Social Media versus Gaming Associations with Typical and Recent Dreams

Jayne Gackenbach and Arielle Boyes

RUNNING HEAD: Social Media vs Gaming and Dreams

Social Media versus Gaming Associations with Typical and Recent Dreams

Jayne Gackenbach and Arielle Boyes

Grant MacEwan University

Author Note

Jayne Gackenbach, Department of Psychology, Grant MacEwan University; Arielle Boyes, Department of Psychology, Grant MacEwan University.

This research was funded by a grant from the Research Council at Grant MacEwan University. We would like to thank Sarah Gahr, Keyfer Mathewson, and Carson Flockhart for their help in coding dreams and Taylor Witiw and Caterina Snyder for their editorial assistance.

Correspondence regarding this article should be addressed to Dr. Jayne Gackenbach, Department of Psychology, Grant MacEwan University, Room 323H, 10700 – 104 Avenue, Edmonton, AB Canada T5J 4S2, gackenbachj@macewan.ca.

Abstract

Cirucci (2013a) hypothesized that video game players would display similarities to social media users and that this relationship should be examined. This inquiry compared university students who varied in the degree to which they use social media (SMU) and play video games (VGP) on several dream indices and one personality inventory. Dreams have been shown to be continuous with waking mentation (Schredl, 2003) and to regulate negative emotions (Levin & Nielsen, 2009). Thus, they may offer a relatively unobstrusive measure of reactions to media use. While there were meaningful differences between the four groups (high VGP/high SMU; high VGP/low SMU; low VGP/high SMU; low VGP/low SMU), most analysis resulted in no differences in dreams. Differences seemed to support the nightmare protection thesis of video game play such that high end gamers, no matter the degree of social media use, suffered less from these negative types of dreams. Additionally, the high VGP/high SMU group had the thinnest psychological boundaries and thus were perhaps most susceptible to media effects. While at the same time this group of high end media users showed the least negative self concepts in their recent dream content. This was reflected in their typical dream reports as well.

.*Keywords*: dreams, video game play, social media use, nightmares, lucid dreams, dream control

Social Media versus Gaming Associations with Typical and Recent Dreams

The Pew Research Centers' Internet and American Life Project tracks not only internet use but also related technology including texting, tweeting, social media, and wireless access. A quick survey of recent findings by the Pew Research Center illustrates how widespread electronic media use has become, particularly for social applications (Kohut, et al, 2011). While the various integrations of technology into our lives, from robots to toys, are endless, what is important to keep in mind is that our daily waking realities are changing dramatically via the incorporation of technologically constructed alternative realities into our routines. Sometimes these changes are quite distinct, as immersing oneself in a video game, other times they merge seamlessly with our waking reality, as when texting while walking between classes. These technological integrations also overlap in a more perceptually profound way, as in the work on the Game Transfer Phenomenon, which examines how video game play experiences are transferred to the real world as perceptual illusions (Ortiz de Gortari & Griffiths, 2012). The reverse, inverse presence, has also been investigated and in these experiences reality is perceived as technologically mediated (Timmins & Lombard, 2005). Additionally, on the immediate horizon is the increasing use of augmented reality technologies such as Googles' glass, which show a map overlaid on a segment of the viewer's waking reality visual field (Koetsier, 2013), as well as cost effective virtual reality technologies such as Oculus Rifts' headsets for gaming (Orland, 2013).

Digitally enhanced living permeates modern society and impacts human consciousness in a variety of ways. Understanding such impacts and their ramifications is vitally important. One particular area that merits investigation is dreaming. On a theoretical level it has often been suggested that dreams are a constructed reality. It can also be argued, however, that waking

reality is also constructed (Blackmore, 2012). Although waking constructed reality influences our lives the most, other constructed realities, such as during drug use, illness, hypnosis or meditation (Blackmore, 2012), also impact our lives. However, never before has such a large part of the population been affected so widely by a constructed alternative realities from these alternative means. Today technology constructs alternative realities and the impacts of these constructions are far reaching. Digital impact studies have focused primarily on waking measures, but dreaming impacts offer a more subtle, less halo effect, account of the impact of digital realities. This is based on Schredls' (2003) continuity hypothesis, which holds that dreaming mentation is a continuation of waking thoughts and experiences, but also the negative emotional regulation function of dreaming (Levin & Nielsen, 2009). Our prior research efforts, for instance, have focused upon video game play and dreams (reviewed in Gackenbach, 2012a**;**b) and have found some impact on dreams with potential clinical relevance, nightmare protection effect (Gackenbach, Ellerman, & Hall, 2011) through increased dream control and lucidity (Gackenbach & Kuruvilla, 2013). In this study we turn our attention to non-gaming digital life.

In a preliminary study on the association between non-gaming digital life and dreams, Gackenbach and Boyes (2012) asked students if they had played computer games or used the computer for non-gaming purposes during the day prior to a recent dream that they reported. The students then answered questions regarding their confidence about the type of dream they reported and their emotions during said dream. There was some indication that the high end non-gaming computer use group had more lucid (females only) and control dreams, but less bizarre dreams. All three of these dream types had previously been found to occur in gamers (Gackenbach, 2012b). Previously, however, we did not inquire about the varieties of non-gaming computer use. The purpose of this inquiry is to compare the self-perceptions of typical dreams

and reports of a recent dream of non-gaming and gaming electronic media users. We are focusing particularly on social media use, both on computers and on computer-like appliances, i.e. smart phones.

As noted above, video game play was the focus of our initial inquiries. However, it is clear that other types of digital life are becoming dominant, not only in the mechanics of day to day life, but also as a force that is shaping the self (i.e. less sense of shyness; Yen et al., 2012), relationships (i.e. finding love online is becoming normalized; Hand, Thomas, Buboltz, Deemer, & Buyanjargal, 2013), and more broadly, society (i.e., changing political landscapes; Macafee & De Simone, 2012). Our research of this phenomenon is particularly relevant since the comparison of video game play (VGP) to social media use (SMU) has precedence in the communication studies literature.

Cirucci (2013a) has argued that VGP and SMU groups are essentially doing the same thing. Both groups create avatars (though social media avatars are real images while gaming avatars are virtual), both bond via computer code, and both activities can be seen as performances. On the other hand, one might say that competition is a primary element of gaming while cooperation dominates social media use. In response to this line of thought, Cirucci argues that there actually is competition in some social media use, as in getting the most friends, or the most likes. In essence, Cirucci (2013a) suggests that winning in gaming is defeating one's foes, while winning in social media is becoming a celebrity. Furthermore, Cirucci suggests that both forms of competition demonstrate the search for acceptance.

In Ciruccis' (2013b) initial inquiry into the thesis of strong parallels between VGP and SMU, Cirucci interviewed individuals who differed in their use of each type of media. Cirucci found that both SMUers and VGPers suspend their disbelief. In contrast, Cirucci found that the

self for Gamers is authentic while for SMUers it is idealized. Further, Cirucci discovered that VGPers tend to have friends and thus do not feel in need of friends, while SMUers do feel in need of friends. Finally, Cirucci reports that the more individuals game, the less they rely on social media for play.

In line with Cirucci's (2013b) research, our current inquiry examines VGP and SMU in terms of how immersion in the digital world impacts other constructed worlds, i.e. dreams. Due to the continuity between waking and dreaming mentation, such an inquiry begins to allow us to understand the associated deeper emotional elements of such virtual experiences. Specifically, one dreaming function is thought to be negative emotional regulation (Levin & Nielsen, 2009), thus one could hypothesis that if a waking media experience is disturbing it would present most clearly in dreaming life. This effect has been demonstrated with films shown prior to sleep but the effects of today's digital media use on subsequent dreams has not been widely studied. If these two virtual experiences are similar, as argued by Cirucci (2013a), then the results of our inquiry into dreams should show few differences. Conversely, ifthere are meaningful differences between fighting in a video game and friending on Facebook, for instance, then we might expect differences in both typical and recent dreams. Differences might fall along social fulfillment versus competition with the emphasis on getting social needs fulfilled as the focus of SMUers and winning as the focus of VGPers. Differences in dreamt aggression and related constructs might emerge between these groups with presumably more aggression in VGPers. Previous research into gamers' dreams has shown considerable cognitive control during dreams (Gackenbach & Kuruvilla, 2013), but SMUers may not demonstrate this ability. Finally, since gamers' dreams have generally been found to be more bizarre than the norm (Gackenbach & Dopko, 2012; Gackenbach, Kuruvilla, Ferguson, Darlington, & Mathewson, 2014), and since the

sorts of bizarreness associated with VGP are not typically found in SMU, we might also expect a difference in this area.

Method

Participants

Research participants were drawn from a pool at a western Canadian university (74%) for 2% course credit. The remaining 26% of participants came from an online public access site. There were 175 male participants and 507 female participants. Average age was 21, with a range from 13 to 68. Marital status was reported as single by 93% of respondents. Finally, 72% of the respondents were Caucasian.

Materials

Demographics: The first part of the online survey asked about general demographic information including gender, age, marital status, and race/ethnicity.

Video Game History: This part of the questionnaire asked about the research participants' video game play history. Questions included frequency of play, length of a typical play session, the life time number of games played, and the age play began. In addition to these four questions, which have been used frequently in our previous research, there were various additional questions. These include preferred genre, video game reading and social habits, and questions about participants' play 24 hours prior to filling out the questionnaire. There were 15 questions in this section of the survey, which were drawn from our previous research (summarized in Gackenbach, 2012b). The questions on reading and social habits about gaming were taken from research by Murzyn (2012).

Electronic Media Use Questionnaire: There were three subsections to this questionnaire: cell phone use, computer and other media use, and social media use. The items were drawn from

various Pew Research Center polls, as well as other communication study's' surveys on media use. There were six questions on cell phone use, and six on computer and other media usage. Many of these questions allow multiple answers. Thirteen questions asked about social media usage, and many of these questions allowed for multiple answers.

Typical Dream Questionnaire (TDQ): This 60-item questionnaire was developed by Nielsen, et al (2003). It investigates the dimensional structure of dreams by asking the respondent to indicate how frequently they have had each type of dream experience. This survey was normed on Canadian college students. At the end of the survey respondents were asked which dream experience happened most often and earliest in their lives. Finally, respondents were asked for their typical dream recall as well as the average number nightmares they experienced per month.

