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Violent Video Games and Aggression Among Young Adults: The Moderating Effects of Adverse Environmental Factors

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Abstract

Research is divided on the effects of violent video games (VVGs). Some scholars claimed that VVG promotes aggression, reduces empathy, increases self-injury, and externalization, whereas others claim that a minimal or, in some cases, no traits as reported by the former is associated with playing VVGs. This study provides evidence to support claims that VVG is associated with aggressive behavior among young adults. However, the study focused more importantly on the moderating effects of adverse environmental factors on this relationship from a cross-cultural perspective. A total of 3,219 young adults between 18 and 35 years sampled from colleges and game centers in Ghana and China provided support for this study. We adopted a parallel moderated-mediation regression analysis and found that increased exposure to VVG is associated with reduced empathy concerns, aggression-related thoughts, and increased aggressive behavior. Although controlling for gender, setting, and location, the results pointed to the magnifying effects of the adverse environments in explaining the association between VVG and aggressive behavior. This study thus provides strong support for the frequently debated adverse effects of playing VVG among young adults with a particular reference to environmental factors and will hence aid in communicating a more representative viewpoint on the effects of VVG.

Keywords: violent video games, empathy concerns, aggression-related thoughts, aggression behavior, gamers

Introduction

TECHNOLOGICAL ADVANCEMENT AND the accessibility of the Internet have affected every dimension of human life. Video games (VGs) are currently among the popular entertaining activities across ages.¹ Literature indicates that >90 percent of US children and >97 percent of adolescents from 12 and to 17 years in the United States and China play VG with about 15 hours of weekly screen exposure.² Studies have shown that >85 percent of all VGs contain some level of violence.³ However, the effects of violent video games (VVGs) remains debatable in the literature.² Some studies argued that VVG leads to physiological desensitization to violence, aggression-related thoughts, and feeling.^{4,5} However, some other studies found VGs, in general, have positive effects on children.⁶ Many of the existing studies with these parallel findings turn to evaluate the immediate and short-term noticeable effects minutes after playing (priming) mostly among only college students and children, which is adequate but not sufficient. The

problem posed by such a conclusion is that college students are under supervisory principles and regulations that are likely to restrain their actions and reactions. Most college students engage only in casual video games.⁷ It is worth mentioning that no group is immune to violent media, as it has become a very predominant theme within modern media. Therefore, focusing only on children and adolescence will not present a comprehensive understanding of VVG.⁸ It is crucial to expand the scope and to keep in mind that VVG's exposure is just one peril cause of aggressive behavior. As noted by the American Psychological Association as one of the myths associated with VVG, it is inconclusive to assume that VVG is the only cause on increases in youth aggression without recourse to other factors such as adverse environments.⁹

In a meta-analytic review, Ferguson argued some key points worth noting. First is the question of sample size in determining the statistical significance of results on VVG. Based on the fact that statistical significance is subtle to sample sizes, it is crucial to consider the sample size in concluding on the

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association between VVG and aggressive behavior. Next, the setting and method (correlation or laboratory experiment) showed up. The author argued that studies based on laboratory experiments are inconsistent and misleading.¹⁰ A typical example is an experiment with a computer noise blast level that concluded that a higher noise level is related to external aggression.¹¹ It was later criticized that such claims are based on indirect and unsubstituted methods that have never been associated with any actual crime or violence.¹⁰

From the divided front on the choice of samples, setting, and the conclusion on the effects of VVG in literature, this study presents a cross-cultural perspective of VVGs and aggressive behavior. First, we combined samples from both developed (China) and developing (Ghana) country. We sampled active gamers from both universities and game centers. Whereas we are not comparing the effects between the two countries, we believe this provides a more general view of the phenomenon and will shed significant insight into VVG's effects on aggressive behavior.

