Impact of Brief Exposure to an E10-Rated, Mildly-Violent Video Game on Teen Players’ Short-Term Attention and Concentration Ability

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Past studies have examined the impact of M-rated, very violent video games and E-rated non-violent video games on attention and concentration ability. The aim of this study was to examine the effect of brief exposure to an E10-rated, mildly-violent video game had on short-term attention and concentration ability in 15- to 17-year-old males with moderate-use video gameplay histories. Subjects were randomly assigned into playing either an E10-rated, mildly-violent video game or a trivia card game for 45 minutes. The subjects in the experimental group performed significantly worse on the neuropsychological measure of attention and concentration (Digit Span Forward [DSF]) compared to those in the control group, who showed consistent performance before and after the exposure. The findings in this study are unique, as this is the first time that the impact of an E10-rated, mildly-violent video game on a player’s short-term attention and concentration ability has been examined. Based on the results of this study, although limited by small sample size, it is recommended that video game playing should be limited for students and young adults prior to participating in activities that require concentration and attention such as school work. Future studies should be conducted on a larger scale to further validate the current findings.

INTRODUCTION

Extended exposure time in high-use players of both the non-violent and very violent video game has been linked to attention and concentration difficulties. Children and adolescents who spent more time playing video games had more attentional problems, even when pre-existing attentional difficulties were statistically controlled in the analysis (Gentile et al., 2012). There is also evidence suggesting that M-rated, violent video games have a more deleterious effect on attention and concentration abilities than non-violent video games. Anderson (2014) found from his study with 210 student subjects that those playing a first-person-shooter (FPS), violent video game self-reported more attentional difficulties than those who played third-person, action, real-time strategy games, and other types of non-violent video games. Existing literature demonstrates that exposure time to video games is a sub-variable that also impacts attention and concentration abilities (Gentile et al., 2012). Extended- and intermediate-level exposure to both M-rated violent and E-rated, non-violent video games have been associated with attention difficulties in high-use and low-use youth players. Our earlier study was the first to explore the impact of brief exposure (45 minutes) to video game playing, wherein the impact of M-rated, very violent video games on short-term attention and concentration ability in low-use players was investigated. In this study, we examined M-rated, very violent video games on short-term attention and concentration ability in low-use players (Brawer & Buckwalter, 2015). Findings demonstrated that short-term exposure (45”) to violent video games resulted in significantly impacted concentration and attention abilities after comparing pre and post DSF scores.

Even though E10-rated video games are approved for children aged 10 and above, they are often played by much younger children. Given indications that both non-violent and very violent video game playing for intermediate and extended exposure periods are associated with attention difficulties in youth players, we decided to explore the impact of brief exposure to mildly violent, E10-rated video games. To the best of our knowledge, this is the first study that has examined the impact of mild violence in E10-rated video games on attention and concentration ability in youth players immediately after video game immersion. This may also be the first study to examine brief exposure to any kind of video game playing on moderate-use players. Based on precedent studies relating to the impact of video games on concentration and attention, we hypothesized that adolescent, moderate-use video game players would perform significantly worse on a neuropsy-
chological measure of attention and concentration after playing a mildly-violent, E10-rated video game for 45 minutes, when compared to the control group in this study.

MATERIALS AND METHODS

Participants
The subjects for this study were 14 adolescent boys, aged 15 to 17. All the subjects had moderate-use video game playing histories, averaging 7 to 16 hours of game playing per week. Subjects were recruited from Flintridge Preparatory School (located in La Canada, California) and were all academic high-achievers from middle- to upper-class families. The population of academic high-achievers was a sample of convenience. One recent study demonstrated that video games did not impact academic performance in adolescents, which is why this population was chosen (Drummond et al., 2014). If academic performance is not correlated with video game playing, then investigating in this context, “academic high achiever” was defined as the upper 15% of an elite private school class. Subjects were white, African-American, Latino, Asian and mixed race (Table 1). Subjects came from families with one to three children. All but one subject resided in two-parent households, with one subject residing in a single-parent household. Authorities at Flintridge Preparatory School approved the study, and informed consent was obtained from the adolescents’ legal guardians.

Study Design
Subjects were randomly assigned to two groups. The experimental group had 7 adolescent male players with moderate-use video game playing histories who were exposed to 45 minutes of an E10-rated, mildly violent video game (Super Smash Bros for Wii U). The control group had 7 adolescent male players with moderate-use video game playing histories who were exposed to 45 minutes of playing a trivia card game (Fact or Crap).

A split-plot factorial design was employed for the analysis. This design analyzes two main effects as well as the emergent interaction between the main effects. The split-plot factorial design was chosen for its ability to explicitly test the interaction between the two main effects, which, in this case, is whether the two groups show changes from pre- to post-testing in a significantly different manner. The investigation of this interaction in a split-plot design allows the test of our hypothesis with a single significance test instead of two if paired t-tests were used.

Mild Violent Video Game Exposure
The video game used during the exposure period for the experimental group in this study is called Super Smash Bros for Wii U (Saito & Kobayashi, 2014). It is a mildly-violent video game and is rated E10 for cartoon violence, approved for children aged 10 and older. Super Smash Bros was selected for this study because it is a very popular party game that is played by children of all ages and by teens.

Trivia Card Game Exposure
The trivia card game used during the exposure period for the control group in this study is called Fact or Crap. It is a fast-paced trivia game, recommended for those aged 12 and above, that challenges players to separate information into truth or fiction categories. The age recommendation being 2 years greater than the video game age rating is not pertinent to the study because the content of the card game does not contain any violence, which is the age-related variable that is being controlled.