Dream Collection Questions: The participants' were asked about their most recent dream, followed by questions about the type of dream and emotions felt during the dream. Ten questions about dream type were followed by emotional evaluations of the dream along 15 dimensions. These questions have been used repeatedly in our previous research (summarized in Gackenbach, 2012b). Each dream type question was accompanied by a definition.

Boundary Questionnaire: This was the 18-item short form of Hartmanns' (1989) personality inventory, which assesses psychological boundaries**,** a personality trait concerning the degree of separateness ("thickness") or connection ("thinness") between mental functions. It was administered to a subset of respondents.

Procedure

Students were given access to the online survey through their participation in the mass testing research pool at a western Canadian university. This pool is primarily made up of

Introductory Psychology students as well as some higher level psychology students. Course credit was awarded, 2% of the final grade, by entering the computer management system (SONA). Consequently, when participants were directed to the survey, all personal identifiers had been stripped and their participation was anonymous. Participants agreed to participate by so indicating on an informed consent. A second set of participants were gathered by mounting the survey on several psychology research websites. These surveys were also anonymous.

The order of the questions was the same as listed in the materials section. Thus, all participants got the questions in the same order. Questions were arranged from the least personal (demographics) to the most personal, with the telling and self-evaluation of a dream. Following the completion of the survey by the first 149 respondents, the short form of the boundary questionnaire was added to the end of the survey.

Participants were informed that they would not loose credit if they decided not to participate or dropped out at any time. Once participants finished or closed the survey, thus choosing not to continue, they were presented with a debriefing statement.

Results

All research participants' responses to the video game play items, the social media items, and the Typical Dream Questionnaire (TDQ) items were separately factor analyzed with factor scores kept as variables. Factor analysis was used in order to discover separate dimensions for each set of items. Separate factor analyses were computed for each type of variable because factor scores were thought to be justified to use in defining groups. Four groups of research participants were identified based upon median splits of the video game play and social media use factor scores. Differences in typical dream factor scores in relation to electronic media use were explored. Participants also provided a summary and self-evaluation of a recent dream. This

information was examined through data reduction using factor analysis and resultant factor scores. Finally, independent judges coded the recent dreams using the Hall and Van de Castle dream content analysis system (HVDC; Hall & VandeCastle, 1966), the threat simulation dream coding (Revonsuo & Valli, 2000), and the central image dream coding (Hartmann, 1989). Although the HVDC was expected to show group differences, with a wider coding range than the other two types of coding, these two types of coding were also employed because of past findings with threat and central image and gaming.

Surveys from 817 participants were collected over an 8-month period. Of these, 82% entered the survey with the boundary questionnaire added. 210 of the respondents completed the survey online and did not receive course credit. In total, 682 participants finished the survey and agreed to the informed consent.

Data Reduction Analyses

In order to meaningfully organize and reduce the information gathered, various data reduction techniques were undertaken. Many of the questions for social media use, which were taken directly from the Pew Research Centers' surveys (Hampton, Goulet, Marlow, & Rainie, 2012; Kohut, Wike, Horowitz, Simmons, Poushter, Barker, Bell, & Gross, 2011; Lenhart, 2012; Smith, 2011; Madden & Zickuhr, 2011), were in yes/no format. Therefore, where appropriate, they were summed to get indications of preferences suitable for entry into multivariate data analysis. Other variables related to social media use were averaged appropriately. With regards to the video game questions, data manipulation was needed for the genre preference questions. Specifically, as per Gackenbach and Bown (2011), genre preferences were reduced to five types based on variations of player-felt sense of presence, i.e. being there in the digital world. Games

were weighted by player rated presence. Details of these various data reduction manipulations can be found in the online appendix.

All subjects' responses to the video game questions were factor analyzed with the resultant four factors accounting for 63% of variance. Due to pairwise deletion, the number of respondents varied, ranging from 629 to 682. Four factors emerged with a varimax rotation. The first factor loaded all gaming variables, except for the genre variables, using the .5 cutoff. Therefore, it was labeled the hard-core gamer factor. The other three factors all dealt with genre differences. Factor 2 was labeled Action and not Casual, Factor 3 was labeled Adventure, and Factor 4 was labeled Role-Playing Game (RPG) and not Sport. As shown in Table 6, in the online appendix, none of the questions about typical video game play loaded with any of the genre items in factors 2 to 4. Thus, it was thought justified to use scores on the first "hard-core gamer" factor to define gaming groups.

Social media use factor analysis was then computed and can be found in the online appendix in Table 7. This included cell phone use, which was measured in terms of number of texts sent, as well as the other social media derived variables. It resulted in two factors accounting for 66 % of variance with 48% on Factor 1. The first factor loaded all the social media variables, which were derived across types of social media, while the second factor loaded two Facebook specific variables along with the typical number of cell phone texts sent. To confirm that Factor 1 scores did indeed represent social media use (SMU) as reflected in Factor 2, a medium split representing high versus low SMU was done to create two groups from Factor 1 scores. Several t-tests on Facebook and cell phone usage were then computed. These specific Facebook variables constituted the composite ones in the factor analysis. All but two of these tests were significant and indicated higher Facebook type use by the high SMU group. Table 8,

found in the online appendix, shows the means, N's, and standard deviations for these analyses. Based on these validation tests we are confident that the high and low SMU groups do, in fact, represent differences in SMU.

The final data reduction factor analysis was also done for all research participants on the 56 Typical Dream Questionnaire (TDQ) items. The varimax rotated factor analysis can be seen in the online appendix in Table 9. Thirteen factors, accounting for 59% of the variance, emerged with all but 16 of the items loading above .5 on at least one factor. The first factor accounted for 26% of the variance with each additional factor adding 2% to 5%. Factor labels are listed below with one sample item each:

Factor 1 – Disaster: TDQ item 21. Floods or tidal waves.

Factor 2 – Magic/Mythology: TDQ item 20. Having magical powers (other than flying or floating through the air).

Factor 3 – Chase/Fear: TDQ item 4. Being frozen with fright.

Factor 4 – Murder: TDQ item 27. Being killed.

Factor 5 – Paralysis: TDQ item 15. Being tied, unable to move.

Factor 6 – Failure: TDQ item 6. Arriving too late, e.g., missing a train.

Factor 7 – Alien Life: TDQ item 46. Seeing a UFO.

Factor 8 – Nudity-sex: TDQ item 13. Being inappropriately dressed.

Factor 9 – Death: TDQ item 35. A person now dead as alive.

Factor 10 – Materialistic positive experiences: TDQ item 5. Eating delicious foods.

Factor 11 – Epiphany: TDQ item 51. Seeing an angel.

Factor 12 – Self-transformation: TDQ item 25. Being a member of the opposite sex.

Factor 13 – Evil: TDQ item 56. Encountering a kind of evil force or demon (nothing loaded above .5 on this factor but item 56 loaded above .4).

It should be noted that many of these factors were the same as those identified in the original research on the TDQ by Nielsen et al. (2003), thus we used their labels for factors 1, 3, 4, 5, 6, 7, 8, 10, 11, and 12.

Gamer Group by Social Media Use Group Analyses

As indicated based on a median split, the first factor for the video game questions was used to identify high and low video game playing groups. Likewise, the first factor in the social media use factor analysis was used for the same purpose. Thus, four groups were identified: high video game players who are high social media users (HH; N=119); high video game players who are low social media users (HL; N=84); low video game players who are high social media users (LH; N=87); and low video game players who are low social media users (LL; N=125). 415 of the 682 usable respondents provided sufficient information for classification. While it would have been ideal to further classify these groups by sex, it can be seen in Table 1 that some groups did not have enough subjects to continue with sex differences as an independent variable. Accordingly, this is a limitation of this inquiry.

A video game player (VGP) group x social media user (SMU) group multiple analysis of variance was computed on the TDQ factor scores. There were several main effects for both VGP and SMU groups and one interaction. These statistical tests, with multivariate test adjustments,

are portrayed in Table 2. The means, standard deviations and number of subjects per cell are portrayed in Table 3. While the murder factor was significantly different for both media use groups, the other factor differences suggest different interpretations associated with murder in dreams. For the gamer split, high end gamers also had higher evil scores and, notably, higher magic/mythology scores. An examination of the items loading with factor 2, magic/mythology, shows typical dreams of gamers, across SMU groups, to be empowering, featuring items such as flying or soaring, having superior knowledge, creatures[i], magical powers, and being an animal. Murder, chase/fear, and death TDQ factor scores evidenced a SMU group difference favoring low-end SMU users. This connotes a negative overtone to the dreams of the low-end SMU users across gamer groups. There was only one interaction between the media use groups, which is illustrated in Figure 1. The most positive materialistic experiences in typical dreams were reported by the high VGP/low SMU group with the lowest reported by the low VGP/low SMU group. The high social media groups across VGP fell in between. .

To further examine any potential differences between media use groups, three additional self-report measures were considered: typical dream recall, typical nightmares, and psychological boundaries. Although there were no group differences in dream recall or nightmares (*F*-values can be viewed in the online appendix) there was a main effect for the VGP group and an interaction with the SMU group on psychological boundaries. The Boundary scale was taken by a subset of respondents when it was attached to the end of the survey in 2013. 277 university students completed the boundary questionnaire as well as an additional 74 from generic online websites. VGP main effect was $F(1,190)=4.779$, $p=.030$, $\eta_p^2=.025$, and the VGP x SMU interaction was $F(1.190)=4.420$, $p=.037$, $\eta_p^2=.023$. There were 96 high gamers and 98 low gamers. VGP high mean was 34.873 with a standard error of 0.880 and the low VGP mean was

32.173 with a standard error of 0.867. The interaction can be viewed in the online appendix in Figure 3, which shows that the high end VGP/SMU group had the thinnest boundaries (i.e., high scores indicate thin boundaries).

Recent Dream Self Evaluation

Of those who filled out the survey, 324 reported a recent dream. While not without its problems, the collection of recent dream data offers a counterpoint to self-impressions of patterns of dreaming as collected with the TDQ. Both methods rely on self-report and its incumbent memory biases but by collecting both different perspectives on recalling dreams are accessed. Finally, an advantage of dream collection is that unbiased judges can evaluate the collected dream using standardized protocols.

