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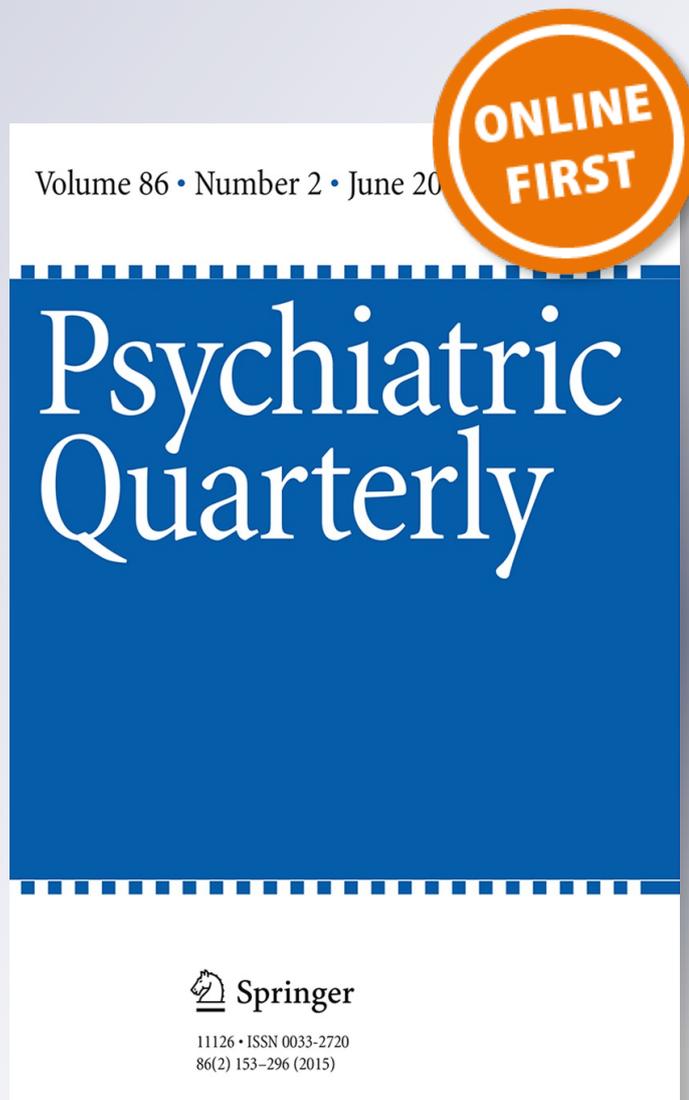
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Psychiatric Quarterly

ISSN 0033-2720

Psychiatr Q

DOI 10.1007/s11126-015-9361-7



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Violent Video Games Don't Increase Hostility in Teens, but They Do Stress Girls Out

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Abstract The impact of violent video games (VVGs) on youth remains unclear given inconsistent results in past literature. Most previous experimental studies have been done with college students, not youth. The current study examined the impact of VVGs in an experimental study of teens (12–18). Participants were randomized to play either a violent or non-violent video game. Teens also reported their levels of stress and hostility both before and after video game play. Hostility levels neither decreased nor increased following violent game play, and Bayesian analyzes confirmed that results are supportive of the null hypothesis. By contrast, VVG exposure increased stress, but only for girls. The impact of VVGs on teen hostility is minimal. However, players unfamiliar with such games may find them unpleasant. These results are put into the context of Uses and Gratifications Theory with suggestions for how medical professionals should address the issue of VVG play with concerned parents.

Keywords Video games · Violence · Adolescents · Stress

Introduction

The issue of whether VVGs impact youth hostility remains hotly contested in the scholarly community. Professional organizations such as the American Academy of Pediatrics [1] and American Psychological Association [2] have released policy statements linking VVGs to problematic behaviors in youth. However, these statements have been controversial, with some scholars arguing that they are misleading and biased [3]. Recently a group of over 230 scholars have written to the American Psychological Association [4]

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asking that their policy statement be retired due to inaccuracies in this statement. Thus, the issue of whether VVGs do or do not contribute to hostility in youth remains unclear.

