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The Relationship between Video Game Play and Threat Simulation Dreams

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Abstract

Revonsuo proposes an evolutionary theory of dreaming in which dreams allow an individual to prepare for real world threats in the safety of the virtual setting of the dream world. Based upon previous work examining the dreams of video game players, it was hypothesized that high-end gamers would experience fewer threat simulation dreams due to frequent threat resolution rehearsal during game play. Subjects were asked to report a night before dream and fill out surveys regarding their gaming history, media use, and dream experiences. Using a factor analysis, support for the main hypothesis was found. Individuals with a history of game play experienced fewer threat severity variables in their dreams.

The Relationship between Video Game Play and Threat Simulation Dreams

The emotion regulation theory of dreaming suggests that by expressing our emotions in the dream world, our psychological well-being is maintained (Revonsuo, 2000; Kramer, 1991; Nielsen & Lara-Carrasco, 2007). Numerous researchers have found that the content of dreams are commonly linked with real world occurrences and the accompanying emotions experienced by the individual. For instance, a study by Hartmann (1998) found that the dreams of trauma victims first focused on the event itself and as time progressed the content of the dreams shifted to emphasize the emotions associated with the trauma. Thus, as the trauma was being processed and overcome, the manifest content of the individual's dreams changed yet the underlying emotions of fear, anxiety, and survivor guilt often persisted.

Dreaming has also been shown to aid in the therapeutic process with children who have been exposed to a trauma. Researchers noticed that therapeutic gains were witnessed when these children incorporated wished for or imagined actions into their dreams of the traumatic event (Pynoos & Nader, 1990). For example, Nader and Pynoos described the experiences of a young adolescent rape victim. Originally, this young girl's dreams focused on the events involved in the trauma itself. Yet as therapy progressed, the content of her dreams began to focus on her rage toward her rapist (Nader & Pynoos, 1990). The girl would recall hitting the aggressor or injuring him with a spear during her dreams. The emotions linked to these dreams shifted dramatically during this process. The fear and sadness that first surrounded her dreams were overcome by the anger and the satisfaction she felt with her ability to finally retaliate against her aggressor. Some critics note, however, that the examination of dreams from subjects involved in trauma may be biased. That is, the resulting findings may have been influenced by a symptom of a given psychopathology, such as Post Traumatic Stress Disorder (PTSD) or depression triggered by the

event (Blagrove as cited in Punamaki, 1998). Others point out, however, that trauma dreams are characteristically distinct from dreams triggered by PTSD. For instance, Ross and colleagues assert that unlike dreams caused by psychopathology, trauma dreams often lack recognizable content and disturb continuity of sleep, due to their disturbing content (Ross, Ball, Sullivan, & Caroff, 1989).

Recently, it has been suggested that character-self interactions during dreams are especially important when considering the role of negative emotion regulation in dreams (Nielsen & Lara-Carrasco, 2007). These interactions are believed to be significant for two reasons. First, emotional elements are generally social in nature, thus character-self interactions focus on the emotions being experienced by the dreamer. Secondly, social conflicts experienced by dreamers in the waking world are frequently carried over into the content of their dreams. Nielsen notes that most character-self interactions focus on emotions such as anxiety, fear, or anger. Thus, it appears that negative emotions are given privilege in the dream world (Nielsen & Lara-Carrasco, 2007). Like many theories of dreaming, there is still no perfect agreement but there is an emerging consensus regarding the emotionally adaptive function of dreaming. That is, dreams do seem to have an emotional regulation function, especially with regard to the regulation of negative affect.

Related to theories of emotional regulation is a theory based on evolutionary assumptions and is the focus of the current study. Revonsuo's (2000) dream simulation theory claims that dreams hold a specific and important purpose, which has been refined through the process of evolution. According to his theory, dreams are meant to mimic threatening situations that may be encountered in the real world, in the safe virtual environment of the dream world (Revonsuo & Valli, 2000). By allowing an organism to refine its threat avoidance skills in a protective

environment, these skills would likely transfer into the waking world, increasing the organism's chances of survival. A similar process of skills transference is used by many athletes when training for sporting events. In fact, visualization, mental rehearsal, and cognitive enactment are some of the most commonly used techniques for improving athletic performance (Short, Ross-Stewart, Monsma, 2006). Revonsuo also suggests that the victim in a threat simulation dream would likely be an individual who plays a large role in the reproductive success of the dreamer, such as themselves, a sexual partner, or a biological family member (Revonsuo & Valli, 2000). Dreaming would increase the reproductive fitness of an organism by allowing it to prepare for situations that might jeopardize the transference of its genetic material to future generations. Thus, dreaming would be a valuable tool that would be maintained by evolution (Revonsuo & Valli, 2000). Revonsuo provides six testable propositions that compose the complete threat simulation theory (Revonsuo, 2000).

First, he purports that dreams are not a disorganized or useless phenomenon, but instead a purposeful manifestation of the perceptual world. In support of this assertion, Revonsuo points to the finding that dream consciousness is organized in a manner similar to waking consciousness. For instance, a study conducted by Zadra, Nielsen, and Donderi (1998) found that a variety of sensory experiences, such as audition, olfaction, and (more rarely) gustatory sensations, are reported by dreamers in a manner similar to those experienced in the waking world. Hence, it appears that sensory experiences during dreams occur in a meaningful manner and imitate parallel processes that occur during wakefulness. Thus, the ordered and realistic perception of the virtual world presented in dreams implies a more specialized purpose for the phenomena.

Revonsuo's second principle states that dream experiences are dedicated to the imitation of threatening events. He notes that many researchers have found negative emotion and

threatening events to be highly prominent in dream reports. For example, Domhoff (1996) examined the “enemies” category of the Hall and Van de Castle model and found that for both males and females, an enemy was most commonly defined as a male stranger or an animal, rather than a significant person within the individual’s life (Hall & Van de Castle, 1966). This has special significance to the theory of threat simulation in that these individuals would most likely pose a threat to a person living in the Environment of Evolutionary Adaptedness (EEA), that is one where humans were constantly faced with threats to their survival and reproductive potential.