Such a dream collection method does not mean that respondents actually provided a dream transcript, only that they claimed they were reporting a dream. Neither does it mean that they evaluated their dream on all variables, nor that they evaluated their dream at all. Respondents were asked to describe the emotions they experienced during the dream, and to detail the type of dream they believed they had experienced. As a result of this, when the self-dream evaluations were reduced by factor analysis, not all of the 324 respondents had provided data for each of the questions. For the factor analysis to reduce variables (see Table 10 in the online appendix) on the self-report of dream type, only 168 respondents answered all of the questions. This analysis revealed that three factors accounted for 51.7% of the variance, with the majority being accounted for by the first factor. This factor was identified as negative dreams, the second as a lucid type factor, and the third as a non-bizarreness type factor. The second data reduction factor analysis on the self-reported dream evaluations focused on emotions, which can be viewed in the online appendix in Table 11. Eleven emotions were entered into this factor

analysis, which consisted of reports by 221 individuals. Three factors emerged accounting for 59.2% of the variance. In this case the three factors were easily interpreted. The first factor was negative emotions other than the fear/terror/anxiety dimension, which constituted the third factor. The second factor clustered positive emotions. In both factor analyses, interpretation used a .5 cutoff.

Separate multivariate ANOVA's were computed on the resultant dream type and dream emotion factor scores, with the same video game player groups (VGP) by social media user groups (SMU) as independent variables. For this computation, the time of the dream was introduced as a covariate in order to control for dream recall effects. In terms of the three emotion factors, none evidenced any media use group effects. The second multivariate ANOVA on self-reported dream type factor scores revealed that there was a VGP by SMU interaction on the negative dreams factor score ($F(1, 100) = 6.995$, $p = .009$, $\eta_p^2 = .065$). This is portrayed in Figure 2. The highest negative dream factor scores were reported by the low SMU low VGP group.

Independent Judges Dream Coding

Four independent judges also evaluated the recent dreams reported by respondents. Three different dream content analysis systems were used: Hall and Van de Castle (1966), Threat Simulation (Revonsuo & Valli, 2000), and Central Image (Hartmann, 1989). There were two judges for each system; the reliability requirement before they could move on to coding dreams alone was at least 80% agreement and was achieved for each pair of judges. The Hall and Van de Castle (HVDC) results will be presented first followed by the other two dream content analysis results.

Hall and Van de Castle. The analysis of the HVDC coding was done using Schneider and Domhoff's (2004) DreamSAT excel spread sheets. The results are portrayed in Tables 4, high VGP, and 5, low VGP, in relation to of SMU in each table. For the high VGP groups, low and high SMU, were compared to both male and female HVDC norms because there was a mixture of both sexes in these groups. In contrast, the low VGP group was predominantly female and thus the high and low SMU subgroups were compared to female HVDC norms exclusively (Table 5). P-values in each table were adjusted using the Benjamini-Hochberg method (as cited in Schneider & Domhoff, 2014).

The first group in Table 4 was the high gamers and high social media users. This group's dreams were coded as evidencing more dead and imaginary characters when compared to the HVDC male and female norms, what may be a result of video game exposure to characters of this nature. Additionally, dead characters have gained popularity in this era; TV shows or novels involving dead characters may be gaining notoriety via social media sites and thus may have exposed this group to such characters as well. This group was never the befriender in interactions compared with the HVDC norms. Overall aggression was lower but physical aggression was higher than the HVDC norms. This has been interpreted in past research (Gackenbach, 2012b) to mean that gamers, and here also high SMUers, do not aggress as often as non-group members but when they do it is more violent. Additionally, misfortunes per dream for this group were lower. This did not indicate an increase in good fortunes, however, which were also lower than the norm. Finally, these high VGP, high SMU media users were coded as having fewer familiar settings.

The second group examined contained high gamers who were low social media users. This group also showed more dead and imaginary characters. Again, this may be a result of increased

exposure in video games and in popular media. As with the previous group, this group was less likely to be the aggressor in the dream but when they were aggressive it was more physical, which may be a case of nightmare protection (Gackenbach, Ellerman, & Hall, 2011). Although gamers act out scenes of physical aggression when under attack they may not be seeking out aggressive scenarios on their own. Thus, as these scenarios are similar to video games, they may be interpreted as fun rather than nightmares.

The high VGP, low SMU group, however also showed more self-negativity relative to the HVDC norms. Relatedly, more negative emotions were marginally significantly present in this group's dreams. Less friendliness as with the other group was coded. Since both groups are high VGP, the competitive spirit of gaming may dominate their dreams and thus result in less friendliness. Lastly, misfortunes were less likely to be present in this group's dreams.

The last two groups, low VGP and high/low SMU, did not contain enough male participants to make appropriate comparisons to the HVDC male norms and therefore were only compared to the female norms. The results can be seen in Table 5. For the group of low gamers and high social media users the aggression/friendliness ratio was higher than the norm. Following on this is the group's higher percentage of physical aggression and self-negativity as well as lower percentages of friendliness and misfortunes per dream.

Our fourth group was the low gaming and low social media using group, which it can be argued represent the group least engaged in the digital environment compared to their peers. As with the two high gaming groups this one had significantly more dead and imaginary characters present and more aggression/friendliness present. The second aligns with the physical aggression, which was also found to be significantly higher. As with the other low gamer group,

self-negativity was higher and there was less friendliness per dream. This may be a result of the perceived social isolation suggested by lack of media involvement. It may also be indicative of the lack of positive effects associated with video game play.

As before both misfortunes and good fortunes were less likely to be present in this low VGP/low SMU group relative to the HVDC norms. Success was also less likely to be present, which may be a consequence of lacking social supports. This group also experienced fewer dreams with at least one success and similarly, dreamer-involved success was lower.

Threat and Central Image. A separate pair of judges coded the same dreams that were coded for the HVDC on threat simulation and central imagery. The same VGP group by SMU group ANCOVA's were computed on these judges' evaluation, and again utilizing the time the dream occurred as a covariate in order to partially control for memory differences across time. The ANCOVA for central image intensity was not significant. The ANCOVA's for the four threat simulation variables, which could be treated as continuous, were not significant either. The specific F-values can be seen in the online appendix.

Discussion

There are two theoretical perspectives that inform these results. First, does dream content act as a relatively unobtrusive reflection of waking beliefs and behaviors as related to different patterns of media use? Second, do different patterns of media use change dream content in ways that may reflect differing reality construction processes? These results certainly inform the first view, while the second view is more speculative, pushing notions of the character of dream structures beyond what has generally been considered. These considerations will be taken up separately in this discussion of the results.

Dreams as a reflection of waking concerns and behaviors

This perspective is most clearly stated in Schredl's continuity hypothesis (2003). That is, that dreams are a continuation of waking thoughts. Various lines of inquiry have supported the continuity hypothesis including work from our laboratory (Gackenbach, Sample, & Mandell, 2011). In this inquiry differences between social media use (SMU) and video game play (VGP), and their associations to self-reported typical and recent dreams, were examined. Cirucci (2013a) has suggested that these media use activities are very similar and should be studied alongside each other. In line with Cirucci's (2013b) research, we created four groups of different patterns of media use: high VGP/high SMU, high VGP/low SMU, low VGP/high SMU, and low VGP/low SMU. The typical dream self-reports, as well as those of a recent dream, revealed more similarities than differences between the four groups supporting Cirucci's hypothesis. There were, however, sufficient differences to warrant discussion.

An analysis of the self-reports of typical dreams showed that high VGP was related to a positive, empowering interpretation of content that might have otherwise been thought of as nightmarish (i.e., murder). This occurred for high VGP across SMU levels. The opposite was the case for high SMU across VGP levels where a clearly nightmarish tone was evident in the case of high SMU. This supports the nightmare protection thesis that we have investigated in prior research (Gackenbach, Ellerman & Hall, 2011; Gackenbach, Darlington, Ferguson, & Boyes, 2013). In particular, our previous research has shown that playing video games trains individuals to fight back in threatening dream situations. VGP and SMU interacted in only one of the typical dream analyses. Specifically, having positive typical dream experiences was rated as highest for the high VGP/ or x low SMU group. This is consistent, if one assumes the continuity hypothesis of dream content, with Cirucci's (2013a) claim that the more gamers play video games, the less

they need or use social media. The lack of either online activity was least associated with typically having positive dream experiences.

It is important to note that self-reports of what one thinks one typically dreams about do not always agree with what one reports in any given single dream. Ideally, multiple dreams across time would be collected to validate the self-report of typical dreams, which was not the case in the present inquiry (Domhoff, 2005). However, our major TDQ factor structure replicates what has been found across three cultures (Canada, Nielson et al., 2003; Germany, Schredl, Ciric, Götz, & Wittmann, 2004; and China, Yu 2008). We are unaware of any studies examining the association of typical dream reports to dream content in dream diaries.

Respondents' self-reports of their most recent dream was self-evaluated along two dimensions: type of dream and emotions in the dream. Six self-evaluations of dreams dimensions were identified by factor analysis. Factor scores from these were dependent variables in two separate VGP x SMU ANCOVA's, with length of time since the dream as a covariate. Only two were significant or approached significance: fear emotions and negative type dreams factor scores. Again, the potential negativity of dreams was most associated with high SMU and low VGP. This suggests that without video game play as protection, social media users are more troubled by their reported dreams. Four of the factor scores, two from emotions and two from dream type, however, did not result in media use group differences. Therefore, Cirucci's (2013a) thesis of the similarity between these media use groups seems reasonable at least in terms of defining the groups and to some extent in terms of different outcomes associated with each group. Cirucci notes differences between VGP and SMU groups in outcome as we have found but there are more similarities than differences in our findings.

In addition to undergoing self-evaluations, the self-reported recent dreams were also coded by independent judges. Most directly relevant to the aforementioned findings, regarding the nightmare protection thesis of gaming, were the coding of Threat Simulation (Revonsuo & Valli, 2000) and Central Image (Hartman, 1989). These sets of judges' evaluations, however, resulted in no media use group differences. This inconsistency between judges evaluations of dreams compared to dreamers evaluations is well known in the dream literature (Schredle, Ciric, Götz, & Wittmann, 2004) and has appeared in our previous work as well (Gackenbach, 2012b). It could be argued that the only important perception is self-perception, whatever the perceptions of others. Or vice versa, that self-perception is eternally distorted and only external perceptions (judges in this case) are valid. Such inconsistency bears further inquiry. A third interpretation is that one recent dream does not necessarily capture what a person typically dreams about, which supports the need for a series of dreams (Domhoff, 2005).