Recent longitudinal studies of VVG play and risky aggressive behaviors among youth have failed to support beliefs in long term effects. Such studies have suggested that VVG effects are miniscule and may be due to competitive aspects of the games rather than violent content [5] or are entirely negligible [6]. Others have suggested that the impact of video games on youth well-being may be dose specific, with the best outcomes for moderate users, with both non-users and addicted users demonstrating greater problems [7]. Even in such circumstances, video game effect sizes appear to be very small, potentially of little practical significance. One recent meta-analysis of studies of VVG use in children found that the evidence for harmful effects on a range of mental health related outcomes, including aggression, was weak [8]. However, it remains possible that short-term effects of VVG exposure may exist even if long-term effects appear to be less of a concern.

To date, approximately one hundred experimental studies of VVG effects have been conducted, although the majority of these have been with college students and have demonstrated considerable methodological weaknesses [9]. Such studies often match violent and non-violent game conditions poorly introducing significant confounds [10]. Many also use unstandardized aggression outcome measures, with a demonstrated potential for false positive results [11] or which have proven difficult to replicate [12, 13]. Thus, room still remains for experimental studies of youth using better methodology.

One way of addressing the potential for false-positive results that can occur in good-faith when scholars reanalyze results over and over until they get results they expected to see is through the pre-registration of research protocols. Such pre-registration effectively locks in a data analysis plan, reducing the flexibility that scholars have to reanalyze data repeatedly using different strategies until results in line with prior expectations are achieved. Indeed, prior meta-analysis has indicated that researcher expectancy effects have likely resulted in spurious results in VVG research [8]. Increased use of pre-registered designs with standardized well-validated outcomes could help elucidate true effects in this field. With this in mind, the current study seeks to improve upon existing data by using standardized outcome measures with a pre-registered research design. The current study will examine the evidence for two hypotheses, namely:

H1 VVG exposure results in short-term increases in hostility in youth.

H2 VVG exposure results in short-term decreases in stress in youth.

The second hypothesis was included to examine commonly expressed beliefs by youth that video games, including VVGs can reduce stress. Some previous research has indicated that both violent and non-violent games are effective in reducing provoked stress in youth adults [14] but the current design will examine this in a sample of youth using day-to-day rather than provoked stress.

Methods

As noted above, the basic design, hypotheses and analyses were pre-registered through the Open Science Framework: <https://osf.io/vn3zk/> Initial plans were made to assess parental media supervision but, in some cases, the adolescents who participated were 18 and unaccompanied by a parent and, thus, this measure was dropped from the initial plan.

Participants

Participants in the current study were 43 youth (12–18) recruited from a small local community in the south of the United States. Participants were offered a \$10 gift certificate as compensation for their participation. A majority of the participants (67.4 %) were male and Caucasian American (74.4 %) with smaller numbers of African American (9.3 %) Hispanic (7.0 %) or Asian (2.3 %) youth as well as those who identified as “other” (7.0 %). Mean age of the participants was 15.37 (SD = 2.38).

Measures

Trait Aggression

In addition to a demographic form including self-reported video game consumption, youth were asked to fill out the 15-item short form of the Buss and Warren [15] aggression questionnaire (AQ). This Likert scale survey is designed to measure trait aggression and served as a control variable in the current study. Coefficient alpha with the current sample was .72.

State Hostility

Feelings of hostility were operationally defined as the total score on the State Hostility Scale [16]. The State Hostility Scale (SHS) is a 35-item, 5-point Likert-type scale in which respondents are asked to report their current mood. A series of adjectives are presented to the respondent and they are asked to rate how strongly they disagree or agree (i.e., 1 for “strongly disagree” and 5 for “strongly agree”) with each word. In this study, the SHS was highly reliable at pretest (Cronbach’s $\alpha = .83$) and posttest (Cronbach’s $\alpha = .87$).

