BRAND LOGO PLACEMENTS IN VIOLENT GAMES
Effects of Violence Cues on Memory and Attitude Through Arousal and Presence

Eui Jun Jeong, Corey J. Bohil, and Frank A. Biocca

ABSTRACT: With the general aggression model and presence (i.e., sense of “being there”) theory as frameworks, this study investigates the effects of violence cues (blood and screams of pain) and players’ individual differences in aggression (trait aggression) on brand logo memory and on attitude change in a violent first-person shooter game (Half-Life 2). Physiological arousal (skin conductance levels) was assessed during game play and participants reported their sense of presence in the game. Results indicate that violence cues influence brand logo memory through engagement and affect attitude change via arousal. Although physiological arousal led to positive change in brand attitude, it does not significantly influence logo memory. Conversely, although higher levels of spatial presence led to better logo memory, there was a corresponding reduction in attitude change for highly recognized brands. We consider the possibility that increased memory but negative attitude change with higher presence in violent video games could deter advertisers from placing their messages inside violent games.

Video games are increasingly viewed as an attractive medium for advertising. These interactive environments are known to be very arousing, which is thought to foster memory formation for in-game events and locales (Jeong, Biocca, and Bohil 2008). As we demonstrate in this paper, however, advertising in highly immersive violent video games can potentially have a negative impact on change in brand attitude. Might this result dissuade advertisers from placing their ads in violent games?

The relatively few studies on the effects of ad placement in violent games belie the rapid growth of advertising in this medium. Expenditures in the in-game advertising market reached $77 million in 2006 and are expected to reach $1 billion by 2012, following the rapid growth of global game markets (Yankee Group 2007). In 2008, violent games (including shooting or fighting) comprised three out of five blockbuster video games in global markets (NPD 2009).

This rapid increase of advertiser demand for visibility in popular violent games stands in contrast to the small number of studies on 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 thoughts 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 tended to opt for nonviolent content such as sports or racing games (e.g., Lee and Faber 2007; Nelson, Yaros, and Keum 2006; Wise et al. 2008; Yang et al. 2006).

An important issue in violent games is the level of realism of the violence. Steady technological improvements have led to increased realism of portrayals of violence in media (Ivory and Kalyanaraman 2007). One factor is the link between cue realism such as injury, cues of pain, and blood on the perceived violence and aggression of a game (Ballard and Weist 1996; Farrar, Krcmar, and Nowak 2006). Recent studies have reported that realism cues such as blood and sound effects influence user arousal and aggressive thoughts (e.g., Barlett, Harris, and Bruey 2008; Jeong, Biocca, and Bohil 2008).

The objective of the current study is to investigate how graphical and auditory realism of violence cues (realistic blood and pain sounds), as well as users’ trait aggression, affect physiological arousal during violent game play. Furthermore, the study examines the effects of violence cues and trait aggression on the sense of “presence” (i.e., the sense of “being there” in a virtual space; Biocca 1997; Lombard and Ditton 1997). We
will test a path model based on our previous work examining effects of violence cues on brand memory and change in brand attitude through arousal and presence.

This work is guided by two frameworks: one is a theoretical framework that explains the processes underlying violent media effects, known as the general aggression model (Anderson and Bushman 2001, 2002); the other is the sense of presence that is influenced by realistic cues and affects brand memory and change in brand attitude. According to the model, violent media influence user internal states such as physiological arousal and aggressive thoughts (Anderson and Bushman 2001), and the effects of increased arousal on memory have been found to co-occur with vividness of portrayal (Kensinger and Schacter 2006; Ochsner 2000). In advertising studies, the relation between increased arousal and brand attitude has also been investigated (see Grigorovici and Constantin 2004).

Likewise, previous studies of presence report that realistic visual and auditory cues increase the sense of presence (Lombard and Ditton 1997). Presence has also been reported to influence brand memory and changes in brand attitude (Kim and Biocca 2001; Nelson, Yaros, and Keum 2006). Thus, it is natural to assume that playing violent games may bring about advertising effects such as brand memory and attitude change via violent media effects on arousal and presence.

LITERATURE REVIEW

Mediated Aggression in Violence Realism: General Aggression Model

Media violence has been connected with user aggression and violent behavior (Anderson and Bushman 2001; Ballard and Weist 1996). In video games, violent content has been shown to instill aggressive thinking (Anderson et al. 2004; Bensley and Eenwyk 2001; Sherry 2001).