The other set of judges' evaluations of these dreams was more extensive. This set was based on the classic Hall and Van de Castle (1966) method of dream content analysis. The results were partially presented as a function of sex. Two of the groups had approximately equal numbers of male and female respondents (high VGP/high SMU and high VGP/low SMU) while the other two groups were predominantly female (low VGP/high SMU and low VGP/low SMU). Thus, although the social media groups relative to the gaming groups had higher female representation, there is inextricably, a high SMU group among gamers. All comparisons were to the norms.

For the two high gaming groups (high and low SMU), higher dead and imaginary characters were coded. This has occurred in previous research into gamers dreams (Gackenbach, 2012b) but it should be noted that the low VGP/low SMU group also differed significantly from

the norms for this character coding. Therefore, it might be concluded that these results represent generational shifts in media portrayals, which can be seen in the popularity of zombies, superheroes, and aliens, along with anything forensic, in today's media landscape.

The social interaction subscales are particularly relevant here and are made up of aggression and friendliness. The high VGP, across SMU levels, were less aggressive both in overall percentage and dreams with at least one incident. However, when the high VGP groups were aggressive it was more violent as indicated by the higher physical aggression percentage. In contrast the low VGP group, across SMU levels, had a higher aggression relative to friendliness percentage and higher physical aggression.

On the flip side are the friendliness ratings by the judges where social media seemed to be slightly more influential. Specifically, and surprisingly, among the high VGPers those who were high SMUers were befrienders in their reported dreams less often than the norms, while those who were also high VGP but low SMUers did not differ in the percentage of times they were befrienders. There was no difference in the friendliness per dream between the high and low SMUers and high gamers. Both were significantly less than the norms. However, this last was also true of the two low VGP groups, so we can postulate that across all research respondents, relative to the HVDC norms, today's young people are less friendly in their dreams. This finding is not surprising given the various media influences of hostility, war, zombies, and other negative themes.

Another way to examine this theme of gloom and doom in today's media savvy youth is the self-negativity and negative emotion HVDC ratings. Here again there is some indication that SMU makes a difference among the high VGP groups. Specifically, for both groups it was the

low SMUer who were rated as more self-negative and reported more negative emotions in their dreams than the norms. The high VGP/high SMU group, alternatively, did not differ from the norms. The low VGP, across SMU levels, were higher in self-negativity and consistent with negative emotion norms. Thus, in three of the four media use groups the negative overtone of the times likely filters into dreams while one group, high VGP/high SMU, is no more negative than earlier generations.

Continuing with this theme of generational angst, from viewing waking life through the eyes of today's media, are the success/failure due to the characters own efforts and the misfortune/good fortune scales which examine the consequences of the characters actions. The most positive dream scenario would be success and good fortune with the least positive being failure and misfortune. These variables showed differences from the norms primarily in the dreams with at least one incident category. Specifically, across SMU and VGP groups there was less misfortune and less good fortune than the norms, though again this seems more a generational finding. In terms of absolute percent of these variables in these dreams, there was no difference from the norms except in bodily misfortunes where only in the high SMU/low VGP group was there less than the norms. In this case not playing video games seems to have its benefit when accompanied by high social media use.

Success variables evidenced some differences from the norms for the low gamer groups, less success, but no differences from the norms for the high gamer groups. This is not surprising as gaming is about winning. Thus, even in this angst toned generation if one games there are wins sufficient at least to bring them up to previous generational norms.

Finally, across VGP and SMU groups this generation of media users was coded as having more indoor dream settings but less familiar settings than the norms. While one can receive a cell signal in the Rocky Mountains, which is fairly near to this university, most media is used indoors. The lower familiar settings perhaps can also be a reflection of media use as users are exposed to a wide range of unfamiliar places online and in games.

Accordingly, we can say, with some qualifications, that Cirucci's (2013a) hypothesis was upheld by this inquiry. However, when Cirucci did a preliminary test of her hypothesis (2013b) she found that the idealized self for gamers is authentic while for SMUers it is idealized. This fits with some of our findings regarding the dreams of social media users, if one takes Rogers (1966) notion of a large gap between real and ideal selves as being maladaptive. Cirucci also found that gamers have friends, and therefore argues that they don't feel in need of friends while social media users do feel in need of friends. In our data these interacted, but not entirely as Cirucci predicted. Specifically, when looking at befriending in dreams, which according to the continuity hypothesis would occur if befriending was happening in waking life, the only group that showed a difference from the norms was the high VGP/high SMU. The other three groups evidenced no differences from the norms and in terms of one incident of friendliness in a dream, all four groups were less than the norms.

Finally, Cirucci (2013b) reports that the more individuals game the less they rely on social media for play. In a comparison of the ages that play began for the two high VGP groups (for both high and low SMU) we found that in contrast to Cirucci's contention, those who had been playing longer where in the high SMU group ($t(144)=3.047$, $p=.003$). We can therefore conclude, with some exceptions, that the combination of gaming and social media use seems to be the most adaptive.

Dreams as one reflection of alternative reality construction processes emerging

While more speculative, this theoretical view is perhaps the more interesting, if esoteric, of the two ways to consider these results. The question it offers is that perhaps the very structure of dreams are changing and not merely reflecting waking concerns. We argue that this dream structure change is due to the increasing and pervasive use of digital media among the populous, which is becoming higher in presence. As has been argued in the meditation side of the consciousness literature (Hunt, 1995; Alexander et al, 1990; Sparrow, Thurston & Carlson, 2013), these waking practices affect night-time dreams by increasing the quality of consciousness in sleep, lucidity/witnessing. Recent researchers have argued that lucidity may not be a type of REM dream but rather a transitional state of consciousness (Voss, Holtzman, Tuin, & Hobson, 2009), which can be induced through gamma stimulation of frontal lobes (Voss, Holzmann, Hobson, Paulus, Koppehele-Gossel, Klimke, & Nitsche, 2014).

We have argued that gaming especially, and perhaps social media use, may act as a type of meditative state since it is extraordinarily absorbing and improves attentional skills and thus results in some of the same impacts on dreams as meditators including changes in lucidity (Gackenbach, 2008). Therefore, if lucid dreams are not actually dreams but a separate, transitional state of consciousness offering widely claimed benefits, then presence in digital media may change this state of consciousness in sleep.

Lucidity was only directly asked about in the questions following the recent dream report. This question loaded in a factor analysis with other related items like dream control. Self-assessed lucidity factor score for a recent dream evidenced no SMU or VGP group differences. However, given the importance of lucidity for this theoretical framework several additional

analyses on lucid dreaming were computed. These analyses dealt with prelucid experiences (i.e., thinking you're in a dream only to conclude you are awake; false awakening, etc.). These also evidenced no SMU or VGP group differences. Although previous research has found support for this thesis, there is no support from this research inquiry.

Limitations and Conclusions

The major limitation of this study, and indeed any inquiry into VGP and SMU, is gender. While there is not a clean split between males as gamers and females as social media users, there is an uneven distribution such that some cells are almost impossible to fill. Since it is statistically invalid to control for sex of subject as a covariate, and since there were males and females in each VGP/SMU cell, but not enough to enter sex as another independent variable, we varied sex across cells. We were only able to consider sex in the comparisons of the Hall and Van de Castle dream content analysis to norms, but even there, males were part of that sample.

Another limitation is the uneven answering of questions by respondents, was due to both survey length and a general reluctance or inability to report a personal dream. We typically loose about one quarter to one third of our samples due to lack of dream reports or under reporting of a dream. This may be culturally specific as Chinese dream researcher Ming-Ni Lee (personal communication, June 2013), reported that out of approximately 100 survey respondents, only four did not report a dream. Thus, it could be argued that collectivist societies give different meanings to dreams by valuing them relative to the individualized societies of the west where they are not valued (Punamaki & Joustie, 1998). Alternatively, the demand pressure to conform in collectivist societies may explain this difference.

In conclusion, some support was found for Cirucci's (2013a) thesis of the similarities between individuals who play video games and those who use social media. The differences in relation to the combination of these forms of digital media use, however, are also noteworthy. Differences seemed to support the nightmare protection thesis of video game play such that high VGPers, no matter their degree of social media use, suffered less from these negative types of dreams. Additionally, the high VGP/high SMU group had the thinnest psychological boundaries and thus were perhaps most susceptible to media effects. While at the same time this group of high end media users showed the least negative self concepts in their recent dream content, which was reflected in their typical dream reports as well.

References

Alexander, C. N., Davies, J. L., Dixon, C. A., Dillbeck, M. C., Ortzel, R. M., Muehlman, J. M., & Orme-Johnson, D. W. (1990). Higher stages of consciousness beyond formal operations: The vedic psychology of human development. In C. N. Alexander, & E. J. Langer (Eds.), *Higher stages of human development: Adult growth beyond formal operations* (pp. 88-126). NY: Oxford University Press.

Blackmore, Susan (2012). *Consciousness: An Introduction (2e).* Oxford: Oxford University Press.

Cirucci, A. M. (2013a). First person paparazzi: Why social media should be studied more like video games. *Telematics and Informatics*, *30*(1), 47-59.

Cirucci, A. M. (2013b, June). *Staging identities: A comparison of video gamers' and social media users' digital identities*. Paper presented at the annual meeting of the International Communications Assocation, London, England.

Domhoff, G. W. (2005). The content of dreams: Methodologic and theoretical implications. In M. H. Kryger, T. Roth, & W. C. Dement (Eds.), *Principles and Practies of Sleep Medicine* (4th Ed., pp. 522-534). Philadelphia: W. B. Saunders.

Gackenbach, J.I. (2008). Video game play and consciousness development: A transpersonal perspective. *Journal of Transpersonal Psychology*, *40*(1), 60-87.

Gackenbach, J.I. (2012a). Video game play and dreams. In D. Barrett & P. McNamara, (Eds.) *Encyclopedia of Sleep and Dreams* (pp. 795-800). Santa Barbara, CA: ABC-CLIO.

Gackenbach, J.I. (2012b). Dreams and video game play. In J.I. Gackenbach (Ed.), *Video Game Play and consciousness* (pp. 173-190). NY: NOVA Science Publishers.

Gackenbach, J.I. & Bown, J. (2011). Video game presence as a function of genre. *Loading*. *5*(8). Retreived from http://journals.sfu.ca/loading/index.php/loading/index.

Gackenbach, J.I. & Boyes, A. (2012). Non-gaming virtual immersion and dreaming. Under editorial consideration.

Gackenbach, J.I. & Dopko, R. (2012). The relationship between video game play, dream bizarreness, and creativity. *International Journal of Dream Research*. *5(1),* 23-36.