Next, Revonsuo’s third principle maintains that threatening events encountered in the waking world can have huge implications for ensuing dream content. Many individuals who have experienced a traumatic event often have repeated dreams related to the trauma. Researchers suggest that PTSD nightmares are both qualitatively and quantitatively different from regular nightmares (Hartmann, 1990). PTSD nightmares occur more frequently and are more akin to re-enactments of the traumatic event itself, with the addition of certain elements such as survivor guilt or witnessing one’s own death. Revonsuo suggests, however, that a traumatic event can serve as a trigger to the threat simulation system, causing a sudden increase in the frequency and intensity of these dreams (Revonsuo, 2000). He notes, however, that unlike PTSD induced dreams, which persist for years, threat simulation dreams return to normal weeks after the event, with only small remnants of the trauma enduring over time. In this way, Revonsuo asserts that dreams contain traumatic elements, not to address unresolved emotional turmoil as would be suggested by emotional-regulation theories, but rather due to the physical threatening (and potentially fatal) nature of these events. Thus, as in the prehistoric environment

and consistent with Maslow's theory of motivation, the need for survival overrides the need for psychological well-being (Maslow, 1943).

Revonsuo's fourth proposition claims that threat simulations are efficient re-enactments of harmful situations due to their sensory and perceptual integrity (Revonsuo, 2000). Various neuropsychological studies have found that, even though the brain creates these virtual environments, it still appears to react to them in a manner similar to the real world. For example, researchers have found that the amount of neural firing in the pyramidal tract of cells in the motor cortex increased during REM sleep to a level equivalent to that experienced during waking world movement (Hobson as cited by Revonsuo, 2000). Thus, movements engaged in during dreaming are processed in a similar manner to movements experienced during a state of wakefulness. This high level of dream realism often prevents the recognition of the dream state as separate from the real world. Revonsuo suggests that it is this combination of realism and lack of insight regarding the virtual nature of the dream setting which makes these simulations such an effective tool for threat rehearsal (Revonsuo, 2000). It should be noted, however, that a lack of insight is not always experienced during dreams. For instance, during a lucid dream an individual is aware of the dream state while engaged in it (Gackenbach & LeBerge, 1988). Interestingly, although the content of lucid dreams does not vary greatly from regular dreams, they often contain high levels of both positive and negative emotions, as well as feelings of control and balance (Gackenbach, 1988).

Next, Revonsuo's fifth tenet maintains that dream recall is not necessary for the skills acquired during threat simulation to be advantageous. Revonsuo first points out that mental imagery has been shown to have concrete effects on performance. Consider a study by Ranganathan and colleagues (2004) which tested the improvements in muscle strength that can

be attained with the use of mental imagery alone. Similar gains may be experienced during dreams, even if they are not remembered by the dreamer upon waking. In support of this, it has been found that REM sleep deprivation impairs implicit memory while having little effect on explicit memory (Smith, 2000).

Finally, Revonsuo's sixth principle states that in the EEA, humans were constantly faced with threats to their survival and reproductive potential. This environment triggered the threat simulation system, allowing individuals to hone their threat avoidance and reaction skills. Revonsuo goes on to hypothesize that this practice likely increased their overall fitness and thus was selected by the process of evolution. Support for Revonsuo's theory has been found when considering the dreams of individuals living in current hunter-gatherer societies. These communities are often faced with conditions very similar to those experienced by humans in the EEA. A study by Gregor (2001) analyzed a set of dreams from the Mehinaku Indians living in central Brazil; finding that in comparison to American normative samples, these individuals experienced a significantly higher proportion of physical aggression dreams, with animals more often being involved in these violent encounters (Gregor, 2001).

Following the creation of the threat simulation theory, researchers began testing this theory with some promising findings. For instance, Revonsuo himself used a DreamThreat rating scale to analyze the dreams of 52 subjects, finding that a high number of dreams contained extremely threatening events that would (in the real world) be fatal to the dreamer or to a significant person in the dreamer's life (Revonsuo & Valli, 2000). Another study conducted by Zadra, Desjardins, and Marcotte (2005) tested the threat simulation theory using an expanded version of Revonsuo's DreamThreat rating scale. In accordance with the threat simulation theory, researchers found a high number of animal aggression interactions where the dreamer or

a significant other was often the victim of the threatening situation and in response to the event, the dreamer commonly employed a reasonable reaction to the threat. Zadra et al. also examined the relationship between the dreamer's response and the resolution of the threat. It was found that in all dreams that involved a recurrent threatening theme, resolution was dependent on the dreamer's reaction, which consisted of either fleeing or fighting the aggressor.

However, some criticize Revonsuo's theory of threat simulation, finding fault in his definition of "threat". For instance, Malcom- Smith and Solms (2004) note that Revonsuo includes a wide range of incidents which would have little impact on survival, such as losing a purse or missing a bus, in his conceptualization of threatening events. In addition, Zadra, Desjardins, and Marcotte (2005) found that everyday dreams often contained the presence of threats that did not originate from a prehistoric environment. Others note that many of the phenomena that Revonsuo seeks to explain with this theory of threat simulation can easily be interpreted using alternative frameworks of thought (Bulkeley, 2004).

In summary, Revonsuo's evolutionary perspective on the role of dreaming is an innovative and controversial theory, which suggests that dreams help an individual prepare for possible threats in the waking world through practice in the safety of the dream world.

Video Game Play and the Threat Simulation Hypothesis

In the current study, we seek to examine the effects of video game play on dream content from the perspective of the threat simulation theory. Video games have become increasingly ubiquitous in today's society, with newer games being exceptionally realistic and graphic. The virtual reality produced by video games parallels that of the dream world in many ways. For instance, individuals often experience alterations in consciousness, as seen through a strong sense of immersion and presence in both dreams and forms of virtual reality such as video games

(Revonsuo, 2006; Gackenbach, 2006). In addition, both virtual settings present an individual with three dimensional multimodal simulations of objects and space (Revonsuo, 2006). Dreams and video games also present an individual with auditory, visual, and vestibular stimulation (Gackenbach, 2006). Furthermore, multimodal sensory stimulation creates a more immersive environment in both these virtual settings (Gackenbach, 2006).

Interestingly, it has been found that video game play can have an effect on various aspects of dreaming including elements of dream content (Gackenbach, 2006; Gackenbach, Matty, Kuruvilla, Zederayko, Olishefski, & Samaha, 2007 in press). For instance, a study by Gackenbach et al. (in press) found that in comparison to age relevant norms, the dreams of hard core gamers contained fewer misfortunes and a higher frequency of dead or imaginary characters. Additionally, gamers were found to have a lower frequency of aggressive dreams, yet when they did have these dreams, they had a greater intensity of aggression in them. In the framework of threat simulation theory, it may be suggested that because high-end gamers spend large amounts of time immersed in a virtual reality setting, which allows them to re-enact situations that would pose a threat to their survival, in the dream world their mind would be alleviated of such responsibilities. Thus, as was found in the Gackenbach et al. study, gamers should be found to experience a smaller number of aggressive dreams, with more intense aggressive content being found in any threat simulation dreams that they do experience.