Theoretical Framework and Hypotheses

VVG exposure time and aggression

Evidence exists that the exposure time of playing VVG upsurges aggressive behaviors.^{12,13} The longer an individual is exposed to VVG, the more likely it is to have aggressive behaviors, feelings, and thoughts. These are seen in studies from both Eastern and Western countries.^{1,14} Even though males devote more time than females playing VVG, VVG exposure increases aggressive thoughts, feelings, and behaviors in both.³ We, therefore, hypothesize that:

H1: VVG exposure will have a positive association with aggressive behavior.

Even though strong arguments are supporting VVG, aggressive-related thoughts (ARTs), and priming effects, this assumption is valid if the later happened in proximity to the gameplay.^{2,15} Some meta-data points to the possibilities of VVG contributing to priming, ART, and feeling, which results in aggressive behavior.^{14,16} The general aggressive model explained that social knowledge develops over time through a learning process influences behavior. Specifically, aggression comes from the activation and application of ART stored in memory from exposure to violent media¹⁷ We hypothesize that:

H2: VVG will have a positive association with ART.

H3: ART will have a positive association with aggressive behavior.

Some scholars also claimed that VVGs reduce empathy and promote aggression.^{1,14} In a related study, the author put up a strong justification that the exposure to VVGs is a contributing risk factor for increased aggressive cognition, behaviors, and affect and results in decreasing empathy and prosocial behavior among gamers.¹⁴ Repeated exposure to VVG leads to considerable reflective ART structures backed by aggression scripts, inherent attitudes, and beliefs that support aggressive acts.¹⁸ The combination of these factors promotes lack of empathy, physiological desensitization, and lack of tolerance

causing diminishing emotional responsiveness to a negative, positive, or aversive stimulus. Some therapists also suggest that prolonged contact with VVG and gruesome acts of violence, suffering, and pain to others will impact one's physiological responses to future scenes of violence and empathy concerns of victims.¹⁹ The short-time effects might result in priming; however, repeated exposure impacts the overall psyche of the individual.²⁰ We, therefore, proposed that

H4: VVG exposure will influence empathy concerns negatively.

H5: Empathy concerns will have a negative association with aggressive behavior.

The environment is the surest way of propagating aggressive behavior. Children and young adults learn to act violently through the simple observation of aggressive models.²¹ Witnessing violence and aggression is known to lead to arrays of negative consequences for children. Violence and aggression result both from witnessing actual violence at home and public places²² as well as from the media (active or passive).²³ Paradoxically, governments, social bodies, and parents take great cautions to keep children from witnessing violence but often failed in keeping children from viewing and partaking in violent television shows, movies, and VG.²⁴ Other environmental factors that may influence aggression are child abuse, poverty, crime, and antisocial behavior at childhood, early neglect, child maltreatment, exposure to substance abuse and weapons, lighting, law enforcement, and greenspace of urban-dwelling, noise, temperature, and overcrowding.²⁵⁻²⁸ The research acknowledged that people would act differently when placed in different environments.²⁹ Individuals exposed to adverse environmental stress early in life are at risk for antisocial and aggressive behavior.³⁰ Thus, it will be vital to treat the effects of the environment as a magnifier in predicting aggression. We hypothesize that:

H6: Adverse environment will moderate the effect VVG has on aggressive behaviors.

H7: Adverse environment will moderate the influence of ART on aggressive behaviors.

H8: Adverse environment will moderate the effect of empathy concerns on aggressive behaviors.

There is evidence of boys being indulging mostly in VVG and are noted for more aggressive behaviors compared with girls.³¹ It is, therefore, critical to controlling gender and the place of play (country). Institutional regulations guide college students who, in many instances, play VG to reduce academic stress.³² Research has also demonstrated the magnifying role of environmental factors on aggression, where Quebec monozygotic and fraternal twins assessed for aggressive behavior.³³ Bearing in mind the differences in the settings of data collection (college and game café), we deemed it vital to control the setting in this study.

We summarize our hypotheses in Figure 1.