A useful framework for understanding how violent media influence aggression is the general aggression model (Anderson and Bushman 2001). The model postulates short-term effects of media violence (i.e., single-exposure effects) on user aggression as well as long-term effects reflecting the development over time of aggressive personality traits from repeated exposures to violent content.

According to the single-episode general aggression model, violent media influences internal states, either by increasing physiological arousal, priming aggressive cognitions (including previously learned aggressive scripts or schemas), creating an aggressive affective state (Anderson and Bushman 2001, 2002), or some combination of these. The model has been the basis for several studies investigating media violence effects on aggression (e.g., Anderson et al. 2004; Arriaga et al. 2006; Barlett, Harris, and Bruey 2008; Eastin 2006; Jeong, Biocca, and Bohil 2008).

The internal states referenced by the general aggression model can be influenced by situational and personal inputs. Situational inputs are features (or cues) of media content, such as weapons, insults, or uncomfortable circumstances that increase an observer's aggressive state, or anything that can affect arousal, cognition, or affect. Personal inputs include an observer's attitudes, beliefs, and tendencies related to aggression (Anderson and Carnagey 2004), otherwise known as trait aggression.

Trait aggression\(^2\) has been the focus of many media violence studies, including studies on video game violence (e.g., Barlett, Harris, and Bruey 2008; Williams and Clippinger 2002). Trait aggression is an important personal input since it represents stable personality features, including hostility and anger, which may have been influenced by prior exposure to media violence.

One situational input of particular interest to us is the effect of improving technology on video game realism. Cue realism has been shown to increase arousal and engagement in violent games (Ivory and Kalyanaraman 2007; Jeong, Biocca, and Bohil 2008). This includes visual realism (e.g., of weapons or blood) and auditory realism (e.g., of pain sounds). Sensory realism cues such as these have been a central focus of study due to their potential to increase players' levels of arousal and aggression (e.g., Ballard and Weist 1996; Barlett, Harris, and Bruey 2008; Jeong, Biocca, and Bohil 2008).

Effects of Realistic Cues and Trait Aggression on Arousal

Graphically realistic visual cues have been shown to affect perceived violence (Potter et al. 2002). We focus especially on realistic blood since it is commonly depicted in violent games, and this depiction is one of the criteria differentiating youth-oriented games from adult-only games in game rating boards (e.g., “Game Ratings and Descriptor Guide” in the Electronic Software Rating Board [United States], the Computer Entertainment Rating Organization [Japan], the Game Rating Board [Korea]).

In game violence studies, the depiction of blood has been found to increase users' perception of gore and aggressive thinking (Farrar, Krcmar, and Nowak 2006). Blood has been shown to increase arousal and aggression in violent games. According to Ballard and Weist (1996), inclusion of blood in a first-person shooter game (Mortal Komhah), led to higher arousal than a no-blood condition. In addition, a realistic amount of blood has been reported to influence arousal (Barlett, Harris, and Bruey 2008), with lower levels of blood leading to lower physiological arousal. Jeong, Biocca, and Bohil (2008) found that, compared with unrealistic blood color, realistic blood color increased both physiological and subjective arousal.
Similarly, realistic sound cues have also been reported to affect user arousal. Listening to unpleasant sounds (e.g., noise) influences user arousal and performance (Cassidy and MacDonald 2007; Loeb, Holding, and Baker 1982). For example, realistic pain cues such as screaming and moaning have been reported to increase observer arousal (Bradley and Lang 2000; Cassidy and MacDonald 2007). However, there is little research into the effects of audio realism on memory and arousal in violent video games.

The study reported here uses the short-episode general aggression model as a guiding framework. We examine the short-term effects of violence cues (situational inputs) on user state during video game play. Focusing specifically on cue realism effects on arousal, we observe physiological arousal as an internal state as in the model. We examine the influence of two sensory realism cues—occurrence of blood and screams of pain—on users’ physiological arousal. We also examine the role of trait aggression characteristics on arousal level. We test the following hypotheses:

**H1:** (a) Portrayal of blood and (b) screams of pain will lead to increased arousal compared with no-blood and no-screaming conditions.