It should be noted, however, that a replication of this study found deviations from previous findings through a decrease in levels of striving and success (Gackenbach & Kuruvilla, 2008). Additionally, previous findings suggesting a lower amount of bodily misfortunes and increases in self-negativity and physical aggression were not replicated in this follow up. In some cases, the differences from norms were the same; more familiar characters, more dead and

imaginary characters, and dreams with at least one instance of aggression, friendliness, sexuality, misfortune, and good fortune were seen.

In summary, it is expected that gamers who play violent games will experience fewer dreams with threatening situations than norms. However, when threat simulation dreams are experienced, these individuals will engage in more effective and pro-active forms of threat resolution due to the practice they have acquired in the virtual setting of the game environment and their greater self-awareness in dreams. Also, as found by Gackenbach et al. (2007), it is likely that a lower frequency of misfortunes or nightmares will occur in the dreams of gamers due to their active role in defending against the threats with which they are confronted.

Methods

Participants

The participant prescreening pool consisted of 1437 undergraduate students from a western Canadian college. Students were given an opportunity to participate in this study as part of a department-wide extra credit opportunity for introductory psychology courses. Of these students, 473 were emailed invitations to participate in the present study based on their video game play history, with an emphasis on high and low-end gaming history. Ninety-three of these subjects completed the survey. One bonus credit was allotted to those students who met the predetermined criteria required for participation and participated in the survey by accessing it via email.

Subject participation was also solicited outside the mass testing pool by posting the experiment on external websites. Sites included “The Web Experiment List at the University of Zurich” (<http://genpsylab-wexlist.unizh.ch/>), “Psychological Research on the Net” (<http://psych.hanover.edu/research/exponnet.html>) and the “Online Psychology Research”

(www.onlinepsychresearch.co.uk). Postings to external sites produced a total of 72 subjects. Of these subjects, only the 41 subjects who completed the survey were included in the participant pool.

A 40 word minimum was also imposed on all reports. This reduced the total number of subjects to 98 from both subject pools (83 from the college sample and 15 from the online sample). This final participant pool consisted of 35 males and 63 females.

Materials

Participants were presented with the following questionnaires in this study.

Prescreening Questionnaire.

This instrument contained 11 items, which gather information regarding the participant's prior video game play habits, susceptibility to motion sickness, meditation preferences, and basic demographic information. These have been developed in previous research (Gackenbach, 2006). Additionally, a second set of questions were included, which inquired regarding synesthesia which was not relevant to this study. This prescreening instrument was used to garner subjects for three separate projects, thus not all questions in this instrument were applicable to the current study.

Games and Dreams Questionnaire (adapted from Gackenbach, 2007).

This survey requires subjects to record a dream from the night before and answer 30 questions relating to media use and dream experiences. More specifically, the questionnaire contained three types of questions: media use questions, dream history questions, and last night's dream questions.

Media use questions focused on both video game play and forms of passive media, such as television and movies. Video game questions inquired about type of games played (e.g. Which

of the following types of games do you play most often?), game play the day before the dream (e.g. Did you play video games the day before the dream you described? If yes, name the games.), violence ratings for all games played the day before the dream, and length of play for each game. Violence ratings were also obtained for television shows and movies watched before the dream.

Dream history questions asked subjects about their general dream experiences, including dream recall (e.g. How often do you recall your dreams upon awakening in the morning?), lucid dreaming (e.g. How often do you have lucid dreams?), observer point of view in dreams, and aspects of dream control (e.g. How often are you able to control your dreams?).

Finally, participants described these dream variables in relation to the specific dream they had reported (e.g. How clear is the recall of the dream you reported?) In addition, subjects were asked about the amount of sleep needed for them to feel rested and how much sleep they received the night of the dream. Lastly, subjects were asked about the violence and scariness of the reported dream and if they would classify it as a nightmare.¹

Procedure

After consenting to participation, participants filled out the “Media Use Questionnaire” adapted from Gackenbach (2006). Upon completion, participants were presented with a debriefing statement, which provided information regarding the basic nature of the research and contact information in case further debriefing was preferred by the participant. Information regarding the nature of the study was limited in order to maintain the integrity of the hypothesis.

If participants met the necessary criteria (based on responses to questions inquiring about frequency of game play, length of gaming session, age of first gaming experience, and number of

¹ Subjects were also given Tracy Kahan’s *Sleeping Experiences Questionnaire* and *Subjective Experiences During Sleep (SERS)*. This data and the dream history data will be analyzed separately.

played game formats), they were emailed an invitation to participate in the second phase of the current study. In this section, participants again completed an informed consent form. Finally, they were presented with the “Games and Dreams Questionnaire” adapted from Gackenbach (2007). Subjects were to complete the questionnaire at a different time if they did not recall a dream from the night before. When they had completed the questionnaire, participants viewed a debriefing statement. They were thanked for their participation, provided the basic rationale for the current study, and offered the appropriate contact information.

It should be noted that the web access subjects were given a slightly altered form of the survey, in that a prescreening was not mandatory for participation. Instead, these individuals filled out questions regarding their demographic information and gaming history at the end of the survey.

Once all the data from the subjects was obtained, only data from subjects who provided a dream report of 40 words or more and were restedⁱ was included in subsequent analyses. Two judges were trained to rate the morning after dream reports using the “Dream Threat Rating Scale” (Revonsuo, 2000). Using this system, dream analysis is carried out in two phases. To begin, the researcher must identify and isolate the description of any threatening events that may occur in a dream report. A threatening event is one that meets at least one of the following two criteria. First, the event may be considered an “objective threat” if it would impose harm (physical or mental) on the individual or his/her property, were it experienced in the waking world. An event that is indirectly experienced or heard about may also meet this criterion. Conversely, an event may be categorized as a “subjective threat” if it is interpreted by the dreamer to be somehow dangerous, regardless of the presence of an objective threat. A

“subjective threat” classification may be given when the dreamer reports feelings of fear or anxiety.

Next, the identified threatening events are rated on the eight following subscales: Nature of the threatening event, target of the threat, severity of the threatening event for the self, participation of the self in the threatening event, reaction of the self to the threatening event, consequences of the threatening event to self, resolution of the threatening event, and the source of the threatening event. Each of the subscales allow for further classification within them. For example, an event being analyzed using the “nature of the threatening event” subscale allows the researcher to further breakdown the event by classifying it as one of a variety of threatening events including escapes, accidents, diseases, catastrophes, etc.