Gackenbach, J.I., Darlington, M., Ferguson, M.L., & Boyes, A. (2013). Video game play as nightmare protection: A replication and extension. *Dreaming*. *23*(2), 97-111.

Gackenbach, J.I., Ellerman, E. & Hall, C. (2011). Video game play as nightmare protection: A preliminary inquiry in military gamers. *Dreaming*. *21(4),* 221-245.

Gackenbach, J.I. & Kuruvilla, B. (2013). Cognitive structure associated with the lucid features of gamers dreams, *Dreaming*. *23*(4), 256-265.

Gackenbach, J.I., Kuruvilla, B., Ferguson, M.L., Mathewson, K. & Darlington, M. (2014). Gamer links to dream bizarreness and lucidity: A failure to replicate, *International Journal of Dream Research*. *7*(1), 67-71.

Gackenbach, J.I., Sample, T., & Mandel, G. (2011). The continuity versus discontinuity hypotheses: A consideration of issues for coding video game incorporation. *International Journal of Dream Research, 4(2),* 63-76.

Hall, C., & Van de Castle, R. (1966). *The content analysis of dreams*. East Norwalk: Appleton.

Hampton, K. N., Goulet, L. S., Marlow, C., & Rainie, L. (2012). Why most Facebook users get more than they give: The effect of Facebook 'power users' on everybody else. Washington, D.C.: *Pew Research Center*. Retrieved from http://www.pewinternet.org/~/media//Files/Reports/2012/PIP_Facebook%20users_2.3.12.pdf

Hand, M. M., Thomas, D., Buboltz, W. C., Deemer, E. D., & Buyanjargal, M. (2013). Facebook and Romantic Relationships: Intimacy and Couple Satisfaction Associated with Online Social Network Use. *Cyberpsychology, Behavior, and Social Networking*, *16*(1), 8-13.

Hartmann, E. (1989). Boundaries of dreams, boundaries of dreamers: Thin and thick boundaries as a new personality measure. *Psychiatric Journal of the University of Ottawa*, *14*, 557-560.

Hunt, H. (1995). *On the Nature of Consciousness: Cognitive, Phenomenological, and Transpersonal Perspectives*. New Haven, CT: Yale University Press.

Koetsier, J. (2013). How Google is melding our real and virtual worlds with games, apps … and Glass. *ISPR Presence News*. Retrieved from http://ispr.info/2013/05/14/how-google-is-melding-our-real-and-virtual-worlds-with-games-apps-and-glass/?utm_source=rss&utm_medium=rss&utm_campaign=how-google-is-melding-our-real-and-virtual-worlds-with-games-apps-and-glass

Kohut, A., Wike, R., Horowitz, J. M., Simmons, K., Poushter, J., Barker, C., Bell, J., & Gross, E. M. (2011). Global digital communication: Texting, social networking popular worldwide. Washington, D.C.: *Pew Research Center*. Retrieved from http://www.pewglobal.org/files/2011/12/Pew-Global-Attitudes-Technology-Report-FINAL-December-20-20111.pdf

Lenhart, A. (2012). Teens, smartphones & texting: Texting volume is up while the frequency of voice calling is down. About one in four teens say they own smartphones. Washington, D.C.: *Pew Research Center*. Retrieved from http://pewinternet.org/~/media//Files/Reports/2012/PIP_Teens_Smartphones_and_Texting.pdf

Levin, R., & Nielsen, T. A. (2009). Nightmares, bad dreams, and emotional dysregulation: A review and new neurocognitive model of dreaming. *Current Directions in Psychological Science*, *18*(2), 84-88.

Madden, M. & Zickuhr K. (2011). 65% of online adults use social networking sites. Washington, D.C.: *Pew Research Center*. Retrieved from http://www.pewinternet.org/~/media//Files/Reports/2011/PIP-SNS-Update-2011.pdf

Macafee, T., & De Simone, J. J. (2012). Killing the Bill online? Pathways to young people's protest engagement via social media. *Cyberpsychology, Behavior, and Social Networking*, *15*(11), 579-584.

Murzyn, E. (2012). Incorporation of game elements in dreams: Exploratory research into World of Warcraft dreaming. In J.I. Gackenbach (Ed.), *Video Game Play and Consciousness*. (p. 197-222), NY: Nova.

Nielsen, T. A., Zadra, A. L., Simard, V., Saucier, S., Stenstrom, P., Smith, C., & Kuiken, D. (2003). The typical dreams of Canadian university students. *Dreaming*, *13*(4), 211-235.

Orland, K. (2013). How fast does 'virtual reality' have to be to look like 'actual reality'? *ISPR Presence News*. Retrieved from http://ispr.info/2013/01/07/how-fast-does-virtual-reality-have-to-be-to-look-like-actual-reality/?utm_source=rss&utm_medium=rss&utm_campaign=how-fast-does-virtual-reality-have-to-be-to-look-like-actual-reality

Ortiz de Gortari, A.B. & Griffiths, M.D. (2012). Chapter 11: An introduction to game transfer phenomena in video game playing. In J.I. Gackenbach (Ed.), *Video Game Play and Consciousness*, NY: Nova Science Publishers, (p. 217-244).

Punamaki, R. L., & Joustie, M. (1998). The role of culture, violence, and personal factors affecting dream content. *Journal of Cross-Cultural Psychology*, *29*(2), 320-342.

Revonsuo, A., & Valli, K. (2000). Dreaming and Consciousness: Testing the threat stimulation theory of the function of dreaming. *Psyche*, *6*, 1-25.

Rogers, C. R. (1966). *Client-centered therapy*. American Psychological Association.

Schneider, A. & Domhoff, G. W. (2004). The quantitative study of dreams. Retrieved from http:// www.dreamresearch.net/.

Schneider, A. & Domhoff, G.W. (2014). Corrections for the statistical significance of multiple comparisons. Retrieved from http://www2.ucsc.edu/dreams/DreamSAT/multiple_comparisons.php.

Schredl, M. (2003). Continuity between waking and dreaming: A proposal for a mathematical model. *Sleep and Hypnosis*, *5*(1), 26-39.

Schredl, M., Ciric, P., GÖtz, S., & Wittmann, L. (2004). Typical dreams: stability and gender differences. *The Journal of Psychology*, *138*(6), 485-494.

Smith, A. (2011). Why Americans use social media. Washington, D.C.: *Pew Research Center*. Retrieved from pewinternet.org/~/media//Files/Reports/2011/Why Americans Use Social Media.pdf

Sparrow, G.S., Thurston, M. & Carlson, R. (2013). Dream reliving and meditation as a way to enhance reflectiveness and constructive engagement in dreams. *International Journal of Dream Research*, *6*(2), 84-93.

Timmins, L.R. & Lombard, M. (2005). When "real" seems mediated: Inverse presence. *Presence*, 14(4), 492-500.

Voss U, Holzmann R, Tuin I, & Hobson J.A. (2009). Lucid dreaming: a state of consciousness with features of both waking and non-lucid dreaming. *Sleep*. *32*(9), 1191-200.

Voss, U., Holzmann, R., Hobson, A., Paulus, W., Koppehele-Gossel, J., Klimke, A, & Nitsche, M.A. (2014). Induction of self awareness in dreams through frontal low current stimulation of gamma activity. *Nature Neuroscience*, 17, 810–812

Yen, J. Y., Yen, C. F., Chen, C. S., Wang, P. W., Chang, Y. H., & Ko, C. H. (2012). Social anxiety in online and real-life interaction and their associated factors. *Cyberpsychology, Behavior, and Social Networking*, *15*(1), 7-12.

Yu, C. K. C. (2008). Typical dreams experienced by Chinese people. *Dreaming*, *18*(1), 1-10.

Table 1

Research Participant Distribution as a Function of Gaming and Social Media Use and Gender

Sex of Participant	Video Game Play	Social Media Variables high	low	Total
Males	high	50	33	83
	low	4	15	19
Total		54	48	102
Females	high	69	51	120
	low	83	110	193
Total		152	161	313

Table 2

Multivariant Analysis on TDQ Factor Scores for Gamer Group (VGP) X Social Media Use Group (SMU) ANOVA

Source	Dependent Variable	df	F	Sig.	Adjusted Sig.*	η_p^2
VGP						
	TDQ factor 2 magic/mythology	1	21.504	**.0001**	**.0003**	.061
	TDQ factor 4 murder	1	9.711	**.002**	**.004**	.028
	TDQ factor 11 epiphany	1	3.277	.071	.071	.010
	TDQ factor 13 evil	1	9.196	**.003**	**.006**	.027
SMU						
	TDQ factor 3 chase/fear	1	5.146	**.024**	**.035**	.015
	TDQ factor 4 murder	1	4.444	**.036**	**.043**	.013
	TDQ factor 9 dead	1	6.665	**.010**	**.016**	.020
	TDQ factor 12 self-transformation	1	3.322	.069	.075	.010
VGP x SMU						
	TDQ factor 10 materialistic positive experiences	1	4.750	**.030**	**.039**	.014
Error	All variables same error df	332				

* Significance levels for multiple tests were adjusted using the Benjamini and Hochberg (1995) False Discovery Rate

Table 3

Means/N's/Standard Deviations on Multivariant Analysis ANOVA on TDQ Factor Scores for Gamer Group (VGP) X Social Media Use Group (SMU)

TDQ Factor Score	Group (VGP or SMU)	Mean	Standard Deviation	Number of Respondents
TDQ Factor 2:	High VGP	0.2248	1.081	162
Magic/Mythology	Low VGP	-0.209	0.7899	174
TDQ Factor 3:	High SMU	-0.124	0.993	163
Chase/Fear	Low SMU	0.135	1.071	173
TDQ Factor 4:	High VGP	0.210	1.052	162
Murder	Low VGP	-0.138	0.977	174
TDQ Factor 4:	High SMU	-0.082	0.989	163
Murder	Low SMU	0.154	1.041	173
TDQ Factor 9:	High SMU	0.216	1.046	163
Dead	Low SMU	-0.073	0.991	173
TDQ Factor 13:	High VGP	0.177	1.029	162
Evil	Low VGP	-0.165	0.992	174

Table 4

High Video Game Play (VGP) Groups as a Function of Social Media Use (SMU) Hall and Van de Castle Incidence Rates, Norms and Benjamini-Hochberg Method Adjusted p-Values

