Games and Aggression

Audiovisual technologies have been highly scrutinized because of the levels of violence presented in their content as means of entertainment. According to Barclay (2018), more than 90% of games rated E10+, teen or mature, have some form of violent content. Events such as the Virginia Tech campus shooting

(2007), the Sandy Hooks massacre (2012), Aurora massacre (2012), the Pulse shooting (2016), and, more recently, the shooting of Parkland Florida High School (2018) have all been linked by media outlets to video game violence. Video games' effect on a player's behavior is often explained through the General Aggression Model (GAM), which states that as we develop, we learn to perceive, analyze and respond to our environment, leading to developing structures or schemata that help us resolve everyday conflicts (Anderson & Dill, 2000). This cognitive scaffolding is built on the subject's experiences and interactions, which include, but are not limited to, engagement with video games.

According to Anderson and Dill (2000), video games can prime aggressive behaviors by rewarding violent or antisocial behavior. The constant rehearsal and conditioning of negative actions might have deleterious consequences on players' attitudes. The rising concern for these technologies has even prompted the American Psychological Association (APA) (2015) and The American Academy of Pediatrics (2016) to issue statements warning the public about these technologies' possible detrimental effects on behavior. However, APA would later reaffirm that the association between video games and aggression does not extend to violent outcomes (APA Reaffirms Position on Video Games, 2020). Studies regarding the association between video games and aggression have mostly found negative behavioral consequences (Zheng & Zhang, 2016; Kepes et al., 2017; Greitmemeyer, 2018; Prescott et al. 2018; Yao et al., 2019; Teng et al., 2019; Lopez et al., 2021 Zhang et al., 2021; Zhao et al., 2021).

Hasan et al. (2013) performed a long-term experimental study to explore the effect of violent games on hostile expectations and aggressive behavior. Their results revealed a cumulative effect of violent video gameplay on hostile expectations and aggressive behaviors. In another experiment, Zheng and Zhang (2016) divided 240 children into two groups to play a violent or nonviolent video game. The results of this study revealed a significant effect of game type (violent vs nonviolent) on aggression $F(1, 54) = 3.58$, $p < .05$) and trait aggressiveness $F(1, 47) = 4.18$, $p < .01$. The results of this study concur with GAM, in which playing violent video games made aggressive traits more accessible to players. Researchers have found similar results in college student populations (Yao et al. 2019; Li, 2022).

Despite this evidence, not all studies have found significant associations between video games and aggression (Decamp & Ferguson, 2016; Przybylsky & Orben 2019; Hilgard et al., 2019). These mixed results have sparked debates among the scientific community regarding the effects of video games on aggression. Some authors claim violent video games' effect on aggression should warrant the attention of parents and professionals (Anderson et al., 2010), while others state that the effects have been overestimated and, in most cases, are insignificant (Ferguson & Kilburn, 2009). In one of the most significant meta-analyses, Anderson and colleagues (2010) compiled 136 studies with 381 effect size estimates. The analysis results revealed that violent video games have a small to moderate effect on aggression, which the authors consider worrisome.

In response, Ferguson and Kilbourne (2010) point out several methodological issues that limit the interpretability of the results and mention other factors that can further influence a subject's aggression. For example, environmental circumstances, upbringing, and biological dispositions can be some of these factors (Ferguson & Kilbourne, 2010). Hildegard et al. (2017) reexamined Anderson and collaborators' 2010 meta-analysis and found a minor effect for experimental studies when publication bias is considered. The authors claim that these effects are smaller than previously thought and recommend using appropriate rhetoric when discussing the possible consequences of video games on behavior (Hildegard et al., 2107). Kepes et al. (2017) later criticized Hildegard et al., stating that the corrections used on the 2010 meta-analysis are inappropriate and these effect sizes should not be taken lightly. This lack of consensus prompted the present study to explore the association violent video games exposure has with aggression.

METHOD

Research Design

The present study has a cross-sectional research design with convenience sampling. The sample was recruited from various Universities and colleges across Puerto Rico. This study was approved by the University of Puerto Rico's Institutional Committee

for the Protection of Human Subjects (Protocol Number: 1819-197).

Participants

The original sample consisted of 284 college students from various colleges across the island. However, 111 cases were removed due to missing information, errors, and unfinished surveys. The final sample was 173 participants. The majority of participants identified as male (50.9%), followed by female (46.2%) and other (1.7%). A large part of the sample was working towards their bachelor's degree (74.4%) when completing the survey. Most participants admitted to working part-time jobs on average of 10.62 hours (*SD* = 12.69) a week.