To ensure an adequate level of inter-rater reliability, the two judges reviewed the rating scale together, including sample dreams provided by Revonsuo. They then coded two dreams separately and compared their results. Whenever a discrepancy was encountered, the judges discussed their reasoning and negotiated a communal decision consistent with the Revonsuo criteria. This process was carried out until an inter-rater reliability of 80% was reached for ten dreams.

A total of 93 dreams were collected from participants (one dream from each subject). These dreams were randomly ordered and each coder rated either even or odd numbered dreams.

Results

Prescreening surveys were used to evaluate 1437 students from a western Canadian college, on a variety of gaming factors. Based on their responses, 473 subjects were invited to participate in this study. In total, 93 of these invited subjects participated in the current study with 8 students opting out after having begun. In addition to these participants, 72 subjects

accessed this study from postings on various psychological research websites. Of these web access subjects, 41 participants completed the survey. All partial responses were deleted from both subject pools and a minimum word count of 40 words was imposed on all dream reports (Hall & Van de Castle, 1966). All reports were of night before dreams, with average hours since dream to recollection being under one hour for all included participants. Thus, although a total of 134 subjects completed the survey, these restrictions reduced the sample to 98 participants, 35 males and 63 females.

Statistical analyses started with an examination of the threat simulation variables as a function of gamer group. These analyses were then followed by a series of factor analyses where media and self dream evaluations were also examined. Before the ANCOVA's and factor analyses are examined the rationale for the selection of variables and the derivation of others is needed. The rationale for the selection of each variable and for its derivation are covered first, followed by the ANCOVA's and then the factor analyses.

Using a Chi square ($X^2(1)=18.427$, $p<0.005$), it was shown that gender displayed an uneven distribution across gamer types, with 78% of males being categorized as high-end gamers while only 33% of female participants were placed in this category. Thus, gender was entered into subsequent ANCOVA's as a covariate and into the factor analyses.

Media Variables. These participants were placed along a gaming continuum determined by their video game play history. Positions along this continuum, which were denoted by a z-score, were based on four questions inquiring about frequency of game play, length of gaming sessions, age when gaming first began (younger scoring higher), and number of game formats played. This subject pool was then divided into three sections based on gaming z-score, with the middle third being discarded. Using the z-score cut-offs for high-end gamers (0.49) and low-end

gamers (-1.59) obtained from the college sample, subjects from the external sites were selected. More specifically, the completed data of all web access subjects with z-scores higher than 0.49 and lower than -1.59 were used.

Three other gaming variables were used, one referred to gaming history while two referred to game play the day before the dream. Two questions were asked regarding type of game: favourite and currently play. They could have only one response to each question. These game types were recoded to fall along a violence dimension such that first person shooter games were scored 3, all other games types (i.e., puzzle, non-violent role playing, and sport) were scored 2 and no game type preference was scored 1. In both cases, the most frequent category was the other game types (61 out of 98 for Favorite game type, $X^2(2)=37.00$, $p<.0001$; 49 out of 98 for Current game type, $X^2(2) = 14.31$, $p<.001$). The non-game preference and first person shooter preference categories were roughly equal. These two scores were added to create a composite type of game score, where high scores reflected the more violent game type preference as identified by general genre labels.

Violence ratings for media, used the day before the dream, were calculated in two ways. Where available, objective ratings from media rating boards were used (video games played the day before the dream) but if not availableⁱⁱ then the participant's own rating of the violence of the media were used (i.e. TV shows and movies). More information was gathered on the video games played and thus objective ratings were easier to assess. For the TV shows and movies watched often names or other pertinent information were missing and thus it was harder to get objective ratings, so the subjects self-rating of violence of the media was used. It should be noted that the correlation between the objective and subjective ratings of video game violence was significantly correlated $r = .91$, $p<.0001$.

As noted in the methods section, each game, TV show and movie viewed or played the day before the dream was listed with an evaluation of its violent content. In addition, the number of hours playing each game was also identified. The violent media scores in all three cases had means of the up to five games, TV shows, and/or movies listed. The last media variable was the hours playing video games expressed as a percent of the maximum possible hours playing a game the day before.

Threat Simulation Variables. Two blind-raters manually coded the dreams of the subjects, using Revonsuo's method of threat simulation content analysis for dreams (Revonsuo & Valli, 2000). A measure of inter-rater reliability was obtained using the percentage of agreement as suggested by Holsti, which was 80% (Holsti, 1969 as cited in Wimmer & Dominick, 2006).

Next, seven of Revonsuo's threat simulation variables were converted into continuous variables or into dummy variables in order to enter them into subsequent factor analyses. These included presence of threatening event, nature of the threatening event, target of threatening event, severity of threat, participation of self in the threatening event, reaction of self to the threatening event, and consequences to self of the threatening event. The remaining category variables, type of resolution and source of threat, were coded into dummy variables. Each category was entered as a present or absent variable in the threat dreams or as nonexistent in the non-threat dreams. The threat simulation variables clustered into three types: intensity of threat, direction of threat, and self-involvement in threat dream. Separate factor analyses for each cluster of threat simulation variables were calculated in order to determine relationship to media variables and to self-reports about the dream. Two of the factor analyses were on all dreams

collected (threat and non-threat) while the third (self-involvement in threat) was calculated only on the threat dreams.

Self Report Dream Variables. After recording the dream, each participant was asked several questions about the dream he or she just recorded. These included dream clarity, lucidity, observer point of view, control of dream, dream as nightmare, dream as scary, and dream violence. Dream recall was potentially measured in three ways: number of words in transcript (WORD), time since wakeup when dream was recalled (TIME), and self-report of dream clarity (CLARITY). The average number of words in the dream was 90 with a standard deviation of 13.56. The amount of time since awakening to the recall of the dream ranged from immediately to within minutesⁱⁱⁱ and the clarity with which the dream was recalled was rated as moderately clear. So while we are confident that the dreams recalled were from the night before and clearly recalled, these three variables did not significantly correlate with each other: WORD/TIME $r = .13$; WORD/CLARITY $r = .20$; TIME/CLARITY $r = -.08$. Therefore, a composite dream recall index was calculated where each variable was converted to a z-score and these three z-scores were summed. This dream recall variable was entered into the subsequent ANCOVA's as a covariate and into the subsequent factor analyses.

