Brand Memory, Attitude, and State Aggression in Violent Games: Focused on the Roles of Arousal, Negative Affect, and Spatial Presence

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Abstract

Violent games have increasingly gained their market share in recent video game markets. They have attracted much attention due to their potential effects on users in advertising and aggression. However, little research has investigated such effects considering both user aggression and persuasion mechanism in virtual space. Based on the general aggression model and the presence theory, the current study examines the effects of realistic violence cues (blood and screams) and trait aggression on brand memory, attitude change toward brands in the game, and state aggression through physiological arousal (i.e., skin conductance level), negative affect and spatial presence. Results show that violence cues affect both arousal and negative affect, and in turn the negative affect changes attitude toward brands negatively and increases the degree of state aggression. Trait aggression enhances presence, and the spatial presence strongly affects brand memory. Results and implications are discussed.

1. Introduction

Violent video games have attracted much attention due to concerns over their potential to increase player aggression and to affect a player’s real-world behavior. However, these game environments have increasingly been used to persuade in serious games and in advertising. While most research in this area focuses on their effect on the user’s aggression, relatively few studies focus on the impact of violent games on memory and attitude toward advertising that is sometimes present inside these games. As many of the games are highly arousing and often violent, these features may influence how persuasive information and brands are perceived and remembered. The emotions associated with the violent content might interact with the advertising either negatively or positively.

In addition, the current rapid increase of advertiser demand for visibility in popular violent games stands in contrast to the small number of studies into advertising outcomes against the backdrop of violent content. Most studies of violent games focus on violent cue (e.g., realistic blood, weapons) effects on the observer’s aggression level (aggressive feelings or behaviors). There are relatively few studies of the effects of advertising in violent games, such as brand memory formation and attitude change. Most recent studies focusing on advertising effects in games have been tended to opt for non-violent content such as sports or racing games [1-5]. Moreover, there is little research which considers both advertising effects and user aggression with basis of aggression and persuasion theories [6].

The objective of the current study is to investigate how graphical and auditory realism of violence cues (realistic blood and scream sounds), as well as users’ trait aggression, affect advertising effects (i.e., brand memory and attitude change toward the brands) in the game, and user aggression through physiological arousal, negative affect and the sense of ‘presence’ (i.e., the sense of “being there” in a virtual space) [7, 8].

For the purposes, this study examines 1) the effects of violence cues and trait aggression on physiological arousal, negative affect and presence. In turn, 2) the effects of arousal, negative affect and presence on dependent variables (i.e., brand memory, attitude change, and users’ state aggression) are examined. Finally, 3) this study tests the overall effects of the variables by using a path model (SEM) based on our previous work examining effects of violence cues on brand memory, change in brand attitude, and state aggression through physiological arousal, negative affect and presence.

2. Mediated aggression in virtual violence

2.1. General aggression model

Regarding the effects of violent media, general aggression model provides a useful framework for
explaining why exposure to violent media influences user aggression (see [9]). The model postulates both short-term and long-term effects: Short-term effect explains the effects of violent media on user aggression from a single exposure (single-episode) while long-term effect deals with its development into the user’s aggressive personality from multiple or repetitive exposures.

According to the single-episode general aggression model, violent media influences aggression through their impact on the person’s present internal state represented by arousal, cognitive, and affective variables: Violent media increases user aggression by increasing physiological arousal, by creating aggressive affective state, or priming aggressive cognitions including previously learned aggressive scripts or schemata [9].

There are two factors that affect aggression by influencing present internal state – situational and personal inputs. Situational inputs are features (or cues) of the present situation that increase user aggression such as presence of weapon, an insult, or an uncomfortable environment while personal inputs include whatever the person brings to the current situation such as attitudes and beliefs [10]. Situational inputs, thus, include all kinds of stimulating cues in media content that can affect user aggression by influencing user arousal, cognition, or affect; personal inputs can include personal traits or tendencies related with aggression. Regarding the effects of violent game play, for example, personal inputs include users’ trait aggression, whereas situational inputs have included violent game exposure [11].

2.2. Effects of violence cues on arousal & affect

In game violence studies, the depiction of blood has been found to increase users’ perception of gore and aggressive intention [12]. Particularly, blood has been shown to increase user arousal (i.e., a physiological or perceived state of excitement) and aggression in violent games. According to Ballard and Weist’s study [13], inclusion of blood in a shooter game (Mortal Kombat), increase user arousal than a no-blood condition. In addition, realistic amount of blood has been reported to influence arousal [14], with lower levels of blood leading to lower physiological arousal. Jeong et al. [15] found that realistic blood color (i.e., red) increased physiological arousal compared to unrealistic blood color (blue).