Instruments

Online Survey. The online survey used in the study consisted of four sections. The first section compiled subjects' sociodemographic information; the second compiled information about gaming habits and preferences; the third section asked participants about their studying practices, and the fourth section was a Spanish adaptation of the Buss and Perry Aggression Questionnaire. In addition, the student's academic achievement was measured in Grade Point Average (GPA). According to Aand (2007), GPA is one of the better measures of academic achievement because it evidences continuous performance. Participants could complete the online survey using a personal computer, tablet, or phone in approximately 15-20 minutes.

Buss and Perry Aggression Questionnaire (BPAQ). The Spanish version of the BPAQ, like the original, is composed of 29 items that measure physical aggression (9 items), verbal aggression (5 items), anger (7 items), and hostility (8 items) (Andreu et al., 2002). The items are measured in a five-point Likert scale that goes from (1) extremely uncharacteristic of me to (5) extremely characteristic of me. Cruz and colleagues (2013) validated this instrument with 88 Puerto Rican adolescents and estimated an internal reliability of .88. The present study Cronbach Alpha coefficient for the total scale was .86, similar to the Puerto Rican validation study. In addition, the internal reliability was .64 for the physical aggression subscale, .74 for the verbal aggression subscale, .70 for the anger subscale, and .80 for the hostility subscale. These values are considered acceptable under traditional guidelines.

General Procedures

This study used an online survey constructed in google forms to collect information about the subject's sociodemographic characteristics, gaming patterns, studying habits, and aggressive behavior. The survey was promoted through emails and social media pages (Facebook and Instagram). In addition, researchers posted flyers across universities' campuses with a Quick Response Code and a link to the online survey. A fifty-dollar Amazon gift card was raffled as an incentive for completing the questionnaire. The data collection period started in September 2019 and ended in February 2020. The data collected was exported to SPSS version 27 for statistical analysis.

RESULTS

Gaming Habits

The survey asked participants about their gaming preferences and habits. This analysis revealed that most participants like to play video games (94.8%). Most gamers revealed that they play for entertainment (57.7%), sharing time with friends (13.1%), leisure (8.9%), or stress management (7.7). Among the most common video game platforms used are consoles (45.9%), phones (31.4%), and computers (14.5%). Participants reported playing an average of 2.55 hours (SD= 1.72) of video games a day. They also said that, on average, 1.78 hours (SD=1.21) a day were dedicated to playing violent games. The most popular game genres mentioned were action (27.2%), adventure (19.1%), role-playing, and simulation (11.6). Most players preferred playing by themselves (54.9%).

Studying Habits

Researchers also surveyed participants studying habits and the influence gaming has on them. Most participants revealed that they tend to dedicate a significant time to studying (54.9%), they also reported that they frequently or frequently complete their college work on time (68.3%). A considerable number of participants (69.6%) revealed that they have stopped studying to play video games. Despite this, most said they never (16.8%) or rarely do this (46.8%). The majority of participants said that neither their academic

performance (86.7%) nor studying habits (75.7%) are affected by their gaming routines.

Video Gameplay, Employment and Hours Worked Association with Academic Achievement

A multiple linear regression analysis was performed to explore if employment status, hours worked weekly, and time spent playing video games helped predict college students' academic achievement (GPA). Collinearity and homoscedasticity assumptions were met. The results of the analysis revealed that the model successfully predicted five percent of college students' GPA variance, ($F(3, 167) = 3.13$, $p = .03$, $r^2 = .05$). However, the only significant predictor was time spent gaming ($\beta = -.19$, $p = .01$). These results suggest that as time spent on video games increases, there is a small negative effect on students' GPA. Neither employment ($\beta = -.40$, $p = .30$) or hours worked ($\beta = -.01$, $p = .45$) were significant predictors of GPA.

Association Between Video Games and Aggression

This study also explored if playing violent games correlated with students' aggression. The sample was reduced to 157 after correcting for outliers. Researchers performed a Pearson correlation between time spent playing violent video games and Buss and Perry Aggression Questionnaire. As expected, there was a significant correlation between the subscales and the full scale of the BPAQ. However, there was no significant correlation between BPAQ and the time participants spent playing violent video games ($r(157) = .10$, $p = .23$). Neither the subscales nor the full scale correlated significantly with violent video gameplay. This analysis suggests that playing violent video games is not associated with college students' aggression.

Table 1

Analysis of Variance.

	Sum of squares	Df	Mean Square	*F*	Sig.
Regression	20.867	3	6.956	3.128	.027
Residual	371.356	167	2.224		
Total	392.222	170			

Note. a. Dependent Variable: Grade point average. b. Predictors: Time spent gaming, employment status, and hours working.