	Male Norms	Female Norms	High VGP High SMU	*p* vs. males	*p* vs. females	High VGP Low SMU	*p* vs. males	*p* vs. females
Characters								
Dead & Imaginary Percent	00%	01%	06%	**** .000**	*** .015**	04%	**** .0003**	**** .008**
Social Interaction Percents								
Befriender Percent	50%	47%	00%	**** .000**	**** .001**	65%	.182	.142
Aggressor Percent	40%	33%	29%	.621	.862	16%	**** .003**	*** .037**
Physical Aggression Percent	50%	34%	68%	.202	**** .006**	76%	**** .0004**	**** .0006**
Settings								
Indoor Setting Percent	48%	61%	71%	**** .006**	.334	72%	**** .0004**	**** .021**
Familiar Setting Percent	62%	79%	43%	*** .043**	**** .001**	61%	.958	**** .0006**
Self-Concept Percents								

Self-Negativity Percent	65%	66%	68%	.796	.870	80%	**** .003**	**** .008**
Negative Emotions Percent	80%	80%	78%	.796	.862	89%	*** .068**	*** .073**
Dreams with at Least One:								
Aggression	47%	44%	28%	***.052**	**.131**	36%	***.041**	.142
Friendliness	38%	42%	18%	**** .023**	**** .006**	19%	**** .0004**	** .0006
Misfortune	36%	33%	18%	*** .043**	*** .114**	14%	**** .000**	**** .0006**
Good Fortune	06%	06%	00%	**** .015**	**** .017**	02%	.091	.142

Table 5

Low Video Game Play (VGP) Groups as a Function of Social Media Use (SMU) Hall and Van de Castle Incidence Rates, Norms and Benjamini-Hochberg Method Adjusted p-Values

	Female Norms	Low VGP High SMU	*p* vs. females	Low VGP Low SMU	*p* vs. females
Characters					
Dead & Imaginary Percent	01%	02%	.185	03%	*** .048**
Social Interaction Percents					
Aggression/Friendliness Percent	51%	78%	**** .0004**	74%	**** .0004**
Physical Aggression Percent	34%	70%	**** .0004**	77%	**** .0004**
Settings					
Indoor Setting Percent	61%	73%	**** .018**	75%	**** .001**
Familiar Setting Percent	79%	57%	**** .0004**	61%	**** .003**
Self-Concept Percents					
Self-Negativity Percent	66%	88%	**** .0004**	89%	**** .0004**
Bodily Misfortunes	35%	13%	.116[1]	25%	**.493**
Dreamer-Involved Success Percent	42%	21%	.159	06%	**** .003**
Dreams with at Least One					
Friendliness	42%	15%	**** .0004**	17%	**** .0001**
Misfortune	33%	14%	**** .0004**	12%	**** .0004**
Good Fortune	06%	02%	.125	01%	**** .01**
Success	08%	04%	.164	01%	**** .0004**

[1] Prior to adjustment this was significant at .037

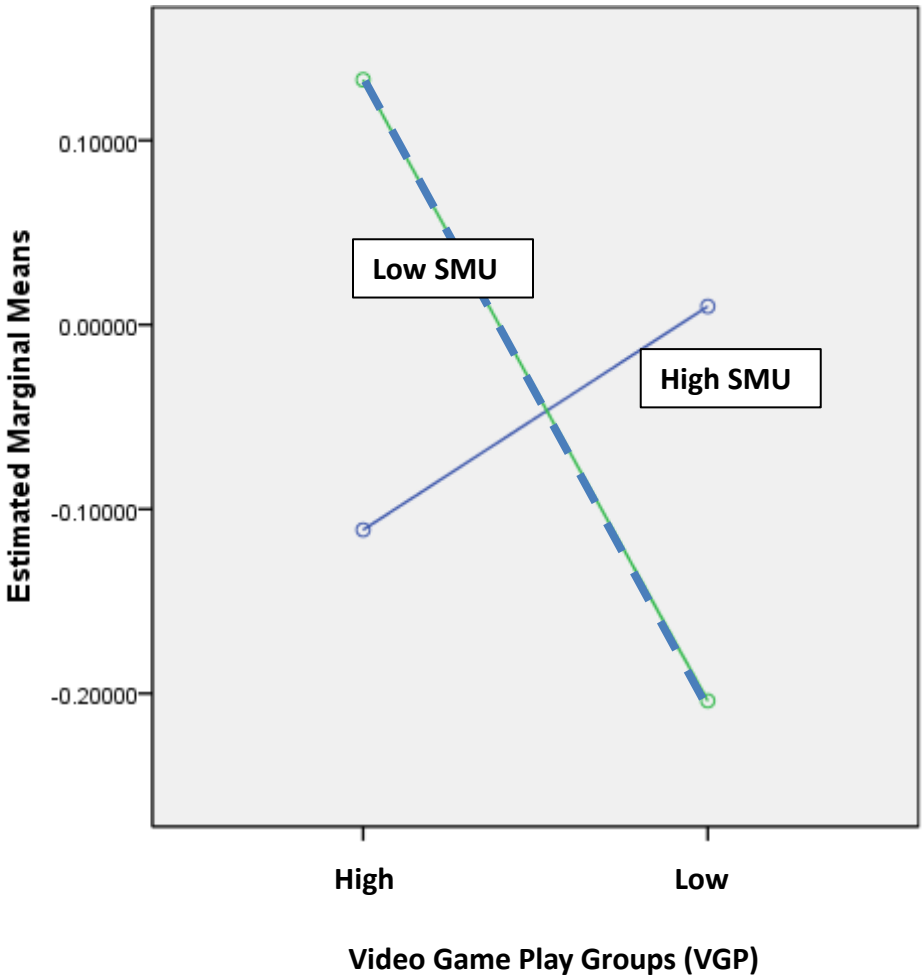

Figure1. Mean typical dream materialistic positive experience factor scores in relation to video game play (VGP) and social media use (SMU)

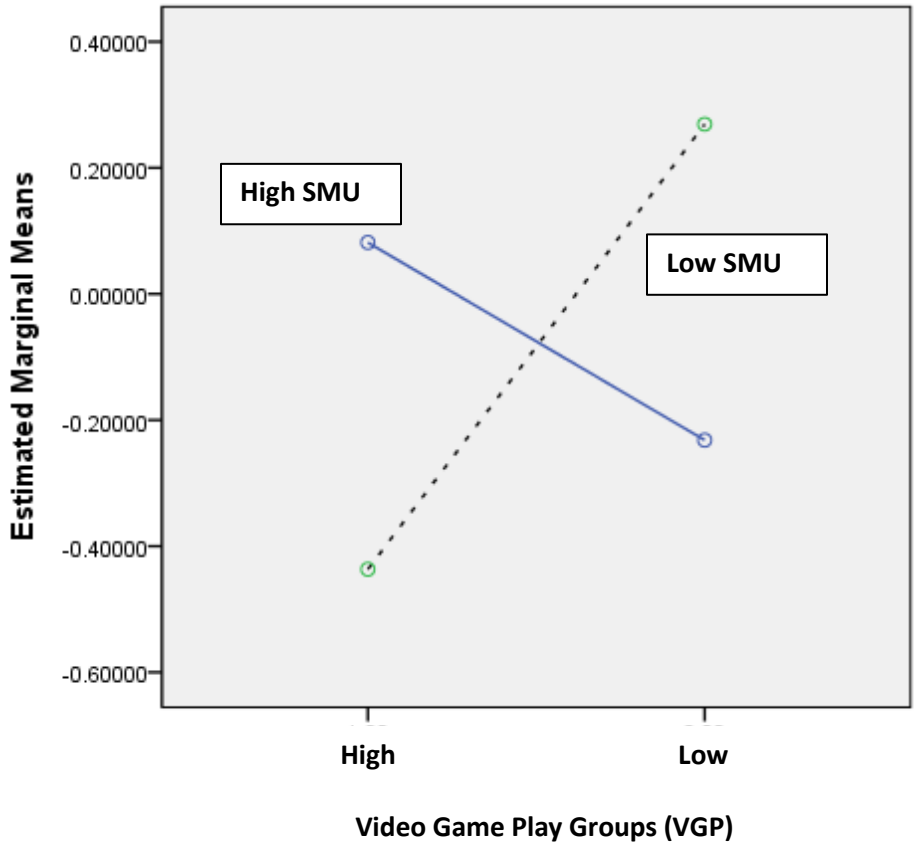

Figure2. Mean self-report negative type dreams factor scores on recent dream in relation to level of video game play (VGP) and social media use (SMU)

Supplemental Results Online Appendix for

Social Media versus Gaming Associations with Typical and Recent Dreams

Genre preferences modifications

Research participants were asked about their favorite genres. The top three favorite choices of 14 offered were converted to ones and all other ranks to zeros. Based on previous research in our laboratory, Gackenbach & Bown (2011), we then weighted genre preferences by of presence, i.e., the felt sense of being there in the media experience. The highest in presence were action and adventure genres. The Action genres were first person shooters (FPS) and fighting games. Means were computed of these as 1st-3rd favorite genre's. Adventure genres offered in this list of potential favorites were real time strategy, strategy, and simulation. Means for these adventure genres when choses as 1st-3rd favorite were computed. In the same manner, those moderate in presence, role playing games (RPG) and Sport had means computed. RPG genre consisted of Massively Multiplayer Online Games (MMO) and role playing games which were chosen as 1st-3rd favorites. The second moderate presence genre, Sport, consisted of driving/racing and sport type games. Means were computed of those chosen as 1st-3rd favorite genre. Finally the lowest in presence was reported by Gackenbach and Bown (2011) as the Casual genre. The mean of puzzle, card, and board type games as well as other type games were computed if rated as 1st-3rd favorite genre's. Each of these computed means was then weighted by multiplying each genre mean by unadjusted presence mean of that genre as below:

Action mean x 106

Adventure mean X 99

RPG mean X 95

Sport mean X 82

Casual mean X 70

Conversions done to social media data:

As with the genre data for video game play, various adjustments were also made to the social media data. Several questions about cell phone use were included in identifying the SMU groups. These were accessing social media from their phones questions (cell use 3 social media sum) and the self-report of number of texts per day. Social Media Use (SMU) questions adapted included:

SMU sum of activities

SMU sum of profiles (Facebook, linked in, twitter, game, instagram, tumblr, pinterest, other)

SMU mean length of use for each social media

SMU mean frequency of use for each social media

SMU Facebook, mean of frequency of activities on Facebook

Dream Recall and Nightmare Self Report Analysis: To further examine any potential differences between media use groups, three additional variables were considered: typical dream recall, typical nightmares and psychological boundaries. While there were no group differences in dream recall or nightmares: i.e., VGP dream recall $F(1,404)=1.315$, $p=.252$; SMU group dream recall $F(1,404)= 1.147$, $p=.285$; VGP x SMU group dream recall $F(1, 404)= .515$, $p= .515$; VGP nightmares $F(1,406)=.057$, $p=.811$; SMU nightmares $F(1,406)=2.219$, $p=.137$; VGP x SMU group nightmares $F(1,406)=.623$, $p=.430$.