ANCOVA's. ANCOVA's were computed on the seven Revonsuo's threat simulation variables that were converted into continuous variables (presence of threatening event, nature of the threatening event, target of threatening event, severity of threat, participation of self in the threatening event, reaction of self to the threatening event, and consequences of the threatening event to self). The independent variable was gamer group (high and low) and the covariates were sex of subject and dream recall composite score. The remaining two variables were left as discrete categories at this time due to their theoretical conceptualization. Initially, ANCOVA's

were computed for all dreams where appropriate and then only for the threat simulation dreams. While one approached traditional levels of significance, it was not found for most of these analyses. These analyses are portrayed in Table 1.

Insert Table 1 about here

Chi square analyses were used for the two remaining discrete threat simulation variables for threat dreams only; the variables were resolution of threat ($X^2(3)= 1.77$, ns) and source of the threatening event ($X^2(2)= 2.42$, ns). Once again, significance was not found.

Factor analyses. Three separate factor analyses were computed to determine the relationship between the media use the day before and the two types of dream variables, threat simulation scores and self report dream evaluation items. Since the focus of the this paper is how media might affect dreams in terms of violence and potential subsequent nightmarish type dreams, threat simulation scores were clustered into one of three types: intensity of threat, direction of threat and self-involvement in threat dream. Separate factor analyses for each threat simulation type were computed with the same media and same self-report dream evaluation questions. All three factor analyses included two individual difference type variables as well, sex of subject and history of game play z-score. For all analyses, a benchmark of + or - .3 was used for interpretation. The first two factor analyses, threat intensity and direction, were computed on the entire dream collection with the selection variables noted. While the role of the self in the threatening dream factor analysis was calculated, only 58 dreams were identified as having threat simulation present. This was done because the self-variables would not conceptually fit with dreams where there is no threat.

The first factor analysis was for four threat intensity variables loading with media use and self-report dream evaluation. It can be seen in Table 2 that threat intensity loaded.

Insert Table 2 about here

only on the first factor along with two media violence variables but not gaming variables. The judges evaluations of threat intensity were confirmed by the participants own evaluation of the dreams as nightmares which are scary and violent. Gamer history (and gender) as well as game play the day before the dream all loaded here but there was no threat intensity in this factor and while the dreamer identified the dreams as violent they were not self or judge identified as threatening or scary or a nightmare. The third factor loaded TV violence ratings with the classic lucid cluster (awareness of dreaming, control of dreaming and an observer point of view) and with a lack of thinking it was a nightmare nor that the dream was scary. The lack of gaming and female sex loaded with TV and movie violence in factor 4 and was only associated with high dream recall. The fifth factor loaded gaming again in the inverse (low gamers) associated with low violence rating for TV and movies and high dream control and dream scariness. Gaming history also loaded on the 6th factor along with preference for first person shooters, not having the third person perspective, dream control and dream being scary. The last factor loaded three media variables, no game preference with high TV and movie violence, associated with three dream self report evaluations: observer point of view, dream was a nightmare, and dream was scary.

The second factor analysis is portrayed in Table 3 and deals with the direction of threat variables created from the categorical variables. The pattern for the first two factors

Insert Table 3 about here

is basically the same as it has been with the previous two factor analyses at least in terms of all the threat simulation variables loading together here and not on any other factor. Like the threat intensity factor analysis but unlike the self involvement in threat analysis this one loaded one media variable, TV violence, with all the threat variables and with the nightmare, scary, violent self evaluations of the dream. Again when gamer history and play the day before the dream was considered the threat variables dropped out while the perception of the dream as violent stayed but the perception of it as a nightmare or scary dropped out. The third factor in Table 3 shows low gaming associated with a lack of lucidity, lack of control, lack of 3rd person perspective, nightmares and scariness in the dream. But this nightmare/scary self perspective was not confirmed by the judges evaluations as none of the threat simulation variables loaded herein. The fourth factor loaded a lack of gaming and femaleness associated with violent TV and movies and high dream recall. A lack of gaming also loaded on factor 5 as did nonviolent gaming preference, nonviolent TV and movie viewing. These were associated with dream control and dream scariness. Factor 6 was the last to load gaming and it was associated with violent TV evaluation, dream control, nightmare, and scariness. Finally the last factor, seven, loaded nonviolent game preference with violent movie rating and the third person perspective.

The last factor analysis (Table 4) examined variables dealing with self as a component of the threat simulation dreams but because these variables do not conceptually lend themselves to the inclusion of nonthreatening dreams this factor analysis was done only on the 58 dreams which were identified by the judges as threat simulations. The pattern of results was slightly different here. In factor 1 gamers (male) who preferred first person shooter games but did not watch TV or movie violence the day before the dream had dreams that were judged to have

severe loss to self and were self evaluated as nightmares that were scary and memorable. The lack of lucidity and the third person perspective may have contributed to the nightmare response.

Insert Table 4 about here

In contrast on factor 2 having played violent games for a longer time prior to sleep, but no history of gaming per se, was associated with fairly trivial threat simulation severity and empowerment on the part of the dreamer (self activity participates in the events and reacts in a way that is possible and reasonable). These dreams were violent and memorable but were not especially seen as nightmares or scary. A different kind of nightmare scenario emerged in the third factor. Here nightmares which were scary and recallable were experienced by those who watched violent movies but not violent TV and did not have a gamer history (female).

Additionally there was no dream control nor observer perspective.

The gamer protection concept is illustrated again in factor 4 where gamer history loaded with playing violent games the night before and liking first person shooters. In this case the dreamer/gamer did not see these as nightmares or scary while the judges scores of high severity of threat to self and low empowerment (low participation and reaction of self) were made of these dreams. Also the dreams were not seen from the observer perspective. In most of the factor analyses the judges and dreamers evaluations matched but in this case apparently not.

Factor 5 loaded nongamers watching violent TV with lack of empowerment of self (reaction) and high dream recall but low dream awareness (lucidity). The 6th factor loaded long game play with preferring no games/moderate games and lack of empowerment in the dreams (participation and reaction of self) as well as low consequences of threat. These were associated with viewing the dream as a nightmare which may be as much due to the victim stance of lack

of empowerment. Movie violence, severe threat to self and dream control all loaded positively on factor 7. Finally factor 8 loaded TV violence with a lack of the observer perspective and a lack of the dream violence.

Discussion

The current study asked subjects to report a night before dream and answer a variety of questions regarding their media use habits and dream experiences. Two blind-judges rated the collected dreams based on Revonsuo's method of threat simulation content analysis (Revonsuo & Valli, 2000). It was predicted that high-end gamers would have a lower frequency of threat simulations in their dreams and that if these situations did occur, gamers would employ a proactive stance in the resolution of these conflicts.

