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Physiological Effects of Video Games on Anxiety

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Description. The proposed study is designed to explore the effect of different types of popular video games on participant's reported anxiety levels, physiological symptoms of anxiety, hormonal fluctuations, and ratings of violence for recent events. Over 4 weeks, participants will engage in video game play on several occasions. On one occasion, participants will play a violent non-competitive video game (as indicated by the game's rating); on another, they will play a non-violent competitive game; on another they will play a violent competitive game; on another they will play a control-based video game (non-violent, non-competitive). A saliva sample will be collected each day following play and will be analyzed for Testosterone (potential rise in response to competition) and Cortisol (potential rise in response to anxiety/stress). Participants will also be given 3 news stories (war story, urban life violence story (muggings, shootings), school violence) to read each day covering recent events. The news stories in each category will be matched on levels of violence. Participants will rate the news stories for level of perceived violence to test for potential desensitization effects of each type of video game. Participants will provide a baseline blood pressure and heart rate measurement before play. Following play, their BR and HR will be taken again, and they will complete a paper anxiety scale and rate the news stories. Participants will begin the study in October. **Hypotheses.** It is expected that the competitive video games will increase Testosterone levels in participants. It is expected that violent video games will increase Cortisol, BP, HR, and anxiety scale scores. It is expected that violent video games will lead to lower ratings of violence for the news stories, but that competitive game play will not have this effect.

Significance. The effect of violence in video games has been studied repeatedly over the past few years, specifically in response to the invention of increasingly detailed gaming systems. In the past it was suspected that video game violence was directly correlated with violent behavior in the core demographic (males, age 12-25). Adachi and Willoughby (2011) found that video game violence was not sufficient to increase aggressive behavior, but competition in video games produced greater levels of aggressive response regardless of the level of violence in the games tested. Violence and competition have been known to cause anxiety and stress, both of which manifest in physical and emotional arenas. Moore, et al. (2007) discovered significant changes in cardiovascular response following violent video game play. The authors stated that they believed that more research was needed in order to "further examine the cardiovascular and emotional impact of sustained video game play". Last Spring, we (authors of this proposal) sought to investigate the effects of video game play (30 minutes) on anxiety and stress levels in undergraduate male students; specifically the use of popular video games (sports and war games; Fifa 2012 and Call of Duty) among that demographic as well as possible effects on anxiety and stress levels. The Spring 2012 study was designed to examine how these two stimuli, violence and competition, affect a player physically as well as psychologically. Researchers first anticipated that both violence and competition would increase physical measures of anxiety (blood pressure and pulse) as well as emotional measures of anxiety (the adapted Beck's Anxiety Inventory). As a control a nonviolent-noncompetitive video game (Bejewled 2) was used. Due to the increase of studies on violence and video games, and the disapproval of their connection to each other, research was focused on the physical manifestations of anxiety that the violence or competition could cause. The Violent-Competitive video game (Call of Duty) increased pulse, systolic blood pressure, and diastolic blood pressure, as well as self-reported anxiety levels. The Nonviolent-Competitive video game (Fifa 2012) increased both systolic and diastolic blood pressure levels, while pulse and self-reported anxiety levels were not significantly increased they did show a trend towards significance. Because there were no significant increases in the Nonviolent-Noncompetitive game (Bejewled 2) it served as the control. However, Bejewled 2 actually caused a decrease in blood pressure in some participants. There were noticeable changes in four of the sixteen participants that played Bejewled 2. These changes ranged from a 10 point drop to as much as a 28 point drop in systolic blood pressure. Significance for these numbers was not determined; however, it should be taken in to account that these drops were well below the average when comparing Call of Duty and Fifa 2012 to Bejewled, and that these 4 scores affected the mean change score of systolic blood pressure for Bejewled. Because these 4 scores were well outside the mean the average was determined to be much less (-0.067) when these scores were not included. More research is needed to investigate the possible positive

effects of Bejeweled, or another nonviolent-noncompetitive game, on physical and mental anxiety. These findings lend support to the hypothesis that violence and competition in video games can increase anxiety levels. The BIOPAC readings specifically show that violence combined with competition in such games can cause anxiety-related physiological changes as well.

Goals. We have been approached about hosting a symposium relating to the effects of popular video games at the SEPA regional conference in Atlanta in March. Completion of this second phase of the study, specifically with the hormonal component, would allow us to give a broad overview of this area of research during this presentation. Further, we expect to submit a write-up of this research to *Cyberpsychology, Behavior, & Social Networking* by the end of the year.

Undergraduate involvement. Psychology students have driven this line of research since its inception in January of 2012. This project began as three research methods students desired to do a project “dealing with something they really liked”. The video game idea seemed to capture their interest and they initially wanted to complete the first phase of the project with only the Beck’s Anxiety Scale as a measure of video game effects. After working with their instructor, the BIOPAC was incorporated into the study design. The students were required to study and learn the BIOPAC system and software on their own, which they did with surprising speed. They ran pilot tests using the system and researched the connection between anxiety and each physiological measure the system was capable of recording. Following the pilot tests, the students decided which measurements they wished to use from the BIOPAC. The instructor guided them through the SONA research system, teaching them how to post their study and available time slots, assign credit, and schedule participants for maximum efficiency. They have since tutored other students on how to use the system. The students also learned how to analyze data and to use the SPSS data analysis system to do so. Following the first phase of the project, the students expressed an interest in presenting the results. They wrote an abstract to submit to the SEPA conference and completed a practice presentation at a Psi Chi meeting last semester. Over the summer, they requested to extend the study further and have been working with both Drs. Cate and Dawson to design the proposed study. They are in the process of amending the IRB to include the new components as well as the abstract for SEPA. The students will again schedule and post study time slots on the SONA system and will run participants, including gathering BIOPAC data and saliva samples (in which they will be instructed) on their own. They will run initial data analysis themselves, and then will be instructed on further analyses. They will write the manuscript with editing from the instructors, and will present the symposium with minimal instructor involvement. One of the three students has decided, as a direct result of this experience, to pursue a graduate career in psychology. **Budget and Timeline.** We expect to collect 4 saliva samples from each of 50 participants. Each saliva sample costs \$15.50 to assay, bringing our total budget need to \$3100. We would like to begin collecting data on October 12, with completion of data collection by December 12. We would like analysis and write-up to be completed by February 12, for presentation at SEPA on March 12. Manuscript write-up and submission would be completed by May 12.

Previously Funded Projects. Salivary Testosterone, Personality and Leadership Effectiveness in an Undergraduate ROTC Program (Jesse Rockmore) was funded in Fall 2010. The resulting writeup was presented as an honors thesis for the student researcher, who presented the thesis in the same process as that of a master’s level student. This project was presented at the University of Georgia’s CURO conference in Spring of 2011. This study is currently in the revision stage in order to be submitted to a journal of military research. In addition to the presentation, thesis experience, and publication for the primary student author, multiple students in the ROTC program were recruited to rate and provide saliva samples for the project. These students were tutored in psychological research design and procedures by the student researcher, who also learned about saliva collection and processing, radioimmunoassay, and data analysis. This student has entered post-bac Biology classes following graduation for a career in teaching.