Methods and Participants

This study sampled a total of 3,219 young adults between the ages of 18 and 35 years from China and Ghana. We focused directly on the actual gamers with a minimum of 2

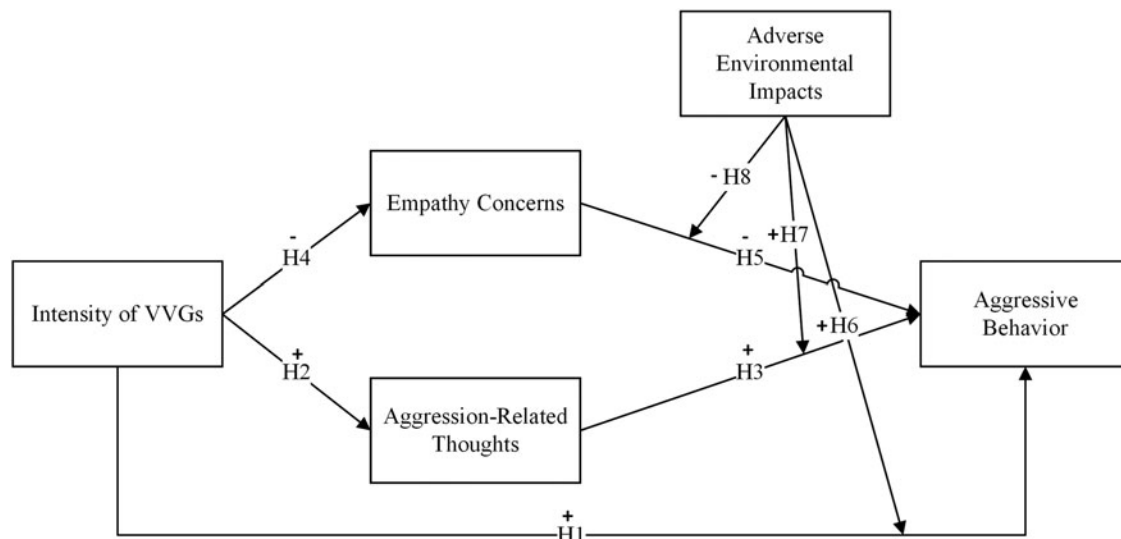


FIG. 1. Research framework.

months of playing experience. Data were collected across 15 game centers (café) and nine universities between August 2018 and March 2019. The choice of the two countries is based on infrastructural and environmental differences. Whereas, for example, proper identification of the gamer using a national ID is required to play in cafés in China with surveillance cameras and good lighting installed, these features are missing in the Ghanaian setting. The cost and the availability of Internet and technology devices are also not the same. Written permission was sorted from managers of gaming café, and participation was based on willingness upon explaining the concept of the study. A statement that respondents can exit the survey at any time if they feel uncomfortable was added as a preamble. All items administered to college students were channeled adequately through the respective student leadership. Ethical clearance was granted by the school of Management and Economics, university of Electronic Science and Technology of China (Institutional Review Board) prior to questionnaire administration. The survey came in the form of QR codes, URLs with few hard copies for some cafés in Ghana. A total of 267 incomplete items were excluded using listwise deletion method as these are randomly missing data that do not affect any particular class of respondents. Sixty-seven other missing data were computed using the multiple-imputation feature in SPSS.³⁴

VVG's exposure was measured by experience (how long have you played VVG (in months) and the frequency of exposure from several times a year to several times a day). We adopted existing scales, aggression was measured on a 5-point aggression questionnaire (Cronbach's $\alpha=0.88$) scale (extremely uncharacteristic of me to extremely characteristic of me) and includes "I often find myself disagreeing with people if someone hits me, I hit back, I have threatened people I know." Empathy concerns were measured with a 5-point 20 items adopted from the two-factor (cognitive and affective; Cronbach's $\alpha=0.71$) "basic empathy scale" (strongly disagree to strongly agree).³⁵ ART items included a modified version of the "schedule of imagined violence" (eight items).^{36,37} Some items are "How often do you have daydreams or thoughts about doing damage to or injur-