**H1c:** Higher levels of trait aggression will be related to higher levels of physiological arousal.

According to the general aggression model, internal states are affected by either situational or personal inputs (Anderson and Carnagey 2004). Thus, situational and personal inputs have direct effects on internal states, and additionally, these could interact to affect arousal. In the current research, we expect that violence cues (depiction of blood or screams of pain) and users’ trait aggression are likely to interact to influence physiological arousal.

In game violence studies, such interaction effects have not received much attention. Most studies of trait aggression focus on main effects of stimuli on internal states: They test trait aggression as a covariate without much attention to its interactions with stimuli (see Barlett and Rodeheffer 2009). Recently, Anderson and Carnagey (2009) reported an interaction effect between trait aggression and experimental game conditions (violent versus nonviolent game) on aggressive thoughts. In their experiment, participants with high trait aggression had more aggressive thoughts in a violent game condition than in a nonviolent game condition. Likewise, there are few studies of the interaction between sound and color on arousal in game play. Wolfson and Case (2000) reported the interaction of background color and sound (music) on users’ physiological arousal (heart rate). They showed that the combination of red color and loud sound increased user arousal in a brick-breaking video game.

Inspired by these observations, we will examine whether violence cues interact with trait aggression. In addition, we expect that specific violence cues (i.e., blood and screams of pain) will interact to influence player arousal. This study will test the following research question:

**RQ1:** Will there be any interaction between depiction of blood, screams of pain, and individual trait aggression on physiological arousal?

### Presence and Arousal in Mediated Experience

In addition to affecting arousal level, realistic violence cues have also been shown to influence the sense of “presence” one feels in a virtual environment (e.g., during a game). Presence is the sensation of being “physically there” in a virtual environment, or the perceptual illusion of nonmediation in a mediated environment (Biocca 1997; Lombard and Ditton 1997).

Presence scholars think of presence as a multidimensional concept, composed of such factors as spatial presence and engagement (or involvement); some add more factors such as realness and naturalness. Early approaches to the sense of presence were driven by technological perspective and spatial presence (i.e., a sense of spatial placement in a virtual environment) was a sole factor in the measurement of presence (Wirth et al. 2007). With the findings of conceptual intersections with existing psychological constructs such as involvement, however, recent conceptualizations have included subdimensions of presence.

Witmer and Singer (1998), for example, considered involvement and naturalness as necessary parts of the presence experience. They defined “involvement” as a psychological state experienced as a consequence of focusing on stimuli or events, and “naturalness” as the degree of perceived naturalness toward objects or events in a virtual environment. Likewise, Regenbrecht and Schubert (2002) included involvement and realness (i.e., reality judgment of the virtual environment) as subfactors of presence.

Developing such concepts, Lessiter et al. (2001) adopted spatial presence and engagement as primary subdimensions of presence. They used previous concepts (e.g., spatial presence, involvement, naturalness, realism, etc.) to find crucial factors in measuring the sense of presence. With factor analysis and validity tests, they reported central concepts such as “engagement,” which refers to a tendency to feel psychologically involved in or focused on the content, and “spatial presence,” which refers to a sense of physical or spatial placement in a virtual environment. In the current study, we adopted the multidimensional concept of presence and focused on the two primary concepts (i.e., spatial presence and engagement) from Lessiter et al.’s study (2001).

According to Lombard and Ditton (1997), 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, gender, and personality traits.

Sensory realism cues such as color and sound, as variables of media form, affect the sense of presence in virtual environments (Lombard and Ditton 1997). Recently, technical advancement in graphical and auditory realism has been reported to increase presence and involvement in high-tech game studies (Ivory and Kalyanaram 2007). Thus, we can assume that presence of blood and screams of pain within a game might increase the sense of 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 (see Anderson and Carnagey 2009). Recent studies about virtual violence have reported a relationship between presence and aggressive feelings (Persky and Blascovich 2008) and hostility (Nowak, Krcmar, and Farrar 2008). Thus, in the current study, we directly test the effect of trait aggression on presence.