In the studies of violent media effects, violent programs were reported to cause negative affect, especially anger or hostility. Violent movies increase user’s negative affect like hostility [16]. Violence cues put hostile feelings to television viewers [17]. Recently, violent games were reported to increase users’ negative affect such as hostility and anger [9, 18]. Violence in television programs decreased positive affect and enhanced anger [19].

Other than visual factors, auditory realism (i.e., screams of pain) was reported to affect user aggression in violent media as a primary factor of sensory realism. Sensory realism refers to formal features of a representation that progressively simulates the same experience in the natural environment, for example a highly realistic representation of violent images (visual realism) or an addition of realistic sound (auditory realism).

Realistic sound cues have been reported to influence arousal and affect. Listening to unpleasant sounds (e.g. noise) influences user emotional arousal and performance [20, 21]. For example, realistic pain cues such as screaming and moaning have been reported to increase observer arousal with negative affect [20, 22]. However, there is little research into the effects of audio realism on arousal and affect in violent video games.

H1 (a/b): (a) Portrayal of blood and (b) screams of pain will increase the degree of user arousal compared to the no-blood and no-scream conditions.

H2 (a/b): (a) Portrayal of blood and (b) screams of pain will increase the degree of a user’s negative affect compared to the no-blood and no-scream conditions.

H3 (a/b): Higher levels of trait aggression will be related to higher levels of (a) physiological arousal and (b) negative affect.

2.3. Presence in mediated experience

Realistic violence cues affect not only arousal or affect level, but also have been shown to influence the sense of “presence” one feels in a virtual environment. Presence is the sensation of being “physically there” in a virtual environment, or the perceptual illusion of non-mediation in a mediated environment [7, 8]. Presence has been used in different names such as telepresence, co-presence or spatial presence. Specifically, spatial presence is defined as “a sense of spatial placement in a virtual environment” [15].

According to Lombard and Ditton [8], there are two factors that affect presence: media form and individual differences. Media form includes the number of senses affected by the media, image quality and size, dimensionality, and perspective. Individual differences include prior experience, personality traits, and gender. Sensory realism cues such as color and sound, as variables of media form, affect the sense of presence in virtual environments. Recently, technical advancement in graphical and auditory realism has been reported to
increase presence in high-tech game studies [23]. Thus, we can assume that depiction of blood and screams of pain within a game might increase the degree of user presence in the virtual environment.

We also suspect that trait aggression will influence the sense of presence in the violent game environment. As the general aggression model indicates, trait aggression could be one of crucial factors in violent game studies [24]. Recent studies about virtual violence have reported a close relationship between user presence and aggression [25], and between presence and hostility [26].

H4 (a/b): (a) Depiction of blood and (b) screams of pain will increase the degree of spatial presence compared to the no-blood and no-scream conditions.

H5: Higher levels of trait aggression will be related to higher levels of the user’s spatial presence.

3. Modeling the experience of violence

3.1. Effects of arousal and presence on brand memory

High arousal has been found to increase memory for central information [30, 31]. Central information can be operationalized as proximity or closeness to the primary task, centrality on the screen, centrality to the plot, duration on screen, size of brand logos, etc. [1, 32].

According to the limited capacity model of information processing, selection processes of user attention are automatically in operation for intensity toward the central information [1, 33]. In arousing environments, focusing attention on central information could drive users to ignore other information since high arousal is contingent with high selectivity [34]. Users will selectively focus on primary information with intensive attention in arousing environments, while they neglect peripheral information. Thus, the effect of increased arousal on memory can be found in primary information carriers.

Focusing on arousal effects on brand logo memory, in the current study we place brand logos directly behind opponents, ensuring that logos are in the field of view whenever they shoot an opponent. In addition, we depict arousing details near the brand logos (blood splattering over the logos) whenever opponents are shot. We suspect that this arousing and centrally located information will be better remembered as a result of increased user arousal.

We also predict that presence will influence brand memory. According to Kim and Biocca [35] presence is strongly correlated with an individual’s ability to recall material. In violent games, a strong sense of presence increases identification with characters [36], leading to better memory for events in the game [37].

H6 (a/b): (a) Physiological arousal and (b) spatial presence will enhance brand memory.