ing other people?" Three additional items were adopted and modified form the emotional susceptibility scale.³⁸ They include, "Sometimes I feel on edge," "I think it takes very little for things to bug me" (Cronbach's $\alpha=0.76$). We applied back-translation to the instruments from English to Chinese and back to English by a certified translation company to ensure consistency and avoid misunderstanding. We then pretested the instruments on 10 Chinese and 10 native English speaker bilinguals for construct validity. The internal consistency of the instruments (not including the controlled variables) was 0.87. In measuring possible environmental factors that trigger aggression, we included temperature,²⁶ noise, lighting, safety and security, and overcrowding, easy access to drug, and availability of alternative entertainment²⁸ measured on a 5-point scale.

The descriptive statistics point out that about 13.7 percent of the participants played VVGs for <5 months, whereas about 40.3 percent have >2 years of gaming experiences with varied gaming frequencies. About 83 percent were males, with 62.3 percent sampled from China. A little less than half (48.7 percent) of valid responses came from college students.

A moderated serial mediation regression analysis using SPSS PROCESS (model 5 and 15) macros was employed for the analysis of the results. All path estimations are based on 10,000 bootstraps of samples at a 95 percent confidence interval.^{39,40}

Results

Table 1 shows the correlation between the key variables. It is noted that males are generally more immersed in VVGs than females ($r=-0.09, p<0.01$). From a location perspective, the respondents from the Chinese gamers are more experienced compared with their Ghanaian gamers ($r=0.38, p<0.01$). We noted that as the level of environmental hostility reported an increase, so is the VVG's exposure (experience and frequency) of the gamers ($r=0.55, p<0.01$). More intense gamers turn to have more aggression-related thoughts ($r=0.43, p<0.01$) and less empathy ($r=-0.31, p<0.01$). The gamers with more hostile environmental impacts are associated with less empathy concerns ($r=-0.35, p<0.01$), high on aggression-related

TABLE 1. DESCRIPTIVE STATISTICS AND CORRECTION OF KEY VARIABLES

Constructs	1	2	3	4	5	6	7	8
VVG's intensity	—							
Gender	-0.09**	—						
Location	0.38**	-0.18**						
Setting	0.23*	0.15*	0.23	—				
Environmental impacts	0.55**	-0.14**	0.71**	0.13*	—			
Empathy concerns	-0.31**	0.065**	-0.35**	-0.56	-0.37**	—		
Aggression-related thoughts	0.43**	-0.23**	0.73**	0.58**	0.70**	-0.40**	—	
Aggressive behavior	0.45**	-0.11**	0.58**	0.88**	0.79**	-0.35**	0.62**	—
Min	1				1	1	1	1
Max	6				5	5	5	5
Mean	4.11				3.86	2.42	3.97	3.63
SD	1.51				1.28	0.51	1.34	1.04

df=3,218.
SD, standard deviation; VVGs, violent video games.

thoughts ($r=0.70, p<0.01$), and actual acts of aggression ($r=0.62, p<0.01$). Finally, the results also point to the fact that higher aggression-related thinking gamers are more likely to act more aggressively ($r=0.62, p<0.01$).

To demonstrate the influence of adverse environmental effects, we presented the proposed model with and without the moderating influence of environmental factors in Figures 2 and 3, respectively.

After controlling for gender, location, and setting VVG exposure explained 57 percent of variance in an ART in youth gamers ($a_2=0.16$, lower limit [LL]=0.139, upper limit [UL]=0.18). It suggests that as VVG exposure increases, the likelihood of ART. These thoughts are associated with actual aggressive behaviors. From H3, the results provided an effect size of $b_2=0.27$, LL=0.24, UL=0.30 to support H2 and H3. The direct and indirect effects of VVG exposure resulted in produced significant effects such that an

increase in one standard deviation in VVG exposure resulted in a 0.19 increase in aggressive behavior ($p<0.01$, LL=0.10, UL=0.36) to support H1.