State Stress

In order to examine current stress, the state anxiety form of the State/Trait Anxiety Inventory (STAI, [17]) was employed. The STAI consists of 20 Likert items such as “I feel calm” or “I feel nervous” which measure *current anxiety*. With the current sample the STAI demonstrated good internal reliability at pretest (Cronbach’s $\alpha = .84$) and posttest (Cronbach’s $\alpha = .87$).

Procedure

Participants and guardians were first given an informed consent form. After consenting to the procedure, youth were first asked to fill out the SHS and STAI pre-tests. Pretesting allows for an examination of change in scores. Randomized videogames groups did not differ on outcome variables at pretest. Without any pretesting, any difference in scores post-test may be due to differential *decreases* in hostility rather than increases and some previous research has supported this possibility [14]. After pretesting, participants were given a cover story regarding potential influences of video games on cognitive learning. Participants were then randomized to play either a violent (Tomb Raider 2013) or non-violent (FIFA) video game. These games were chosen in consultation with an expert in the area of carefully matching video games on variables other than violent content so that

confounds are not introduced (e.g. 10). Participants were allowed to play the games for a 45-min period. Following gameplay, participants filled out the posttest SHS and STAI scores as well as the AQ. They were then debriefed, probed for suspiciousness, given the \$10 gift card and thanked for their participation. All procedures passed local IRB and were designed to meet federal ethical standards for human participant research.

Data Analysis

As indicated in the pre-registration, data analysis consisted of a 2×2 mixed factorial design (time \times game) with trait aggression as a covariate. Bayes factors were also calculated to offer further support for the null or alternate hypotheses.

Results

Hostility

Results for hostility indicated a significant interaction between time (pre/post) and trait aggression [$F(1, 40) = 6.00$; $p = .019$ $r = .36$, 95 % CI .07–.60], as well as a main effect for time itself [$F(1, 40) = 4.83$; $p = .034$ $r = .33$, 95 % CI .03–.57]. However, no main effect for game condition was observed, nor any interaction with time. Because null effects, particularly with relatively small samples can be hard to interpret, these results were further analyzed using Bayes factors that can provide greater evidence for null results than possible through traditional NHST. Mean differences between the violent and non-violent game conditions were analyzed using Bayes factors calculated through a calculator provided by Zoltan Dienes [18]. Dienes' method for calculating Bayes factors is particularly conservative regarding support for null hypotheses. Such support is indicated by scores lower than 1.0, whereas support for the alternative hypothesis is offered by scores higher than 1.0. Using an assumption of $d = .61$ as indicated in a previous meta-analysis [19] for the current contrast between violent and non-violent video games, the Bayes factor for hostility was .46 indicating moderately strong support for the null hypothesis. Note that this analysis is only for post-test data and does not include trait aggression as covariate. Thus, combined with the already conservative nature of the Bayes factor calculator, this is a conservative estimate of support for the null hypothesis.

Stress

Analyses of stress found no significant effects for either time or game condition. However the interaction between the two approached significance [$F(1, 40) = 3.80$; $p = .058$ $r = .29$, 95 % CI $-.01, .54$] with participants becoming more stressed following VVG play. Bayes factors were once again used to assess the support this result had for the alternative hypothesis. As there is little prior research in the area of stress reduction, the expectation of $d = .61$ was once again used for consistency. The Bayes factor here for post test scores was .59 suggesting little difference between post-test scores. Nonetheless, the interaction effect was tested in a second Bayes factor analysis, returning a value of 1.4 suggesting weak support for the alternative hypothesis (albeit in the opposing direction from expected). An examination of means revealed that, stress level for male players did not increase when playing the violent game (29.47 at pre vs 29.56 at post) but stress levels

for female players did (30.25 at pre vs 38.63 at post) suggesting that the increase in stress due to playing violent video games is found entirely among female players.