A combination of Chi squares, ANCOVAs, and three separate principal component factor analyses were used to examine the data. The focus of this discussion is based on the findings from the factor analyses, which were pursued due to the general lack of gamer group differences on the threat simulation variables. However one threat simulation variable did approach significance. Judges evaluated the nature of the threat in gamers' dreams as less aggressive than nongamers' dreams. This is in line with the hypothesis of a virtual reality practice affect overlapping into dreams. The discussion will now turn to discussion of the factor analyses results.

Three different factor analyses were calculated as a function of types of threat simulation variables. In each the same media and dream self evaluation variables were loaded. Thus any differences between the factor structures would be a function of the type of threat simulation variables entered. Because of the nature of the threat simulation variables dealing with self

involvement, it was the only factor analysis that focused solely on dreams containing a threat simulation.

Threat and Nonthreat Dream Factor Analyses. For the two factor analyses^{iv} examining threat simulation intensity ratings and threat direction evaluations by judges, these variables loaded on only one factor in each case. In contrast the media use and dream self evaluations loaded together on all factors for each of these analyses. In contrast the third factor analysis of threat simulation variables involving the self showed a different pattern with all three types of variables loading together on most factors. The first two factor analyses were on all dreams, threat and nonthreat, while due to the nature of the variables the self involvement factor analysis was on threat dreams only.

The first two factors on the intensity and direction of threat analyses evidenced the same thing. Factor 1's showed high threat associated with high violence in passive media viewed (TV/movies) and high dream scariness, violence and nightmare evaluation by the dreamer. This finding is in accordance with a past study that has identified a connection between day before violent media exposure and violent dream content (Hartman, 2000). As expected when the role of video gaming comes in the picture the connection of media violence to scary dreams changes. In factor 2 for both of these analyses, day before the dream gaming and history of gaming loaded with the subsequent dream as being self evaluated as violent but without a threatening, scary or a nightmare loading. Thus, the major hypothesis that gamers have developed adaptive dream strategies for processing violent game play is broadly supported. In fact, all threat factors, while not loading significantly, did show a shift in direction from factor one, indicating a decrease in all types of threats in terms of intensity and outcomes.

As noted all the other factors in these two analyses also loaded a combination of media use and dream self evaluation but no dream threat. In some cases the factor structures were similar (factors 4 and 5) while in others they were not (factors 3, 6 and 7). So in both analyses exposure to violent media the day before the dream, but not gaming media, was associated with the lack of gaming, femaleness, and high dream recall (Factor 4). It can be suggested that because violent content often makes dreams more salient, they are thus recallable (DeDonato, Belicki, & Cuddy, 1996). In contrast nongaming history loaded on factor 5 in each analysis with a lack of exposure to violent passive media and self evaluations of a dream as scary but controllable. This is confusing as dream control would seem to be a protective factor (Gackenbach & Bosveld, 1989) which did not evidence in this case. However, these dreams were not evaluated as nightmares just scary so perhaps the control element did offer some protection. Additionally, while violent movies/TV were not viewed the day before in general young people today are exposed to quite a lot of violent media in movies especially and thus may not see the same sort of thing in a dream as nightmarish while acknowledging it was scary. However the lack of a loading for violence would support this interpretation in the light of potential desensitization to violence through the highly violent movies at least.

The remaining three factors in each analysis were not the same and thus it must be argued that intensity of threat versus direction of outcome of threat played a role in these different factor structures even though neither variable loaded on these factors. So for the intensity of threat simulation factor analysis factor 3 seemed to reflect a positive dream situation with high lucidity, control and third person perspective associated with low nightmare and scariness ratings. This empowered dream loaded or is associated with high-TV-violence-viewing-the-day-before-the-

dream. This seems confusing, unless you consider that gamer history loaded just below the benchmark on this factor so perhaps we see here the gamer protective element coming into play.

This pattern is somewhat contrasted in factor 6 of the intensity of threat analysis. Gamer history loaded with scary self evaluations and controllable dreams. This shift may be due to the logic offered earlier (factor 5 for intensity analysis) regarding a distinction between nightmarish and scary dreams associated with dream control and/or due to the lack of the third person (observer) perspective. Needless to say if you are in a dream and you are embodied as the dream ego versus a relative separation as an observer it would be a more difficult dream situation to handle. Thus when comparing factors 5 and 6 the former is a media factor without gamer background while the latter is a gamer factor without day before media violent media exposure. In both cases these media circumstances were associated with scary but controllable dreams but in the gamer history factor (number 6) the observer perspective was embodied and the nightmarish evaluation was just below benchmark. So while earlier (factor 2) we saw a stonger gamer factor associated with violent but not nightmarish/scary dreams in this case it was so associated. But in this case the dreams were not violent and in this case there was not day before the dream game play. Perhaps the protective factor of game play in terms of threat intensity might be understood as a combination of a history of game play with game play the day preceding the dream. Simply having a gaming history in and of itself does not protect from scary/nightmarish dreams. One wonders if there had been violence, which did not load on this factor (6), if the pattern would have been different.

A slightly different pattern was the case in factor 7 of the intensity analysis. Here a scary nightmare was associated with the third person perspective and from the day before media perspective, violent TV/movies preceded the dream. Also for factor 7 there was no gamer history

or game play the night before to act as a protective element and indeed game play preference was away from the violent type (i.e., first person shooters).

Let's now turn to the factors in the direction of threat simulation factor analysis that did not echo the intensity factor analysis (Factors 3, 6 and 7). Keep in mind that in all but factor 1 the threat variables did not load, so while judges did not see threat, dreamers did in some of these cases. The third factor has nongamers having scary/nightmarish dreams that were not lucid, controllable or from the observer perspective. These dreams however were not associated with any day before media exposure. Thus one could argue that this is the classic nightmare where one feels out of control.

Day before media exposure did figure into the factor structures of 6 and 7 in the direction of threat factor analysis. For factor 6 gamer history and viewing of violent TV, but not game play, was associated with scary nightmares where there was control. Again this is perplexing but perhaps the lack of self perceived violence in the dreams, just below bench mark, explains this. That is, if a dream is violent the gamer history/day before play experience protects but if not violent then the gamer is susceptible to nightmares like everyone else and in this case perhaps triggered by violent TV watching. In the last factor in the direction of threat analysis, a lack of interest in first person shooter games and watching movie violence loaded with the observer perspective.