We tested for the possible effects of VVG on empathy concerns. It is noted that, about 16 percent of the reduction in empathy concerns is explained by VVG exposure ($a_1=0.70$, LL=-0.08, UL=-0.058). VV gamers are likely to develop weaker empathy concerns. However, the more empathy gamers feel, the less aggressive they become ($a_2=-0.14$, LL=-0.20, UL=-0.081). VVG, empathy concerns, and ART together explained 46 percent of the variance in the aggressive behaviors of gamers. Although this evidence is huge enough to conclude on this relationship, it will be overemphasized without the consideration of the role the general environment of the gamer has on its aggressive behaviors.

We introduced the possible moderating effect of adverse environmental factors in Figure 3. From an effect size of

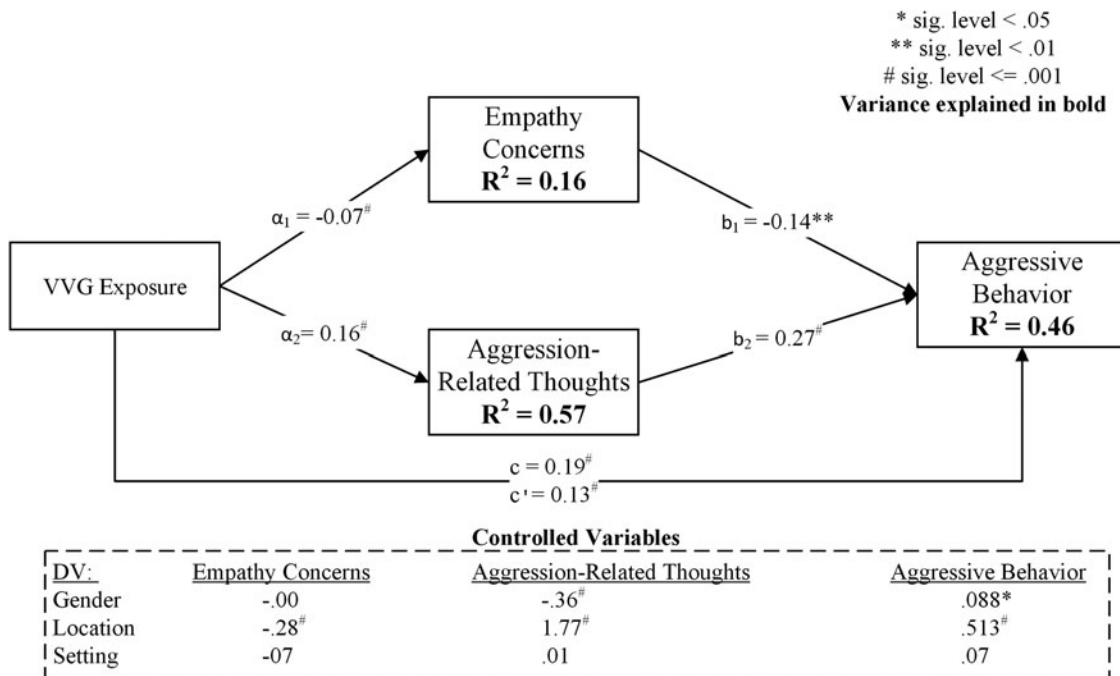


FIG. 2. Impact of VVG on aggressive behavior. VVG, violent video game.