Discussion

Whether violent video games do or do not increase hostility in youth has been a source of controversy now for several decades. The current study sought to address this controversy with a randomized experimental design, preregistered and using standardized outcome measures to reduce researcher expectancy effects. Current evidence did not support beliefs that youth hostility increases due to VVG play. Although the sample was small, Bayes factor analysis confirmed that the results are not likely due to Type II error and represent a true null result. However, contrary to expectations, no support was found for the belief that VVGs reduce stress either. Male players remained steady in terms of stress level, whereas female players increased in stress following VVG play.

Taken together these results suggest that it is simplistic to make “one size fits all” statements about VVG (or non-VVG for that matter) effects. Indeed, rather than objectionable content having direct effects in predictable directions, the impact of particular games (whether violent or not) may have more to do with the degree to which players enjoy them and match well with the game than anything specific to the game itself. For instance, previous research has indicated that players can become hostile when frustrated with a game, but that violent content has little impact [20]. This fits well with our observation of female participants becoming stressed after the VVG condition. Although gaming among young females is increasing, girls continue to tend to choose fewer violent games than boys. Thus, girls may have found the violent game to be more frustrating and a poorer match for their interests, thus increasing stress. It may be erroneous to assume that violent content, in particular, has a negative emotional impact on girls, and more appropriate to suggest that they are simply annoyed by a type of game they might not choose to play.

This is also consistent with Uses and Gratifications Theory [21] which suggests that media use, whether by youth or adults, is not a passive process in which media is injected into cognition and mechanically imitated, but rather a complex process in which individuals select media according to predetermined needs and expectations. Thus, individuals may choose specific games in expectation that those games may induce particular desired mood states. Media use becomes an active process in which users actively select, shape and process their media world, often in very idiosyncratic ways. From this perspective, media effects are expected to be distinctive, subtle, and user generated rather than content generated.

Testing such an approach with experimental designs can be challenging, given that randomized experimental designs create an artificial situation in which participants are forced to consume media they might not otherwise choose. When such media is inconsistent with what the individual might have chosen to watch or play, this could in and of itself induce hostility that has little to do with the content of the media. However, future experimental designs could examine for this by randomizing individuals into conditions in which they are allowed to choose media. It may seem initially counterintuitive to randomize participants into a choice condition, but such designs could allow for the ability to examine the degree to which active participation in media relative to forced consumption influences behavior.

Regarding conversations between pediatricians and parents, data is accumulating that blanket warnings and “abstinence only” advice regarding VVGs may not be terribly constructive. Debates about VVGs in the scholarly community will undoubtedly continue for some time, but evidence suggests that the debate over VVGs has more akin to past moral panics regarding other media ranging from dime novels to comic books to rock music. Thus, medical professionals may be well advised to avoid hyperbole in warnings about video games. Instead medical professionals may wish to advocate an idiosyncratic approach, noting that individual children may have very different responses to both VVGs and non-VVGs, and that the level of concern is likely akin to the hostility people may feel when playing a variety of other games (card, chess, etc.) as well. Encouraging parental involvement in family gameplay and open conversations between parents and their children, as well as monitoring for potential problem behaviors, whether VVGs or non-VVGs are played (see [22]) may be more constructive than blanket proscriptions based solely on morally valenced content.

The current study is naturally not without limitations. The most obvious of these is the small sample size with reduced power. This was offset somewhat by the use of Bayes factors to increase confidence in the null results for hostility. However, replication with larger samples would be welcome. Further it is difficult to assume that single games can adequately represent either VVGs or non-VVGs. Indeed the term “violent video game” is used so loosely in academia as to apply to games ranging from Pac-Man through Minecraft through Grand Theft Auto 5. Such a broad term arguably has very little true conceptual utility and it may be helpful for scholars to begin to consider conceptualization of video games that move beyond simple violent/prosocial dichotomies that are likely more misleading than particularly useful [23].

In conclusion, the current study adds to data suggesting it may be time to reconsider the narrative on the VVG debate. It is hoped that this study contributes positively to future discussions of this issue.

Acknowledgments All authors received no grants, honorarium or other funding to contribute to this report.

Conflict of interest The authors have no conflicts of interest to declare and are solely responsible for the study design, analysis and decision to submit for publication.

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