3.2. Brand attitude in virtual environments

The effects of both attitude change and user aggression are related via excitation transfer theory [38]. According to the theory, physiological arousal evoked by earlier events can transfer to later events, and can even add to the arousal resulting from later events.

In television advertising studies, excitation transfer theory has been applied to explain “affect transfer” from television program to commercials in the program. For example, Singh and Churchill Jr. [39] observed that advertisements that produce positive emotions could be perceived positively due to residual excitation from prior programming. Russell [40] reported that the pairing of a product and an emotionally rich television show or movie conditions a transfer of affect from the show to the product. Also, positive feelings influence change in brand attitude positively [41].

In hedonic content like video games, arousal strongly affects user evaluation (i.e., preference) for the content. Consumers show stronger preference for video games if they feel higher arousal in the games [42, 43]. It was also reported that gamers’ physiological arousal is positively related to their pleasure in using games [44]. Such emotional arousal might be transferred to the content in the game through excitation transfer or affect transfer. Thus, the increased arousal could induce positive attitude toward brands embedded in the game.

However, as the general aggression model posits, violent games seem to be more related to negative emotions like hostile feelings. Thus, the effect of arousal on users’ attitude changes through affect transfer in violent games could be different from such effect in non-violent hedonic content. In violent game settings, this study tests whether the effect of arousal on the attitude change toward brands in the violent game would be positive or negative.

Similarly, observers with strong feelings of presence in a virtual environment tend to display greater attitude change toward brands [3, 35, 45]. Furthermore, if a high degree of presence leads to brand preference, it can also enhance the degree of arousal and affect, and more positive change in brand attitude induces favorable purchasing intentions [34].

RQ1 (a/b): Will the increase in (a) arousal, (b) spatial
presence induce negative attitude change toward the brands embedded in violent games?

3.3. Affect effects in virtual violence

Mood was reported to affect the degree of memory retention. Many previous studies showed that mood (or affect) influences memory (e.g., [19, 46, 47].

According to the mood management theory, people naturally pursue a positive mood (e.g., pleasure) and avoid negative mood (e.g., pain). When a program induces negative mood, such as anger and distress, viewers would be willing to finish or change the negative mood. In contrast, viewers in a positive mood would more likely want to maintain the positive mood.

Thus, viewers in a negative mood should be in the process of improving their mood by eliminating the negativity, which automatically needs more effort than that entailed with having a positive mood. Because of the effort (or attention), viewers in a negative mood need to focus more on themselves than on the program, they cannot allot much attention to the program. Therefore, we can assume that users with negative affect (e.g., hostility, anger, or irritation) in violent games could not pay more attention to the embedded in-game brands than those with a non-negative affect. This results in poorer memory scores compared to those with a non-negative affect [19, 48].

Affect also influences attitude change. According to the affect transfer hypothesis, user affect toward the program does influence not only the program but also products in the program. If someone has a positive affect toward a program, the positive emotion may be transferred from the program into the in-program products. This transferred affect could result in a positive change in attitude toward the products or commercials in the program (see [40]). In advertising studies, positive affect was reported to increase user preference for brands of various types (e.g., [49]).

In media studies, violent programs (e.g., games) were reported to cause negative affect, especially anger or hostility [16, 50], which is in line with the aggression mechanism in the general aggression model. Thus, negative affect could be transferred into the brands in the game, and induce a negative attitude change toward the brands. However, we need to consider that user arousal was also reported to affect the user’s preference in correlation with user affect in games. As violent games might cause a negative affect, we need to control the affect variable in investigating the effects of arousal and presence on dependent variables (i.e., memory, attitude change, and state aggression). By controlling the negative affect variable, for example, measuring arousal might provide a better sense of its effect on attitude change, enabling us to assess whether the arousal is linked to a negative or non-negative affect. Therefore, it might also be helpful to explore the relationship between presence and attitude change when the level of users’ negative affect is controlled.

In addition, affect influences aggression. As explained in the general aggression model, violence cues affect user aggression by influencing negative affect such as anger or hostility. In relation to arousal level, if arousal evoked by early events is labeled as negative affect (e.g., anger), the residue of the arousal affects later arousal by labeling the latter affect as a negative affect [51]. Thus, negative affect could influence user aggression through transferred arousal combined with negative affect.

H7 (a/b/c): Negative affect will (a) decrease the level of brand logo memory, (b) increase the degree of negative attitude change toward the brands, and (c) enhance the level of state aggression.