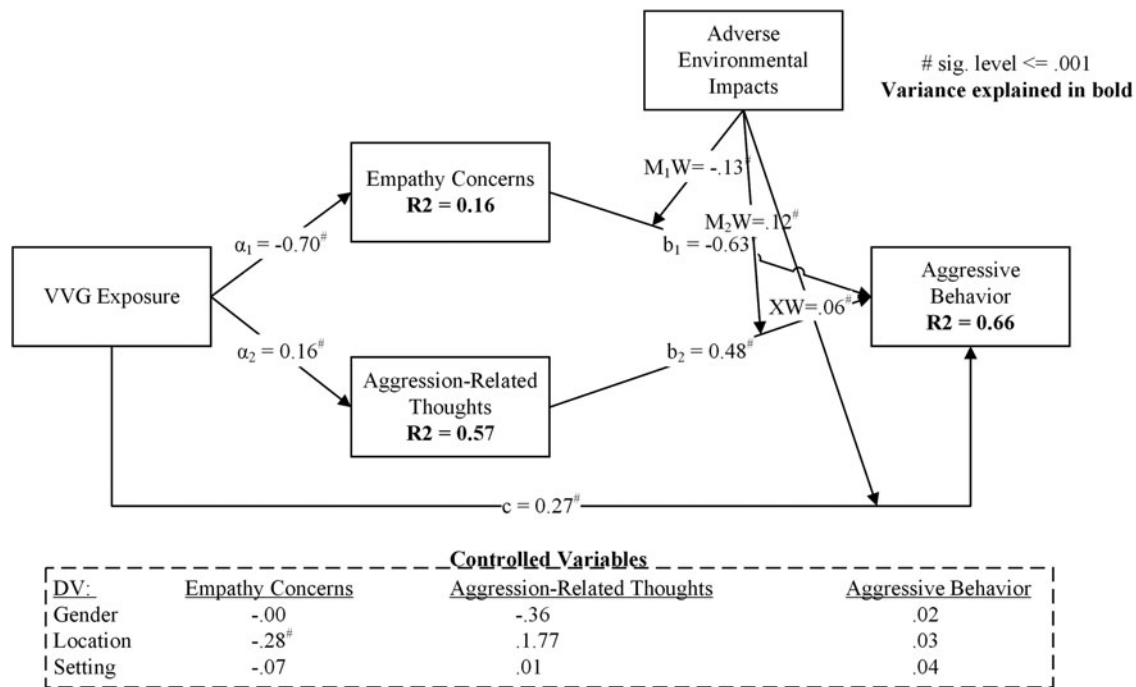


FIG. 3. Impact of VVG on aggressive behavior moderated by adverse environmental factors.

0.19, VVG exposure with the moderation amplification of environmental impacts shot to 0.27 (LL=0.21, UL=0.33). This points to the significant role the environment plays in how VVG influences aggressive behavior to support H6. In less adverse environments, the effects of empathy increased with a decreasing impact on aggressive behaviors from -0.14 to -0.63. The impacts of adverse environmental effects are more conspicuous in the total variances explained in aggressive behaviors. The direct VVG-related variables together explained 46 percent of the changes in gamers' aggressive behaviors. With the consideration of the influences of the environment, the variance explained significantly hiked to 66 percent. The effects of the controlled variables, as indicated in Figure 2, were significant for most of the interactions. However, environmental impacts proved to have a greater influence as its introduction reduced most of the controlled variables in both the effect sizes and significance shown in Figure 3. This provides supports to H6 (xw = .06, p < 0.001), H7 (M₂W = 0.12, p < 0.001), and H8 (M₁W = -0.13).

We present a partial mediation path in Table 2. The mediation paths measured produced some significant effects. The apparent effects were at 1 standard deviation (SD) above the mean in the case of VVG's intensity to aggressive behaviors through empathy concerns. Furthermore, at 1 SD above the mean in the case of VVGs to ART.