Threat Dreams Only Factor Analysis. The last factor analysis used judges' estimations of the degree of involvement of the self in the threat simulation dream scenario. This factor analysis evidenced a distinctly different factor structure from the previous two. In part this was likely due to the limits of these threat simulation variables as only being about the threat simulation dream and thus nonthreat simulation dreams were not able to be included. Except for the last factor all

three types of variables, media exposure, threat simulation involving self, and dream self evaluation, loaded together.

The classic out of control nightmare seems to best characterize the first factor and this time it is associated with gamer history but not violence in the dream nor viewing of violent passive media. One wonders, however, if it was a scary nightmare why its recall was not clear? Scary nightmares with no violence were also the framework for factor 3 but this time associated with the lack of gaming and the lack of TV violence. In both of these factors lucid/control/observer elements loaded negatively thus enhancing the nightmarish quality. But the threat simulation self involvement were different. So with the gamer classic nightmare in factor 1, a severe loss of self was so associated while for the nongamer factor 3 nightmarish elements loaded with a lack of loss of self and high severity of threat. So one could conclude that for gamers the loss of self is frightening while for nongamers it is not while life threat is frightening. This may be influenced by when the dream ends as well as the dreamers' or others' actions. If there is a severely threatening event but the dream ends in the middle of it, its consequences cannot be coded in relation to the self or if the dreamer escapes the severe threat then the consequences would not be self destructive.

Fascinatingly playing violent games for long hours the day before the dream, whether a gamer or not, was associated in factor 2 with violence in the dream but not nightmarish scariness. This is again the game protector factor as the dreamer was evaluated by the judges as empowered (high participation and reaction of self) and not in a life threatening circumstance. This also supports the hypothesis that proactive strategies would be associated with violent dream content if gaming was involved.

So too in factor 4 three gaming variables, game play history, violent game play day before, and preference for first person shooters, loaded with a lack of scary or nightmarish dreams. However, in this case the dreamer was not empowered and there was threat to life. Again this may be explained by the inverse loading on the observer factor, that is, the dreamer was embodied in the dream ego and not in the observer position or third person position. So in this case (factor 4) the dream was not scary from the dreamer's perspective but the judges saw the dreamer as not empowered and in a situation that was life threatening. This may be because the threat is to someone else in the dream, not the dreamer, thus they are just watching it unfold before them. Perhaps a closer look at the empowerment variables might offer additional illumination on this point. High scores on the participation variable are associated with the dream self as actively participating in the course of the threatening events while low scores would indicate the dream self did not or could not actively participate. Since the dreamer did not report an observer perspective, that can mean they were embodied but in the dream watching a threat happen to someone else. The Reaction of Self variable had high scores indicative of the self reacting in a way that would be possible and reasonable in a comparable real situation with low scores indicative of the self "does not or cannot react in any way or the reactions are not reported". However, the two middle points might in fact be more attractive to gamers. The self might react in a way that is impossible but effective (i.e., flying) or the reaction is possible but irrelevant or inefficient (i.e., laughs). In any case despite what the judges may perceive about the dream, the dreamer said he/she was not afraid. This again may be linked to the conflict occurring to someone else in the dream, thus a lack of fear in the dreamer if that someone else was not emotionally close to the dreamer. Also some threat simulations wouldn't evoke fear, e.g wallet stolen, later for an appointment, etc.

Game play length, if not violence or history, was again associated with a lower empowerment in the eyes of the judges for factor 6. In this case there was no threat to self as a consequence but the dream was reported as nightmarish if not scary. Perhaps here the student played a lot but not a violent game the day before the dream, resulting in a nightmare but not one that was especially scary. This interpretation is reflected in the lack of empowerment and low consequences of threat. Passive media characterized the last two factors in this analysis.

Conclusions. Finally, when examining the implications of the current study, a number of limitations should be considered. To begin with, the sample of subjects consisted of two unique and distinctive populations, namely college students and persons participating in on-line psychology research. Due to these specific populations and indeed increasingly the case in today's young adult world, the researchers were not able to create a group of individuals with no game play history. Hence, the subjects were divided into gaming categories with only moderate differences in gaming history. In addition, each subject provided only one night before dream, rather than a dream journal. A journal would have been preferable, as it allows for a larger sample of each individual's dreams (Revonsuo & Valli, 2001).

In summary, the relationship between video game play and threat simulation dreams is complex and intricate. It is suggested from our findings that although moderate levels of day before media exposure are linked with violent dreams and severe forms of threat for low-end gamers, high frequency gamers or game play seem largely unaffected by this violent exposure. For gamers, these dreams are not perceived as frightening or as nightmares regardless of their violent content. Additionally, there was some evidence of gamers or game play as empowering the dreamer in their subsequent dream.

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Table 1

One-way ANCOVA of Gamer Groups on Continuous Threat Simulation Variables with Gender and Dream Recall Composite as a Covariates for all Dreams and for Threat Simulation Dreams

Judges Subscale Type	Mean High End Gamers	Standard Deviation	Mean Low End Gamers	Standard Deviation	F-values
Presence or absence of threat simulation	1.484	.508	1.531	.507	F(1,59)=.067, ns
All dreams					
Nature of threat	1.75	.083	1.838	.934	F(1,59)=.207, ns
All dreams					
Threat dreams	2.411	.507	2.733	.458	F(1,28)=2.909, p<.099
Sum number of threat targets	.645	.798	.719	.772	F(1,59)=.230, ns
All dreams					
Threat dreams	1.353	.493	1.333	.617	F(1,28)=.256, ns
Severity of threat	2.065	1.263	2.188	1.255	F(1, 59)=.136, ns
All dreams					
Threat dreams	3.20	.862	3.24	.752	F(1,28)=.060, ns
Consequences of threat	.778	1.013	.500	.707	F(1,49)=.178, ns
All dreams					
Threat dreams	1.750	.754	1.300	.483	F(1,18)=.350, ns
Participation of self	1.240	.437	1.070	.258	F(1,28)=1.857, ns
Threat dreams					
Reaction of self	2.00	1.323	1.40	1.056	F(1,28)=1.362, ns
Threat dreams					

Table 2

Principle Component Factor Analysis of Media, Threat Simulation Intensity, and Dream Self