Measures
Subjects’ attention and concentration scores were measured before and after exposure with two different, but equivalent, versions of a neuropsychological test called Digit Span Forward (DSF). Due to the basic experimental design as well as the budgetary constraints of the study, blinding of experimenters was not feasible. However, subjects were randomly assigned to treatment groups. The experimenter administered both tests strictly according to the administration procedures outline in the WAIS manual. DSF is a measure of concentration and attention ability (Lezak, 1983). Subjects received a scaled score for their performance on this task to control for any age effects that may be present in the uncorrected scores. Prior to exposure period, subjects in both groups were given Version 1 of DSF. Subjects were orally presented with a series of digits at a rate of approximately one digit per second. After each series, subjects were asked to immediately recall the digits in the order that they were given. A scaled score was derived based on the number of digit strings that were accurately recalled. After 45 minutes of exposure time to either a mildly violent, E10-rated video game (Super Smash Bros for Wii U) or a trivia card game (Fact

<table>
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<tr>
<th>Subject</th>
<th>Race</th>
<th>Siblings</th>
<th>Household</th>
<th>Age</th>
<th>Video Game Time per Week (hours)</th>
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<tr>
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<td>8</td>
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<td>2</td>
<td>m/f</td>
<td>15</td>
<td>17</td>
</tr>
</tbody>
</table>

Table 1. Familial background information for the subjects involved in the study.
or Crap), subjects were immediately given Version 2 of DSF and the score was derived in the same manner. Higher scores indicate better performance on DSF.

**Procedures**

Subjects completed the protocol for this study in one day. Subjects were given a nutritious snack before testing to ensure that hunger and low energy levels did not interfere with subjects’ performance on the neuropsychological measures. Subjects were tested in a quiet room, away from any auditory and visual distractions. Version 1 of the DSF was administered to each subject, before the exposure phase in this study, in order to establish a baseline measure of subjects’ attention and concentration ability. Before the exposure period, each subject was given a 5-minute tutorial explaining the rules of the video game or the trivia game. Immediately following the 45-minute exposure period, subjects were given Version 2 of the DSF to evaluate post-exposure attention and concentration ability.

**RESULTS**

The subjects performed significantly worse on a neuropsychological test of attention and concentration ability (DSF) after playing a mildly violent video game for 45 minutes, compared to how those in the control group \(F(1, 12) = 6.827, p = .023\). Other clinical variables collected were not analyzed, as the focus of the study was exploratory analysis solely of the independent variable. Given the small sample size, replications are suggested. Higher power will allow for more robust analysis for other clinical variables. A split plot factorial design was analyzed with an IBM SPSS GLM model using two fixed-factors (pre-post and experimental/control group).

Factor 1, which represents pre vs. post scores showed no significance difference between conditions \((F(1, 12) = 3.92, p = .069; \text{Figure 1})\). The interaction between the pre-post variable (factor1) and group (experimental vs. control) was significant, as is apparent in Figure 1. The change in mean scores pre to post for the experimental group was significantly different than the change demonstrated by mean scores pre to post in the control group (Tables 2 and 3).

**DISCUSSION**

Even though the American Academy of Pediatrics (AAP, 2001 & 2009) has recommended two hours or less of screen activities (television and video games) per day for teens and children, this study demonstrates that two hours of an E10-rated, mildly violent video game per day can be harmful to a player’s attention and concentration ability. Although extrapolation based on our findings should be made cautiously due to our small sample size, the design of the study allowed for subjects to be their own control which does strengthen our findings. Playing mildly violent video games for less than an hour, especially before starting homework or studying for a test, may contribute to attention and concentration difficulties on a short-term basis. Further research into how long-term attention concentration difficulties are retained after mildly violent video game exposure also needs to be conducted. Repeating our experimental design with a greater number of subjects and subsequently higher-powered analyses would allow for strong findings and the ability to control for potential confounds (which we were lacking). Given that male youths prefer violent video games over non-violent video games (Lenhart et al., 2008), they may be particularly vulnerable to the negative neuropsychological consequences of even brief and mildly violent video game playing. This is important in the context of video games being used as a break activity for boys and male teens prior to homework or other activities that require concentration. In addition, performance in other extracurricular activities that require significant attention and concentration ability, including performance in sports, music, clubs and other engagements, could also be impacted.

Our findings replicate the results of previous research by identifying the negative impact that video games can have on the attention and concentration performance in male adolescent players (Brawer & Buckwalter, 2015). However, this study also provides an additional insight: this is the first study to evaluate the impact of an E-10 rated, mildly violent video game on attention and concentration. Previous studies in the literature have examined E-rated, non-violent videogames or M-rated, very violent video games (Anderson, 2014).

Though the present study provides useful evidence regarding the effect of E10-rated, mildly violent video gameplay on attention and concentration ability on a short-term basis, there were a few limitations that are worth noting. While the subjects in the study came from racially diverse backgrounds, the subjects were not di-

![Figure 1. Pre-exposure and Post-exposure within groups.](image)
verse in terms of academic achievement and education; all subjects were academic high-achievers attending a preparatory high school. Also, while the subjects’ socioeconomic backgrounds were diverse (middle class, upper-middle class, and upper class), there were no subjects with lower-middle or lower-class socioeconomic backgrounds. Another limitation is that this study examined the impact on male players only. Finally, although the use of a control group greatly strengthened the power of the statistical analysis, this study was limited by a small sample size. Future investigations could explore whether intellectual functioning plays a role in the way that mildly violent and very violent video games impact a player’s attention. It would be interesting to explore whether players with lower levels of intellectual functioning or academic success are less, more or equally vulnerable to brief exposure to violent video game playing. One last area of future exploration includes investigating the gender factor. Since less girls prefer violent video games, it is interesting to explore whether non-violent video gameplay impacts attention functioning in high-achieving girls in the same way as in high-achieving boys.

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REFERENCES