4. Method

4.1. Design and participants

The experiment used a 2 (depiction of blood: on vs. off) x 2 (screams of pain: on vs. off) between subjects design. A total of 88 participants (M = 22.52 years, SD = 4.41; 40 males, 48 females) participated in the experiment. All the participants were recruited from a major university in Korea via the university’s official website on a voluntary basis. They were randomly assigned to one of the four conditions. Considering different gaming patterns between males and females, stratified randomization was used in terms of gender. Each group had 10 males and 12 females. Participants received 5,000 KRW (about 5 USD) for their participation in the experiment.

4.2. Stimulus material

The experiment used a modified violent game, Half-Life 2, which is rated “M” (Mature) by the Entertainment Software Rating Board because of violence, blood and gore. The original game was modified for the experiment. Participants played for about 5 minutes to finish one session. Players walked through 22 corridors to kill the opponents who blocked their way to the ending point. There were 20 sites where players have to fight against (a total of 20) opponents. The opponents were all males wearing military clothes. To ensure that all the subjects played the violent game at the same level regardless of their skills, the game was set at the “health mode” so that
the participants could not be killed during the game.

All participants wore headsets during game play to block external noise and to maximize the clarity of auditory cues. In the blood condition, realistic (red) blood was splattered background brand logos of each location. Likewise, in the screams condition, realistic (screaming) sound was screeched by the opponents whenever they were shot by the players. Players were instructed to kill the opponents whenever they were confronted.

4.3. Measures

**Negative Affect.** Negative affect was measured using the Negative Affect subscale of the PANAS-X (expanded version of Positive Affect and Negative Affect Scale [52, 53]. The subscale is composed of 10 adjectives (e.g., hostile, irritable, afraid, nervous) in the five-point Likert scale. We asked the questions about negative affect two times: before the experiment when they arrived at the experiment room (prior experiment affect, α = .88), and right after the experiment when they finished the game (post experiment affect, α = .93). The final value of negative affect was calculated by subtracting the prior experiment affect value from the post experiment value.

**State Aggression.** State aggression was measured using a revised version of Farrar and Krcmar’s state aggression questionnaire (see [54]). The original scale was developed as a modified version of Buss-Perry’s Aggression Questionnaire (see [54, 55]). This was developed to measure “state aggression” (i.e., degree of aggressive reactions depending on specific evoking situations) for a short-term study with a posttest right after an experiment. The measurement is as reliable as the original version and has adequate construct validity. The reliability test showed a good degree (α = .78).

**Physiological Arousal.** We used galvanic skin response measured through skin conductance levels (SCLs) to assess physiological arousal. We used the Biopac MP150 system (Biopac Inc., Goleta, CA) by settings for SCLs with 20 μV/volt filtering and a 1.0 Hz high-pass filter, and 200 samples per second. Before the experiment game, we checked each user’s SCL baseline for about 5 minutes. The SCLs were also measured continuously during each user play the game.

**Spatial Presence.** ITC-SOPI multidimensional presence scale was used to measure presence (see [56]). Spatial presence was measured with total 20 items of 5-scale measure (α = .96).

**Brand Memory.** Each participant viewed a series of 40 brand logos; Twenty of them (e.g. Samsung, Google, EastAir, Schwinn, etc.) were in the game; the other twenty were not in the game. Each user’s memory score was summed from the correctly-answered scores out of the 20 brand logos.

**Attitude Change.** Attitude change toward brands (change in brand attitude) was measured by user ratings on the following dimensions: good, favorable, positive, and like (7-scale measure; [41]). The values were calculated by subtracting pre-test values from the post-test values. The attitude questionnaire for pre-test was taken about one week prior to the experiment. In the pre-test, there were 40 brands including both the brands that would be in the game and other brands not in the game to minimize effects on the memory test.

**Trait Aggression.** Trait aggression was measured using the Buss-Perry’s Aggression Questionnaire, which consists of 29 items in a 5-point scale [55]. For example, “Given enough provocation, I may hit another person” (physical aggression), “When frustrated, I let my irritation show” (anger), “At times I feel I have gotten a raw deal out of life” (hostility), and “I tell my friends openly when I disagree with them” (verbal aggression). A confirmatory factor analysis on this scale was run in order to verify the factor structure and determine reliabilities of the measure. The scale showed good reliability (α = .76).