In video games, a strong sense of presence has been reported to elicit greater enjoyment and arousal (Heeter 1995; Lombard et al. 2000). Ravaja et al. (2006) showed that a higher sense of presence led to increased physiological arousal during video game play. Hence, we test the relationship between arousal and presence as a hypothesis. We propose the following hypotheses:

\[ H2: \text{Depiction of blood and (b) screams of pain will lead to an increased feeling of spatial presence compared with no-blood and no-screaming conditions.} \]

\[ H2c: \text{Higher levels of trait aggression will be related to higher levels of the user’s spatial presence.} \]

\[ H3: \text{(a) Depiction of blood and (b) screams of pain will lead to increased engagement compared with no-blood and no-screaming conditions.} \]

\[ H3c: \text{Higher levels of trait aggression will be related to higher levels of the user’s engagement.} \]

\[ H4: \text{There will be significant relationships (a) between physiological arousal and spatial presence, (b) between spatial presence and engagement, and (c) between arousal and engagement.} \]

**Effects of Arousal and Presence on Brand Logo Memory**

Arousing information has been found to be better remembered than neutral information (Bradley 1994; Bradley et al. 1992; Cahill et al. 1994; Heuer and Reisberg 1990). Arousal affects both subjective vividness and objective accuracy in arousing events (Kensinger and Schacter 2006; Ochsner 2000). However, the effect of arousal on memory depends on the centrality of the information observed (Cowley and Barron 2008).

Central or primary information seems to increase memory without regard to the degree of arousal. Primary 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, and so forth (Cowley and Barron 2008; Lee and Faber 2007). Recent studies show that closeness to a primary task leads to greater memory effects (d’Astous and Chartier 2000; Gupta and Lord 1998; Law and Braun 2000).

Specifically, in gaming studies, Lee and Faber (2007) showed the effect of proximity on brand memory in a racing game. High arousal has been found to increase memory for central information (Brave and Nass 2002; Parrott and Spackman 2000). According to the limited capacity model of information processing, selection processes of user attention are automatically in operation for intensity and selectivity toward the central information (Lang 2000; Lee and Faber 2007). In arousing environments, focusing attention on central information could drive users to ignore other information since high arousal is contingent with high selectivity (Grigorovici and Constantin 2004). 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 logo memory. According to Kim and Biocca (1997), presence is strongly correlated with an individual’s ability to recall material. In violent games, a strong sense of presence increases identification with characters (Tamborini 2000), leading to better memory for events in the game (Grigorovici 2003). In product placement studies, however, the effects of presence on brand memory are unclear. Grigorovici and Constantin (2004) showed that presence negatively affected brand recall. Nelson, Yaros, and Keum (2006), however, could not find evidence of such a negative relationship between presence and memory. They indicated that presence could be a factor in making users focus selectively on central information. Thus, in mediated environments, brands positioned in areas peripheral to the central task are likely more difficult to remember. In prominent locations, the effects of presence on brand memory could be positive. In the current study, we predict that a strong sense of presence will increase brand logo memory. We test the following hypotheses:


**H5:** (a) Arousal, (b) spatial presence, and (c) engagement will increase brand logo memory.

### Change in Brand Attitude Through Virtual Experience

The effects of both attitude change and user aggression are related via excitation transfer theory (Zillmann, Katcher, and Milavsky 1972). 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. Since arousal dissipates slowly, early excitation events intensify subsequent arousal. This effect could manifest itself in aggressive feelings or positive (or negative) change in attitude toward brands.

In television advertising studies, excitation transfer theory has been applied to explain affect transfer from television program to commercials in the program. Singh and Churchill (1987) observed that advertisements that produce positive emotions could be perceived positively due to residual excitation from prior programming. Russell (1998) 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 (Yoo and MacInnis 2005).

In hedonic content such as video games, arousal strongly affects user evaluation (i.e., preference) for the content. Consumers show stronger preference for video games if they feel more arousal in the games (Kempf 1999; Mehrabian and Wixen 1986). It was also reported that gamers’ physiological arousal is positively related to their pleasure in using games (see Ravaja and Kivikangas 2008). 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. Actually, Grigorovici and Constantin (2004) reported that level of arousal had a significant effect on preference for brands embedded in a 3D virtual environment (i.e., video games). We can assume that high arousal could induce positive change in brand attitude in video games. This study will test the arousal effect on attitude change.