Evaluation Variables

	1	2	3	4	5	6	7
sex of subject: Male=1; female=2	-.011	-.589	.024	.501	.243	.104	.006
Z-score for gamer type	-.015	.453	.268	-.356	-.419	.336	.120
mean objective rating of video game	.040	.901	-.033	.057	.243	-.121	-.003
percent of maximum length of play score	.047	.817	-.041	.089	.277	-.290	.135
type of game sum favorite + current	-.029	.458	-.208	.235	-.234	.443	-.411
Mean for TV violence rating	.368	.132	.352	.388	-.392	.136	.300
Mean movie violence rating	.333	.189	-.059	.446	-.475	-.077	.425
threat simulation present=2, absent=1	.917	-.090	.135	-.101	-.092	-.040	-.172
nature of threat recoded aggressive harm=3, nonaggressive harm=2, no harm=1	.903	-.060	.152	-.057	-.010	-.126	-.228
sum of the number of threats from target threat	.936	-.080	.084	.015	-.040	-.037	-.148
severity of threat recoded, 1=none, 2=trivial, 3=moderate, 4=life threat	.908	-.097	.087	-.071	-.117	-.070	-.138
dream recall sum of z's for word, when recalled, & clarity	.119	.085	.131	.818	.264	-.051	-.101
lucidity in dream	-.062	.129	.770	.103	.264	.262	-.094
Observer point of view in dream	.137	-.074	.575	-.219	.119	-.426	.345
control in dream	.143	.054	.512	-.176	.401	.469	.091
Was dream a nightmare	.690	-.023	-.416	-.083	.141	.272	.312
dream scariness	.526	-.034	-.470	-.069	.419	.300	.417
dream violence	.511	.314	-.218	-.075	.194	-.136	-.255

Table 3

Principle Component Factor Analysis of Media, Threat Simulation Direction, and Dream Self

Evaluation Variables

	1	2	3	4	5	6	7
sex of subject: Male=1; female=2	-.024	-.569	.029	.548	.129	.034	-.165
Z-score for gamer type	.014	.428	-.303	-.407	-.314	.400	-.018
mean objective rating of video game	-.029	.902	.001	.057	.216	-.122	-.015
percent of maximum length of play score	-.019	.820	.015	.107	.258	-.192	.166
type of game sum favourite + current	-.022	.452	.162	.084	-.387	.120	-.626
Mean for TV violence rating	.348	.160	-.280	.387	-.361	.362	.254
Mean movie violence rating	.233	.237	.109	.444	-.430	.223	.479
Resolution- Happy Ending*	.884	-.020	-.111	.037	.066	-.223	.021
Resolution- Unhappy Ending*	.934	-.116	-.083	-.073	-.028	-.110	-.031
Resolution- Discontinuity within dream*	.876	.107	-.103	-.034	-.175	-.086	-.107
Resolution- Dream ends in the middle of the threatening situation*	.896	-.140	.062	-.090	-.027	.133	-.075
Source of threat- Personal Life*	.888	-.040	-.015	-.199	-.101	-.044	-.104
Source of threat- Media*	.881	-.130	-.116	.090	-.019	-.053	-.034
Source of threat- Fiction or Fantasy*	.942	.089	-.046	.030	.008	-.127	.007
Source of threat- Unidentified*	.989	-.040	-.064	-.042	-.048	-.076	-.055
dream recall sum of z's for word, when recalled, & clarity	.053	.116	-.093	.840	.078	-.136	-.172
lucidity in dream	.017	-.099	.751	-.163	-.261	-.173	.262
Observer point of view in dream	.189	-.087	-.549	-.107	.240	-.090	.476
control in dream	.132	.042	-.449	-.042	.480	.466	-.174
Was dream a nightmare	.611	.042	.521	.002	.202	.382	.060
dream scariness	.420	.020	.578	.057	.471	.436	.074
dream violence	.417	.376	.256	.004	.234	-.243	-.008

*For all the threat simulation direction variables 0=no threat dreams, 1= no to the type of resolution or source in threat dreams, 2=yes to the resolution or source in threat dreams

Table 4
Principle Component Factor Analysis of Media, Threat Simulation Self Variables, and Dream
Self Evaluation Variables

	1	2	3	4	5	6	7	8
sex of subject: Male=1; female=2	-.476	-.293	.468	.058	-.172	-.150	-.037	.223
Zscore for gamer type	.409	-.109	-.344	.338	-.385	-.234	.116	.270
mean objective rating of video game	.071	.857	.045	.337	-.188	.104	.108	.065
percent of maximum length of play score	.075	.850	.185	.077	.033	.309	-.012	.150
type of game sum favourite + current	.496	.008	.023	.613	.112	-.370	-.044	.201
Mean for TV violence rating	-.419	.211	-.343	-.174	.522	.023	.271	.354
Mean movie violence rating	-.472	-.205	.415	.201	.287	-.104	.390	-.108
severity of threat recoded, 1=none, 2=trivial, 3=socpsy, 4=life threat	-.187	-.337	.542	.396	-.149	-.096	.448	-.273
Participation of self (hi=self participates)	.031	.533	.029	-.600	.063	-.463	.012	-.178
Reaction of self (hi=self reacts in possible way)	-.133	.319	.291	-.371	-.398	-.599	-.035	-.113
consequences of threat recoded no threat=0, no loss self=1, minor loss self=2, severe loss self=3	.687	-.128	-.428	-.154	.221	-.337	.136	-.075
dream recall sum of z's word, when recalled & clarity	-.659	.354	.303	-.017	.308	-.161	-.268	.142
lucidity in dream	-.551	.168	-.252	.181	-.662	-.003	-.119	.194
Observer POV in dream	-.385	-.192	-.515	-.304	-.290	.277	.059	-.415
control in dream	-.279	.140	-.417	-.228	-.157	-.045	.649	.299
Was dream a nightmare	.565	-.037	.523	-.354	-.158	.349	.095	.164
Subject rating of dream scariness	.443	-.141	.549	-.536	-.175	.116	.163	.273
Subject of dream violence	.272	.714	.101	.260	-.001	.091	.250	-.444

ⁱ That is they got their normal amount of sleep or more than normal.

ⁱⁱ It was found that the same show on different networks would be rated differently for television thus TV ratings were difficult to objectively determine. Additionally, not all names of shows watched were given nor were the subjective ratings always provided. So too with the movie ratings information was often incomplete. Additionally, it was unclear if a movie was watched on TV and if TV shows were part of a series. Thus where available subjective ratings were used for TV and movie watching the day before the dream.

ⁱⁱⁱ Dream recall happened in bed upon awakening for 80% of participants and at home for most of the rest.

^{iv} Factor analysis is a statistical procedure of the correlation type, which shows how a set of variables are related. It is interpreted by examining those variables that are entered into a factor above a preset criterion. Thus a set of variables can be said to be related in several ways. Interpretation is a verbal description of the reason why specific variables may be associated with each other on any one factor.