4.4. Procedures

Participants were asked by e-mail or phone to complete an online questionnaire one week prior to the experiment. The questionnaire was about the participants’ previous game experience of shooter games, pre-attitude and familiarity toward brands, demographics, and trait aggression. Before playing the experiment game, each participant checked their state of mood (i.e., answered questions about their negative affect) and they practiced the experiment game by moving their character and using weapons for about three minutes. At the practice level, there were no opponents. Before beginning the game, participants also completed a recording session for baseline physiological arousal during which they sat quietly and relaxed.

Participants played one session of the game. Physiological arousal was measured while the participant played the game. After the experiment, the questionnaires were administered to assess the participant’s negative affect, sense of presence (i.e., spatial presence) and state aggression. To measure brand memory, the recognition-memory test followed. Finally, a questionnaire was filled about the participants’ post-attitudes toward the brands encountered in the game.

5. Results
5.1. Manipulation checks

For the violent realism cues of two levels of blood (present or absent) and sound (presence or absence of screams of pain), manipulation checks were conducted by comparing the means of perceived degree of blood splattering and screaming sound in-between levels. The perceived degree of blood splattering was measured by using two items on a seven-point scale (α = .91; e.g., “How much blood was splattered when you shot the opponents?”,”How much blood was splattered onto the advertisements in the game?”). Perceived sound of screams were measured using two items on a seven-point scale (α = .83; e.g., “How much did the opponents scream when you shot them?”,”How much did you hear the opponents’ screams of pain in the game?”). In the perceived degree of blood splattering, the presence of blood showed higher scores (M = 5.53, SD = .92) than the absence of blood (M = 1.83, SD = .102; t = 17.66, p = .001); the presence of screams was higher (M = 5.62, SD = 1.37) than the condition without screams (M = 1.57, SD = 1.34; t = 13.89, p = .001).

5.2. Path model analysis

A path analysis (SEM) was performed to test the model (see Figure 2) using Amos 7.0. The model specifies the effects of blood, screams of pain, and trait aggression on physiological arousal, negative affect, and spatial presence. In the model, we examined the direct effects of violence cues and trait aggression on physiological arousal, negative affect, and spatial presence. Additionally, the effects of arousal, negative affect, and spatial presence on the dependent variables (e.g., brand memory, attitude change, and state aggression) were examined. Figure 1 shows central values and correlations between variables.

![Figure 1. Correlations between Variables](image)

Figure 1. Correlations between Variables

Sensory realism cues (i.e., blood and screams of pain) exhibited significant effects on physiological arousal. Blood condition significantly increased the degree of arousal (β = .23, p = .024), while the screams condition also increased arousal (β = .24, p = .017). However, trait aggression did not show any significant effect on physiological arousal (β = .02, p = .830). For negative affect, both blood and screams of pain showed significant effects. Blood condition had a significant effect on negative affect (β = .27, p = .007), while screams significantly increased the degree of negative affect (β = .22, p = .034). Trait aggression had no significant effect on negative affect (β = .05, p = .626).

For spatial presence, sensory realism had no significant effect (blood, β = .14, p = .179; screams, β = .09, p = .418), but trait aggression showed a significant effect on spatial presence (β = .22, p = .034).

Players who reported higher levels of spatial presence showed a significant effect on brand memory (β = .28, p = .013). The stronger players feel spatial presence, the more they remember brand logos embedded in the game. However, physiological arousal had just a marginal effect on brand memory (β = .18, p = .10). Negative effect (β = -.10, p = .917) did not show any significant effect on memory scores. Players who had higher levels of negative affect showed a negative significant effect on attitude change (β = -.34, p = .003). However, arousal did not show any significant effect on attitude change (β = -.12, p = .842).

![Figure 2. SEM analysis](image)

Figure 2. SEM analysis

The overall model did satisfy the criterion of model fit by adding the direct path between trait aggression and state aggression. With the path between trait aggression and state aggression, negative affect had a significant effect on state aggression (β = .24, p = .002). Controlling for trait aggression, the more negative the users felt, the stronger they showed state aggression. Trait aggression was the strongest predictor.
in the degree of state aggression ($\beta = .70$, $p = .001$) whereas the other variables did not show any significant effects (i.e., spatial presence, $\beta = .04$, $p = .894$; and arousal, $\beta = -.02$, $p = .699$).

6. Discussion

Based on the general aggression model and the excitation transfer theory, we investigated the effects of realistic violence cues on the player’s level of arousal and on negative affect controlling for the user’s trait aggression. We also tested if they (i.e., arousal and negative affect) subsequently influence the levels of state aggression. In addition, we examined whether negative affect influences brand memory and attitude change for brands placed in the violent game controlling for the levels of sense of presence by testing a path model. This study eventually tested whether the violence cues and trait aggression affect brand memory, attitude change, and state aggression through user emotion, arousal, and sense of presence.