Similarly, observers with strong feelings of presence in a virtual environment tend to display greater attitude change toward brands (Kim and Biocca 1997; Nelson, Keum, and Yaros 2004; Nelson, Yaros, and Keum 2006). Furthermore, if a high degree of presence leads to brand preference, it can also lead to heightened arousal and affect, and more positive change in brand attitude leading to favorable purchasing intentions (Grigorovici and Constantin 2004). Hence, we propose the following hypothesis:

**H6:** The increase of (a) arousal, (b) presence, and (c) engagement will lead to positive attitude change toward the brands.

Finally, we will examine the potential mediating effect of presence and arousal between violence cues and advertising effects (brand memory and attitude change) in a path model. Presence is influenced both by technological and individual cues, but it also influences user responses to media cues. Presence has been reported to play a critical role in mediating between environmental cues and observers’ cognitive, affective, and social states. There is evidence for this mediating effect of presence in the human-computer and virtual environment literatures (Lee and Nass 2004; Lee et al. 2011). Mediating effects of presence in games have been shown for user satisfaction, preference, and enjoyment (Lee, Jin, and Park 2005; Lee et al. 2001). Presence has also been shown to mediate between violent game playing and aggression (Nowak, Krcmar, and Farrar 2008; Persky and Blascovich 2008). However, there are few studies showing a mediator effect for presence on brand logo memory and attitude change in virtual environments. Based on previous studies of violence cues, arousal, brand logo memory, and change in brand attitude, we will examine the mediating role of arousal in our path model.

**RQ2:** Will arousal, spatial presence, and engagement mediate the effects of violence cues on brand logo memory and attitude change?

### METHOD

**Experiment Design**

**Design and Participants**

The experiment used a 2 (depiction of blood: on versus off) × 2 (screams of pain: on versus off) between-subjects design. A total of 80 participants (M = 20.6 years, SD = 2.48; 55 males, 25 females) were recruited from a major Midwestern university in the United States. Participants were recruited for the study on a voluntary basis from three undergraduate classes. They were randomly assigned to one of the four conditions. In terms of sex, considering different gaming patterns between males and females, we used a stratified randomization. Each group was composed of 6 to 7 females and 13 to 14 male students. Participants received course credits for their participation in the experiment.

**Stimulus Materials**

The experiment used the game *Half-Life 2*, which is rated “M” (Mature) by the Entertainment Software Rating Board because of violence, blood, and gore. We modified the original game for the experiment using Garry’s Mod (www.garrysmod.com), which is a design tool that enables users to change gaming environments. Participants played for about five minutes to finish one session. They walked through several corridors to
The Journal of Advertising

kill the opponents who blocked their way to the end point. There were 20 sites where players had to fight against (20 total) opponents. Participants wore headphones during game play to block external noise and to maximize the clarity of auditory cues. Blood was splattered on the background brand logos of each location in the blood condition, as seen in Figure 1, while the blood emitted by wounded enemies was either on or off, depending on experimental condition.

Participants were instructed that they must shoot and kill the opponents to pass through each corridor. Without killing the opponent, no participant could pass to another corridor since the opponent would shoot back and kill the participant in the game. Whenever participants shot and killed an opponent, screams of pain were heard in two of the experimental conditions. Participants could hear all other sound effects (e.g., footsteps, shooting) regardless of condition. All enemies wore military clothes with gas masks covering their faces.

**Measures**

**Trait Aggression**

Trait aggression was measured by the Buss-Perry Aggression Questionnaire, which consists of 29 items on a 5-point scale (Buss and Perry 1992). Using the scale, Buss and Perry (1992) tested three models: (1) a global trait aggression model that assumes all items would load on one general factor; (2) a four subtraits model assuming four correlated factors such as hostility, anger (or temper), physical aggression, and verbal aggression; and finally, (3) a hierarchical model that assumes the four subtraits are sufficiently related to form a general, higher-order factor of trait aggression. Their study showed that the second and third models had reasonably good fits, suggesting one of these should be used to maximize inclusiveness. Thus, the current study adopted the third, hierarchical model and used the second-order factor as trait aggression.