Threat and Central Image. A separate pair of judges coded the same dreams that were coded for the HVDC on threat simulation and central imagery. The same VGP group by SMU group ANCOVA's were computed on these judges' evaluation, and again utilizing the time the

dream occurred as a covariate in order to control for memory differences across time. The ANCOVA for central image intensity was not significant. Gamer group $F(1,140)=.539$, $p=.464$, social media use group $F(1,140)=.725$, $p=.396$, gamer group x social media use group $F(1,140)=.632$, $p=.428$.

The ANCOVA's for the four threat simulation variables that could be treated as continuous were also not significant. For the threat simulation variable: VGP $F(1,84)=.590$, $p=.445$, SMU $F(1,84)=.602$, $p=.440$, VGP x SMU $F(1,84)=.120$, $p=.730$; nature of threat variable: VGP $F(1, 47)=.0001$, $p=.987$, SMU $F(1, 47)=.755$, $p=.389$, VGP x SMU $F(1,47)=2.773$, $p=.103$; target of threat: VGP $F(1,47)=2.147$, $p=.149$, SMU $F(1,47)=.989$, $p=.325$, VGP x SMU $F(1,47)=.025$, $p=.875$; and severity of threat: VGP $F(1,47)=.317$, $p=.317$, SMU $F(1, 47)=.297$, $p=.589$, VGP x SMU $F(1,47)=.144$, $p=.706$.

Table 6

*Video Game Variables Varimax Rotated Factor Analysis**

.5 cutoff	1	2	3	4
How often do you typically play video games?	**.807**	.121	.262	-.011
How long is your typical playing session?	**.703**	.115	.227	.062
How many different video games in any format have you played in your lifetime?	**.711**	.139	.253	.015
How old were you when you played your first video game?	.236	-.022	.286	.048
Weighted action genre mean x presence mean (106)	.105	**.726**	-.129	-.051
Weighted adventure genre mean x presence mean (99)	.046	.046	**.920**	.015
Weighted RPG genre mean x presence mean (95)	.234	.403	-.279	**.690**
Weighted sport genre mean x presence mean (82)	-.003	.224	-.220	**-.796**
Weighted casual genre mean x presence mean (70)	-.260	**-.874**	-.293	-.024
Read books, comics, blogs, and/or news reports about video games?	**.519**	.223	.061	.137
Think about a video game outside of the time you are playing the game?	**.783**	.115	.272	.172
Talk about video games with friends online or off?	**.810**	.158	.172	.156
Watch videos about games or gaming related topics?	**.781**	.037	.195	.183
SMU length.-Game based (e.g., X-box Live, Playstation Network)	**.740**	.196	-.138	-.109
SMU frequency .-Game based (e.g., X-box Live, Playstation Network)	**.751**	.170	-.130	-.121
SMU reasons...-Keeping up with game related status, news and updates	**.612**	-.066	-.154	.003
Social...-Play or talk about video games together	**.787**	.128	.081	.130

*.5 cut off for interpretation with factor scores saved as variables

Table 7

*Social Media Variables Varimax Rotated Factor Analysis**

	1	2
Cell use 3 social media sum	**.613**	.471
CELL average day how many text messages	.195	**.554**
SMU sum of activities	**.637**	.371
SMU sum of profiles	**.915**	.094
SMU mean length of use	**.858**	-.016
SMU mean frequency of use	**.796**	.297
SMU Facebook, mean of frequency of activities	.178	**.837**
Facebook how many people on friends	.042	**.867**

*.5 cut off for interpretation with factor scores saved as variables

Table 8

T-Tests on Social Media Use (SMU) Factor 2 Variables Broken Down as a Function of a Median Split on SMU Factor 1 Factor Scores

	SMU groups	N	Mean	Std. Deviation
*Facebook how many people on friends	high	219	6.87	3.183
	low	220	6.13	3.284
*Facebook status change frequency	high	219	3.06	1.339
	low	220	2.79	1.287
*Facebook click the “like” button next to other people's status, wall, or links	high	219	4.89	1.828
	low	220	4.30	1.821
*Facebook click the “like” button on non-Facebook websites	high	219	1.89	1.385
	low	220	1.62	.974
*Facebook comment on other people’s status, wall, photos or links on Facebook?	high	219	3.97	1.624
	low	220	3.41	1.618
Facebook send private Facebook messages?	high	219	3.64	1.623
	low	220	3.40	1.651
YouTube or Vimeo watch frequency	high	217	2.62	.541
	low	218	2.56	.583
*Cell use 3 social media sum	high	219	1.5662	.64178
	low	220	.8455	.52667
*Cell average day how many text messages	high	219	4.34	1.630
	low	220	3.92	1.407

*Significant difference

Table 9

*Typical Dream Questionnaire Varimax Rotated Factor Analysis**

Varimax rotated factor matrix	Factor#/name	1	2	3	4	5	6	7	8	9	10	11	12	13
TDQ-1. Being chased or pursued, but not physically injured	3 Chase/fear	.087	.077	**.676**	.281	.030	.070	.027	.104	.072	.041	.014	.008	.188
TDQ-2. Being physically attacked (beaten, stabbed, raped, etc.)	4 murder	.085	.105	.382	**.594**	.150	.013	.070	.186	.024	.064	.023	.041	.154
TDQ-3. Trying again and again to do something	3 Chase/fear	-.024	.124	**.625**	.083	.148	.272	.072	.080	-.100	.134	.077	.074	.052
TDQ-4. Being frozen with fright	3 Chase/fear	.148	-.020	**.558**	.064	.356	.021	-.063	.157	-.124	.072	.118	.037	.132
TDQ-5. Eating delicious foods	10 positive	.039	.116	.152	.022	.062	.188	.077	.042	.122	**.654**	.157	-.040	.053
TDQ-6. Arriving too late, e.g., missing a train)	6 Failure	.000	.017	.359	-.009	.070	**.546**	.031	.195	.056	.233	-.019	.052	.023
~~TDQ-7. Swimming~~		~~.273~~	~~.225~~	~~.315~~	~~.046~~	~~.046~~	~~.012~~	~~.038~~	~~.117~~	~~.075~~	~~.402~~	~~-.049~~	~~.149~~	~~.058~~
~~TDQ-8. Being Locked Up~~		~~.271~~	~~.189~~	~~.356~~	~~.327~~	~~.194~~	~~.102~~	~~.073~~	~~-.002~~	~~-.043~~	~~.298~~	~~.052~~	~~.136~~	~~-.167~~
TDQ-9. Snakes	1 Disaster(.4)	.419	.027	.141	.118	.057	.032	.136	.094	-.016	.422	-.093	.132	.001
TDQ-10. Finding Money	10 positive	.163	.332	-.015	.200	-.026	.160	.067	.194	.035	**.530**	.104	-.022	-.216
TDQ-11. Flying or Soaring Through the Air	2 Magic/myth	.081	**.516**	.457	.036	-.097	-.004	.123	.147	.249	.076	.077	.003	-.095
TDQ-12. Falling	3 Chase/fear	.181	-.028	**.622**	.114	.112	.139	.064	.113	.326	.079	-.078	-.025	-.151
TDQ-13. Being inappropriately dressed	8 Embarrass	.125	.042	.139	.080	.106	.187	.015	**.758**	.033	.117	-.005	.008	.061
TDQ-14. Being nude	8 Embarrass	.097	.116	.082	.201	.106	.088	.088	**.781**	.120	.050	.012	-.069	.019
TDQ-15. Being tied, unable to move	5 paralysis	.229	.099	.272	.226	**.541**	.059	.084	.149	.043	.055	.071	.070	-.317
TDQ-16. Having superior knowledge or mental ability	2 Magic/myth	.063	**.625**	.045	.193	.106	.094	.035	.143	.169	.155	.162	.022	.003
TDQ-17. Creatures, part animal, part human	2 Magic/myth	.209	**.669**	.008	.034	.146	.125	.153	.005	-.073	.019	.037	.186	.152
TDQ-18. Your teeth falling out/losing your teeth	8 Embarrass	.138	.014	.197	-.119	.069	-.053	.123	**.516**	-.042	.014	.011	.360	-.111
~~TDQ-19. Seeing yourself in a mirror~~		~~.202~~	~~.073~~	~~.030~~	~~-.033~~	~~.330~~	~~.117~~	~~.056~~	~~.037~~	~~.198~~	~~.357~~	~~.189~~	~~.312~~	~~.112~~