Concerning negative affect, we found that sensory realism cues of violence increased the levels of users’ negative affect. Increased negative affect in turn enhanced the degree of state aggression. In particular, the effect of realistic description of blood affected state aggression through negative affect (one factor of users’ internal states). These results are in line with the general aggression model, which explains that violent media increase user aggression by impacting user’s internal state [9, 51]. The results also imply that the process of increasing user aggression by playing violent games occurs with the increase of users’ negative affect transferring the effect of realistic visual cues (i.e., realistic description of blood) on user state aggression.

Contrary to our expectation, however, arousal did not increase state aggression. Arousal also did not mediate the influence of sensory realism cues on state aggression. According to the general aggression model, user aggression could be affected not by arousal but primarily by affective or cognitive variables. However, in violent game studies, these results are in line with those of Arriaga et al.’s study [18]. They reported that arousal (i.e., heart rate) did not significantly increase aggression (state hostility) when controlling for game content (violent games). In addition, they showed that there were no mediation effects of arousal between violent game playing and state hostility.

Notably, even though both spatial presence and negative affect had significant correlations with state aggression (spatial presence, $r = .22$, $p < .05$; negative affect, $r = .21$, $p < .05$), only negative affect had a significant effect on state aggression in the path model. In addition, trait aggression did not show any significant relationship with physiological arousal. On the other hand, players with higher trait aggression showed a higher degree of spatial presence in the violent game.

The specific sensory cues of violence, blood and screams, increased users’ physiological arousal in violent games. This finding supports the proposition that graphic and auditory realism in violence increases user arousal, which is consistent with previous studies about the blood effect on user arousal in violent games (e.g., [13]).

Increased arousal showed a marginally significant effect on brand logo memory. This finding does not match with the results in previous studies that reported arousal is related to memory scores. Instead of physiological arousal, users’ spatial presence predicted brand memory more strongly. This result corroborates the link between presence level and increased memory [8, 35]. The result also implies that enhancing spatial presence in violent games will lead to increased brand logo memory.

The levels of spatial presence, however, led to a negative change in brand attitude in the violent game. This is in line with the results in Jeong et al.’s study [15], called “boomerang effects.” This result strongly highlights that increased spatial presence in violent games can result in negative changes in brand attitude with an increase in brand logo memory. The significant negative relationship between brand memory and attitude change verifies the competing effects ($r = -.21$, $p < .05$). Players in violent games remember brand logos in the game but they result in negative changes in attitude toward the brands in the game.

Likewise, the increased negative affect from the sensory realism cues prompted a negative change in brand attitude. It is noteworthy that negative affect mediates between a sensory realism cue (i.e., screams of pain) and attitude change toward in-game brands. Considering that negative affect increased state aggression, this result shows that negative affect influences is a key variable affecting dependent variables (i.e., attitude change and state aggression) in violent games. One of the key variables in violent games is the affect variable felt by users since negative affect leads to negative change in brand attitude and to a significant increase in state aggression.

In sum, the current study yielded some findings. First, sensory realism cues of violence increased both physiological arousal and negative affect, following the general aggression model. Second, negative affect was a key variable in effects of violent games by turning the effect of screams of pain on attitude change negatively. Third, physiological arousal did not increase brand memory, nor did they affect state aggression. Finally, spatial presence most strongly
predicted the degree of brand memory, but increased spatial presence leads to a negative change in brand attitude.

Practically, the results in the current study support a public policy about realism description in game rating systems. Generally, especially in Korea, realistic description in games (e.g. red blood splattering) has been rated as “Adults Only (19+)” because of a belief that graphical realism enhances user aggression. Consistent with the intuition that realism cues affect the experience of violence, the current study shows that realistic blood description enhances state aggression through negative affect. Future studies need to examine more mediators or moderators that link between such realism cues and user aggression.

Despite the interesting findings, there are some limitations in this study. Most of all, the placements of brand logos behind game characters with splattering of blood are not natural in real violent game environments. Future studies need to replicate this study with ecological validity. Next, we did not use implicit variables in both memory and attitude change. Recent studies about in-game ads (e.g. [2]), implicit variables have been highlighted. Future studies need to examine the effects of violence cues on implicit memory and attitudes toward in-game ads.

7. References