To verify the factor structure and determine reliabilities of the measure, we ran a confirmatory factor analysis on this scale. From the original Buss-Perry scale, four items (items 6, 15, 19, and 25) were dropped out because of poor reliability, and four items were loaded on different dimensions from the original scale (item 4 on hostility and item 9 on anger from physical aggression; item 16 on verbal aggression from anger; and item 23 on anger from hostility). Following the analysis, each dimension showed good reliability (hostility, 7 items, $\alpha = .77$; anger, 6 items, $\alpha = .78$; physical aggression, 6 items, $\alpha = .75$; verbal aggression, 6 items, $\alpha = .69$). Finally, trait aggression was calculated from the four dimension values (average of the means of the four subtraits), which showed good reliability ($\alpha = .75$). The overall analysis showed adequate model fit ($\chi^2 = 78.63, p > .05$; RMSEA [root mean square error of approximation] = .077; CFI [comparative fit index] = .912).

**Physiological Arousal**

For physiological arousal, galvanic skin response was measured through skin conductance levels (SCLs) using the Biopac MP150 system (Biopac, Goleta, CA). The hardware settings for SCLs were 20 $\mu$Ω/volt filtering and a 1.0 Hz high-pass filter, and 200 samples per second. SCL baseline was measured for 30 seconds before beginning the game, and during play, SCLs were measured continuously.

**Spatial Presence and Engagement**

Presence was measured by the ITC-SOPI multidimensional presence scale (see Lessiter, Freeman, and Davidoff 2001). The questionnaire is composed of four subfactors such as spatial presence, engagement, ecological validity, and negative effects. We focused on two primary factors—spatial presence and engagement. Thus, the questionnaire is composed of 33 items (5-scale measure): (a) spatial presence (20 items; e.g., “I felt as though I was in the same space as the characters and/or objects,” “I had a sense of being in the scenes displayed,” $\alpha = .93$); and (b) engagement (13 items; e.g., “I felt involved in the displayed environment,” “I paid more attention to the displayed environment than I did to my own thoughts,” $\alpha = .88$).

**Brand Logo Memory**

For measuring brand logo memory (logo recognition), a recognition memory test followed the game-playing session. Each participant viewed a series of 40 brand logos: 20 of them (e.g., Samsung, Google, EastAir, Schwinn) were in the game, but the
other 20 were not in the game. The 20 brand logos that were in the killing sites of the game were experienced with blood emission and screams of pain, depending on condition. Each user’s memory score was summed from the correctly answered scores of the 20 brand logos where the user could experience blood splatter (on versus off) and screams of pain (on versus off). Participants were instructed to determine as quickly as possible whether they had seen each brand logo during game play or not.

Attitude Change Toward Brands

To gauge the attitude change toward brands (change in brand attitude), participants provided ratings on the following dimensions: good, favorable, positive, and like (seven-scale measure) (Yoo and MacInnis 2005). The attitude test was conducted two times (pre- and posttest). The attitude change values were calculated by subtracting pretest values from the posttest values. The attitude questionnaire for pretest was taken about one week prior to the experiment. In the pretest, to minimize effects on the memory test, there were 40 brands, including both the brands that would be in the game and other brands not in the game. After the experiment, the attitude questionnaire was taken again for the brands in the game (Pre-Q: \( M = 4.04, SD = .81 \); Post-Q: \( M = 4.50, SD = .66 \)).

Procedures

Participants were asked by e-mail to complete an online questionnaire one week prior to the experiment. The questionnaire gathered information from the participants about their frequency of exposure to shooter games, preattitude and familiarity toward brands, demographics, and trait aggression. Just prior to starting an experimental session, each participant practiced moving their character and using weapons. For this practice, a printed page of instructions was provided, and a trained experimenter read these instructions aloud and aided in their practice. The practice phase did not exceed five minutes, and there were no opponents at this level. Before beginning the game, participants completed a recording session for baseline physiological arousal during which they sat quietly and relaxed.

During the experimental phase, participants played one session of the game. While playing the game, physiological arousal (skin conductance) was measured. After the experiment, the questionnaires were administered to assess the participant’s sense of presence (during the game). The recognition-memory test followed for measuring brand logo memory. Participants were asked to quickly decide whether they had seen the brand logos before or not. Finally, a questionnaire assessed participants’ postattitudes toward the brands encountered in the game.