DISCUSSION

This study explored whether time spent playing video games was associated with academic performance and aggression. The results of the first part of the study revealed that a model that includes employment status, hours worked, and video game exposure can successfully predict five percent of the variance related to GPA. However, a closer look at the regression model reveals that playing video games is the only significant predictor of academic achievement. These results point towards a negative association regarding time spent playing video games and students' GPA. These results coincide with similar studies where video games were found to have a detrimental effect on academic performance (Weis & Cerankosky, 2010; Wright, 2011; Burgess, 2012; Sahin et al., 2016; Yeh & Cheng, 2016; Hartanto et al., 2018; Hua Chen et al., 2019; Gnambs et al., 2020; Zahra et al., 2020). These findings are especially interesting considering that most students revealed that gaming has never or rarely affected their studying habits. In addition, many students thought that gaming did not harm their academic performance. This study's findings were similar to Wrights (2011), where time spent playing video games only accounts for a small portion of the variance of academic performance.

Contrary to our hypothesis, being employed and hours worked were not significant predictors of academic achievement. This might be due to work often being a planned activity, and students can program their studying hours around them. However, gaming can be a spontaneous activity that can happen anytime, even during studying hours. It is essential to mention that the effect found in our study is relatively small. Environmental, social, and biological factors probably contribute more to understanding students' academic achievement. As with other studies, video gameplay's effect on academic achievement was minor, suggesting that it is not as important as other factors when considering academic achievement (Wright, 2011; Ferguson, 2015).

Table 2

Time Spent Playing Video Games, Employment Status and Hours Worked a Week as Predictors of Academic Achievement

Variable	B	SE	95% CI	β	T	Sig.	Tolerance	VIF
(Constant)	6.165	.717	[4.748, 7.581]	-	8.592	.000	-	-
Time Spent Gaming	-.188	.070	[-.327, -.050]	-.211	-2.683	.008	.919	1.088
Employment Status	.-.404	.385	[-1.165, .357]	-1.33	-1.049	.296	.351	2.852
Hours Worked	-.012	.015	[-.042, .019]	-.098	-.764	.446	.344	2.904

Note. r^2= .05

Table 3

Pearson's Correlation Between Aggression and Time Spent Playing Violent Video Games

Factors	1	2	3	4	5
1. Time spent playing violent games	-				
2. Physical aggression subscales	.154 [-.001, .30]	-			
3. Verbal aggression Subscales	.026 [-.13, .18]	.302** [.15 .44]	-		
4. Anger subscale	.053 [-.10, .21]	.103 [-.05, .25]	.362** [.22, .49]	-	
5. Hostility subscales	.039 [-.12, .19]	.139 [-.02, .29]	.323** [.18, .46]	.549** [.43, .65]	-
6. Buss and Perry full scale	.095 [-.06, .25]	.485** [.36, .60]	.626** [.52, .71]	.754** [.68, .81]	.820** [.76, .87]

Note. ** Correlation is significant at the .01 level. Confidence intervals are estimated at 95% inside the brackets.

The second analysis explored the association violent video gameplay has on aggression. Despite the overwhelming body of evidence suggesting violent video games have a negative effect on aggression (Anderson et al., 2010; Hasan et al., 2013; Zheng & Zhang, 2016; Kepes et al., 2017; Greitmemeyer, 2018; Prescott et al. 2018; Yao et al., 2019; Teng et al., 2019; Lopez et al., 2021 Zhang et al., 2021; Zhao et al., 2021) we did not find significant findings. Neither the subscales nor the full BPAQ correlated significantly with violent video gameplay. Thus, the results of this study do not support the theory that violent video games increase players' aggression.

This study has many limitations; among them are the cross-sectional design, sample size, and sampling method used. Future studies should consider using randomized, experimental, and longitudinal techniques to explore the effect of video games on academic achievement and aggression. We also recommend multivariate analysis that considers developmental, social, and environmental factors. The generalization of video games as good or bad oversimplifies a complex medium of entertainment that continues to evolve. Most of the effects estimated in this and previous studies are small, suggesting that video games might not be as detrimental to players as

previously thought. However, more evidence is needed to understand these technologies' effects on students. Modern video games continue to evolve, providing more immersive and complex experiences, which warrants the scientific community's continued attention while recognizing the complexity of the medium studied. Understanding the effects of video games can help researchers, parents, and policymakers make informed decisions regarding the use and regulation of these technologies.

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Informed Consent: All participants completed an informed consent form.

Review Process: This study has been reviewed by external peers in double-blind mode.

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