Discussion

This study aims to explore the environmental amplification of the effects of VVGs on aggressive behaviors. We sampled active gamers with a minimum of 2 months of playtime from across Ghana and China, including university students and gamers who patronize cafés. We focused on young adults between the ages of 18 and 35 years. We presented results that corroborate previous findings pointing to VVG as associated with aggressive behaviors. However, VVG is one of the many reasons for aggressive behaviors. First, this study supports claims that VVG is associated with

TABLE 2. PARALLEL MEDIATION BETWEEN EXPOSURE TO VIOLENT VIDEO GAMES AND AGGRESSIVE BEHAVIORS

Direction	Path	B	SE	95 percent CI		Hypothesis support
				LL	UL	
Indirect VVG>Emp>AB	+1 SD	0.02	0.00	0.01	0.03	Yes
	M of w	0.001	0.00	-0.00	0.01	
	-1 SD	-0.00	0.00	-0.01	0.00	
Indirect VVG>AT>AB	+1 SD	0.03	0.00	0.02	0.04	Yes
	M of w	0.02	0.00	0.01	0.02	
	-1 SD	0.02	0.00	0.01	0.02	

N=3,219.

B=unstandardized B coefficients; SE=standard errors; CI=bias-corrected and accelerated 95 percent confidence interval; LL=lower limit; UL=upper limit; VVG=violence video game exposure; Emp=empathy concerns; AT=aggressive thoughts; AB=aggressive behavior; 10,000 bootstrap samples.

increased ART and feelings,³ which partially explains aggressive behavior. Next, our findings also supported claims that VVG is associated with a reduction in empathy concerns instead of showing empathy to the vulnerable.² Our findings point to a significant association between aggressive behaviors and VVGs.^{12,13} However, we acknowledged that there are other possible amplifiers, which will give an in-depth understanding. The hostility of a gamers' environment, in particular, provided a different dimension to how VVGs impact aggressive behaviors. Our finding supported the possibilities of an adverse environment being an amplifier of the VVG-associated aggression.²¹ Gamers found in environments with less lighting and safety, high temperature, noise, overcrowding, easy access to drugs, and less alternative entertainment options and social supports,²⁵ reported high acts of aggression.

This study supports the many other existing studies that drew some connection between VVG and aggressive behaviors. We, however, made a further discovery of the amplification roles of adverse environmental factors that play on gamers' aggressive behaviors. We pointed to some crucial factors (country-level differences: developed and developing), the setting (colleges and cafés) in addition to age and gender. But more importantly, the impact of the environment is worthy of further investigation.

First, it will be prudent not to limit sample sizes to only college students. The problem with such a conclusion is that college students are under guiding principles and regulations that are likely to restrain their reaction, actions, and inaction. Most college students engage only in what is known as casual video games.⁷ Many college students are also said to use VGs to reduce academic stress. Thus, VGs promote cognitive, motivational, emotional, and social benefits among such study populations.³² Expanding the sample population beyond but including college students is vital.

Secondly, VVGs are heavily dependent on other factors such as technology devices, technology usage, and experience and the availability of Internet connectivity. It is essential to consider a cross-cultural dimension in the conclusion and generalization of any such results.

Finally, there are many other interpersonal, cultural, and social factors that influence behavior. In this case, we considered environmental impacts. It will be unfair to draw any links between VVGs and aggressive behaviors without reference to any and some of these other factors.

Conclusion

Even though we succeeded in shedding significant insights into the impacts an adverse environment may have on VVGs-related aggressive behaviors in a multicultural setting, we believe the debate is not over yet. Other possible factors, including psychiatric and records of violence, should be considered in future study to arrive at more concluding links between VVG and aggressive behavior. This study used a cross-sectional data set, which is liable as far as behavioral analysis is concerned. Such data cannot be used to explain cause and effect explicitly.⁴¹ The back translation of the questionnaire could pose validity problems even though we applied all the needed mechanisms to reduce it. It is, therefore, vital to apply the results in this study with caution. VGs in general and VVGs, in particular, are becoming more

popular across all media platforms and ages. Preventing exposure to VVG will be a difficult task. It is crucial to develop, promote, and improve prosocial values and facilities in the fight against aggression among young adults.

Author Disclosure Statement

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