RESULTS

Manipulation Checks

Manipulation checks for two levels of blood (present or absent) and sound (present or absent screams of pain) were conducted by comparing means of perceived violence and realism between the levels. Perceived violence was measured using four items on a five-point scale (\( \alpha = .89 \); e.g., “The game I played had violent graphics,” “The game was very violent,” “The game was for hard-core violent game users,” and “The game should be rated as adult games due to violence”). Perceived realism was measured using two questions on a five-point scale (\( \alpha = .74 \); “I felt that the killings were very realistic,” “It was believable to me as real”). In perceived violence, the presence of blood showed higher scores (\( M = 3.57 \)) than the no-blood condition (\( M = 1.95; t = 3.71, p < .01 \)); the screams condition was higher (\( M = 3.23 \)) than the no-screams condition (\( M = 1.89; t = 3.39, p < .05 \)). Likewise, in terms of perceived realism, the blood condition showed higher scores (\( M = 2.98 \)) than the no-blood condition (\( M = 1.83; t = 2.85, p < .05 \)), and the screams condition was higher (\( M = 2.84 \)) than the no-screams condition (\( M = 1.97; t = 2.47, p < .05 \)).

Interaction Effects

Before we present our path model, to test Research Question 1, we examined main and interaction effects of sensory realism cues (e.g., blood and screams of pain) and trait aggression on physiological arousal.

To test the effects of sensory realism cues on physiological arousal (SCLs subtracted from baseline), we used one-way analysis of variance (ANOVA). Arousal was the dependent variable: The sensory realism cues (blood, screams of pain) and trait aggression were the independent variables. For this test, we split the trait aggression into two groups (higher versus lower), using the median value (2.25).

The depiction of the two violence cues, blood and screams of pain, significantly increased players’ physiological arousal (blood, \( F[1, 72] = 7.83, p < .01 \); screams, \( F[1, 72] = 4.13, p < .05 \)). Participants who saw blood (\( M = .28, SD = .24 \)) displayed higher arousal than those who did not see blood (\( M = .02, SD = .05 \)). Similarly, those who heard screams of pain (\( M = .26, SD = .14 \)) displayed higher physiological arousal than those who did not (\( M = .05, SD = .05 \)). Players’ levels of trait aggression had no significant relationship to their levels of arousal.

We found two interaction effects on arousal: between blood and screams, \( F(1, 72) = 15.05, p < .001 \), and among blood, screams, and trait aggression, \( F(1, 72) = 12.93, p < .01 \). Contrast tests show that users in the no-screams condition showed higher arousal with the depiction of blood compared with
the no-blood condition, $M = .29$ versus $-.18$, respectively, $F(1, 38) = 10.65, p < .01$, but arousal was not significantly affected by the depiction of blood in the screams condition, $M = .27$ versus $.20$, $F(1, 38) = .80, n.s.$ (not significant). Figure 2 shows that low-aggression participants in the no-screams condition experienced higher arousal in the blood condition than in the no-blood condition, $M = .29$ versus $.26$, respectively, $F(1, 19) = 19.03, p < .01$. For higher trait aggression users, arousal in the screams condition showed higher arousal in the blood condition than in the no-blood condition, $M = .31$ versus $.13$, $F(1, 20) = 4.19, p < .05$. There were no significant differences in other conditions.

**Path Model**

To test the path model, we performed a path analysis. The model specifies the effects of blood, screams of pain, and trait aggression on both physiological arousal and presence. In addition, it tests the relationship among physiological arousal, presence, brand logo memory, and change in brand attitude (see Figure 3). Table 1 shows the correlations between key variables.

**Effects of Sensory Realism Cues and Trait Aggression on Arousal and Presence**

As we have seen in the direct effects, sensory realism cues (i.e., blood and screams of pain) showed significant effects on physiological arousal (see Figure 3). For trait aggression, however, we could not find any significant effect on physiological arousal. Thus, H1a and H1b were supported, but H1c was rejected.

For spatial presence, only trait aggression showed a significant effect ($\alpha = .27, p < .05$). For engagement, scream sounds had a significant effect ($\alpha = .36, p < .01$), and blood condition had a significant (negative) effect on engagement ($\alpha = -.24, p < .05$). Likewise, trait aggression showed a substantive effect on engagement ($\alpha = .41, p < .01$). Thus, H2c, H3a, H3b, and H3c were supported while H2a and H2b were not.