TDQ-20. Having magical powers (other than flying or floating through the air)	2 Magic/myth	.131	**.706**	.135	.148	.077	.017	.068	.040	.146	.145	.004	.077	.113
TDQ-21. Floods or tidal waves	1 Disaster	**.698**	.142	.045	.027	.112	.057	.144	.131	.091	.173	.092	.095	.025
TDQ-22. Tornadoes or strong winds	1 Disaster	**.754**	.107	.184	.094	.055	.076	.120	.092	.052	.006	.076	-.020	.057
TDQ-23. Earthquakes	1 Disaster	**.752**	.178	.047	.116	.139	.107	.119	.057	.063	.090	.126	.091	.002
TDQ-24. Insects or spiders	1 Disaster(.4)	.413	.061	.188	.055	.156	.091	.169	.198	.161	.273	-.289	.064	.150
TDQ-25. Being a member of the opposite sex	12 self-trans	.007	.171	.060	.181	.086	.035	.029	.097	.093	.006	-.078	**.706**	.047
TDQ-26. Being an object (e.g., tree or rock)	12 self-trans	.168	.259	-.033	.162	.112	.078	.138	-.053	.036	.043	.032	**.621**	-.062
TDQ-27. Being killed	4 murder	.064	.148	.236	**.720**	.162	.086	.056	.046	.038	.009	.069	.110	-.062
TDQ-28. Seeing yourself as dead	4 murder	.119	.180	.054	**.665**	.189	.091	.061	-.001	.131	.071	.172	.262	-.098
TDQ-29. Vividly sensing, but not necessarily seeing or hearing, a presence in the room	5 paralysis	.052	.167	.187	.117	**.572**	.103	.018	.095	.298	.025	.071	.143	.210
TDQ-30. Being unable to find, or embarrassed about using, a toilette	8 Embarrass (.4)	.034	-.114	.066	.046	.190	.188	-.039	.423	-.014	.247	.068	.300	.178
TDQ-31. School, teachers, studying	6 Failure	.053	.093	.215	-.039	.127	**.583**	.114	.101	.246	.086	-.095	.083	.289
~~TDQ-32. Sexual experiences~~		~~.007~~	~~.215~~	~~.308~~	~~.232~~	~~.008~~	~~.157~~	~~.063~~	~~.397~~	~~.334~~	~~-.024~~	~~.026~~	~~-.017~~	~~.043~~
TDQ-33. Losing control of a vehicle	6 Failure	.264	.135	.115	.190	.026	**.535**	-.048	.218	.110	-.063	.153	.065	-.084
TDQ-34. Fire	1 Disaster(.4)	.445	.260	.114	.209	.158	.359	-.009	.000	.183	.039	.145	.179	.024
TDQ-35. A person now dead as alive	9 Dead	.154	.091	.025	.147	.178	.099	.090	.121	**.637**	.132	.239	.093	.012
TDQ-36. A person now alive as dead	9 Dead (.4)	.153	.083	.248	.389	.111	.194	.077	.000	.487	.046	.065	.081	.156
TDQ-37. Being on the verge of falling	3 Chase/fear	.228	.030	**.531**	.055	.212	.269	.012	.055	.383	.014	-.018	-.018	-.087
TDQ-38. Failing an examination	6 Failure	.098	.108	.095	.079	.113	**.732**	.027	.079	.093	.137	-.026	.039	-.032
TDQ-39. Being smothered, unable to breathe	5 paralysis	.240	.094	.171	.338	**.554**	.260	.118	.118	.076	-.083	.058	.048	-.200
~~TDQ-40. Wild, violent beasts~~		~~.240~~	~~.389~~	~~.154~~	~~.205~~	~~.224~~	~~.223~~	~~.211~~	~~.038~~	~~-.085~~	~~-.013~~	~~-.048~~	~~.059~~	~~.322~~
~~TDQ-41. Being at a movie~~		~~.146~~	~~.227~~	~~-.022~~	~~.113~~	~~.259~~	~~.421~~	~~.294~~	~~-.042~~	~~.004~~	~~.300~~	~~.081~~	~~.041~~	~~.000~~
TDQ-42. Killing someone	4 murder	.107	.190	-.035	**.582**	.091	-.032	.249	.180	.219	.155	-.129	.036	.291
TDQ-43. Lunatics or insane people		.251	.108	.100	.407	.143	.153	.234	.111	.171	.144	-.008	.093	.348
TDQ-44. Being half awake and paralyzed in bed	5 paralysis	.052	.038	.171	.101	**.704**	.054	.063	.090	.101	.024	.010	.024	.053

TDQ-45. Seeing a face very close to you	5 paralysis	.129	.205	-.025	.131	**.605**	.156	.161	.078	.077	.234	.177	.087	.185
TDQ-46. Seeing a UFO	7 Alien life	.209	.077	.046	.114	.100	.044	**.830**	.098	.061	.110	.119	.076	.036
TDQ-47. Seeing extra-terrestrials	7 Alien life	.160	.174	.067	.084	.076	.017	**.828**	.088	.059	.038	.098	.086	.062
TDQ-48. Traveling to another planet or visiting a different part of the universe	7 Alien life	.071	.396	.045	.107	.066	.068	**.587**	.002	.125	.080	.123	.059	.007
TDQ-49. Being an animal	2 Magic/myth	.116	**.601**	-.016	.090	.078	.158	.274	-.034	.032	.080	.047	.203	-.072
TDQ-50. Being a child again	9 Dead (.4)	.023	.293	.017	.094	.228	.242	.162	.015	.498	.150	.137	.090	-.100
TDQ-51. Seeing an angel	11 Epiphany	.136	.121	.000	.077	.186	.014	.096	-.049	.258	.173	**.722**	.023	-.009
TDQ-52. Encountering God in some form	11 Epiphany	.078	.105	.084	.047	.073	.000	.190	.072	.050	.031	**.790**	-.002	.047
~~TDQ-53.Discovering a new room at home~~		~~.169~~	~~.156~~	~~.179~~	~~-.144~~	~~.038~~	~~.191~~	~~.156~~	~~.271~~	~~.323~~	~~-.061~~	~~.140~~	~~.301~~	~~.213~~
~~TDQ-54. Seeing a flying object crash (e.g., airplane)~~		~~.362~~	~~.125~~	~~.035~~	~~.233~~	~~.047~~	~~.268~~	~~.311~~	~~-.026~~	~~.182~~	~~.007~~	~~.238~~	~~.189~~	~~.051~~
~~TDQ-55. Someone having an abortion~~		~~.196~~	~~-.077~~	~~-.015~~	~~.298~~	~~-.119~~	~~.173~~	~~.160~~	~~.109~~	~~.042~~	~~.127~~	~~.285~~	~~.385~~	~~.110~~
TDQ-56. Encountering a kind of evil force or demon	13 evil (.4)	.154	.292	.228	.237	.169	.005	.118	.143	-.011	-.057	.278	.017	.484

* Interpretation of each factor was based upon a .5 cutoff with adjustment for a .4 cutoff as relevant. Crossed out items did not load on any of the 13 factors.

Table 10

Factor Analysis of Self-Reported Dream Types Regarding Recent Dream

	Component		
	1	2	3
DREAM.-Lucid dream	.076	**.787**	-.176
DREAM-Control dream	-.018	**.780**	.163
DREAM.-Nightmare	**.641**	.046	-.024
DREAM.-Bad dream	**.659**	-.058	-.181
DREAM .-Mythological/spiritual dreams	.391	.380	-.137
DREAM.-Bizarre dream	.358	.038	**-.654**
DREAM.-Observer dream	**.541**	.460	.113
DREAM.-Electronic media dream *	**.568**	.109	.105
DREAM -Normal dream	.216	.006	**.835**

*Video game, social media, computer or cell phone was part of dream

Table 11

Factor Analysis Kept Factor Scores on Self-Report Emotions Associated with Recent Dream

	1 negative emotions other than fear	2 positive emotions	3 fear
DREAM emotion-Anger	**.761**	-.039	.160
DREAM emotion-Awe	-.004	**.656**	-.122
DREAM emotion-Arousal (sexual)	.229	**.741**	.040
DREAM emotion -Anxiety	.442	-.297	**.635**
DREAM emotion-Fear	.278	-.140	**.862**
DREAM emotion-Guilt	**.566**	.201	.268
DREAM emotion-Frustration	**.719**	-.296	.182
DREAM emotion-Sadness	**.661**	.033	.392
DREAM emotion-Hatred	**.633**	.116	.316
DREAM emotion-Happiness	-.083	**.842**	-.151
DREAM emotion-Jealousy	.491	.475	.061
DREAM emotion-Embarrassment	**.599**	.247	-.032
DREAM emotion-Ecstasy	-.022	**.771**	.003
DREAM emotion-Downhearted	**.677**	-.040	.096
DREAM emotion-Terror	.125	.020	**.902**

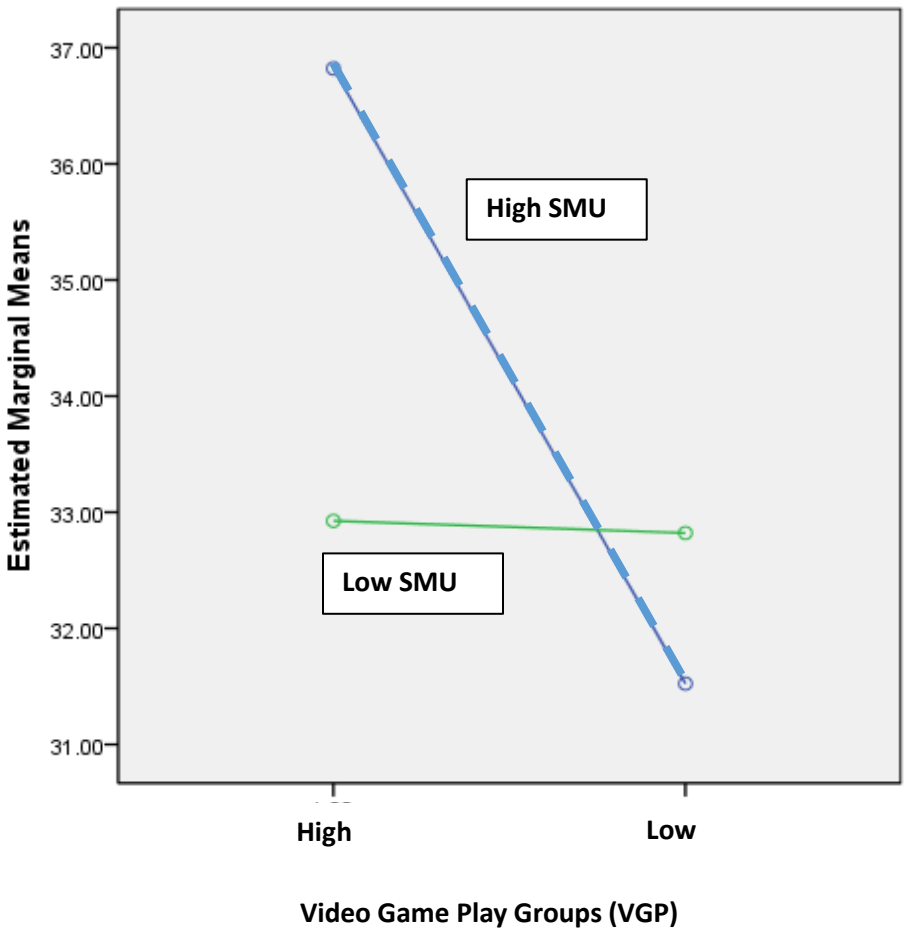

Figure 3. Video game group (VGP) x social media use group (SMU) ANOVA on Boundary sum scores

[i] In video games creatures often have magical abilities and are seen as powerful.