**Effects of Arousal and Presence on Brand Logo Memory**

Players who reported higher levels of spatial presence remembered (recognized) more brand logos, $\alpha = .38, p < .01$. Likewise, the effect of one of the other dimensions of presence, engagement, on brand logo memory was also significant ($\alpha = .28, p < .05$). Thus, H5b and H5c were supported.

There was a significant correlation between physiological arousal and brand logo memory ($r = .26, p < .05$). However, when presence was controlled (spatial presence and engagement), the significant relationship between arousal and memory disappeared ($\alpha = .08, n.s.$). Thus, H5a was not supported.

There was a significant correlation between physiological arousal and presence along both the dimensions of spatial presence ($r = .32, p < .05$), and engagement ($r = .24, p < .05$). The two dimensions of presence were strongly intercorrelated ($r = .36, p < .01$). Thus, H4a, H4b, and H4c were all supported.

**Effects of Arousal and Presence on Change in Brand Attitude**

We tested the effects of arousal and presence on attitude change. Users who experienced higher levels of arousal reported greater change in brand attitude in the game ($\alpha = .25, p < .05$).
But players who reported higher levels of spatial presence displayed strong negative change in brand attitude ($\alpha = -0.40, p < .01$). Level of engagement did not significantly affect attitude change. Thus, H6a was supported, whereas H6b and H6c were not.

Finally, we conducted an analysis of mediation effects. We compared the improvement of model fit between the path model and the other model that includes direct paths between violence cues and dependent variables (see Valkenburg and Peter 2008). There was, however, no improvement of model fit between the two models: $\chi^2$ change ($df = 4$) = 1.56, n.s. The analysis suggests there are two significant paths mediating the effects of the sensory cues of violence on brand logo memory attitude change: one path is through arousal mediating the change in brand attitude; the other was through engagement (an indicator of presence) mediating the recognition memory for brand logos.

**DISCUSSION**

As brands and brand products appear increasingly inside violent games, does the sensory realism of violence inside the
games potentially affect players’ brand logo memory and attitude change for brand logos placed in the games? Guided by the general aggression model, we looked at the impact of game-related aspects of violence (i.e., realistic violence cues) and user-centered tendencies toward violence and aggression (i.e., trait aggression) on the player’s level of arousal during game play. In addition, we examined their effects on the user’s immersive experience of the game (i.e., sense of presence). Finally, we tested whether the players’ arousal and sense of presence significantly mediate the effects of violence cues on brand logo memory and attitude change for brand logos placed in a violent game.

We found that the sensory realism of violence, specifically the depiction of blood and screams of pain, increased users’ physiological arousal while playing. These results are consistent with previous studies showing that the mere presence of blood (e.g., Ballard and Weist 1996) increases users’ arousal and the general relationships between unpleasant sounds and arousal (e.g., Bradley and Lang 2000). This is broadly consistent with the general aggression model, which predicts the effects of situational inputs, in this case, realistic violence cues, on the viewer’s arousal.

Turning now toward properties of the user, trait aggression did not show any significant association with physiological arousal in the path analysis. At the same time, those with higher trait aggression were more likely to feel spatial presence in the violent game. There was an interaction of the player’s level of trait aggression with the sensory cues of violence in the game. The result indicates that that combination of violence cues—blood and screams—increases arousal of the users with higher trait aggression. Overall, this indicates that although users with higher trait aggression are not more aroused than others by the violence cues, they feel more spatial presence in the game than those with lower trait aggression.

The more aroused a player was in the game, the more likely he or she was to have increased positive change in brand attitude. This is consistent with previous studies about the effect of arousal on user evaluation in hedonic content (e.g., Kempf 1999; Mehrabian and Wixen 1986). From the perspective of affect transfer and excitation transfer, the relationship between increased arousal and positive change in brand attitude is also predicted. First, for gamers, arousal is related to user pleasure resulting from emotional intensity (see Ravaja and Kivikangas 2008). Second, our measure of arousal—skin conductance level—is also sometimes used to measure arousal and pleasure (Wang and Minor 2008). In psychophysiology studies, high arousal and positive valence tend to be present when galvanic skin response (SCLs) is high (Mandryk and Atkins 2007).

Increased arousal, however, did not lead to improved brand logo memory. This finding differs from previous studies reporting that arousing events are better remembered. One explanation could be the effect of interactivity in (dynamic) gaming environments. In most previous studies of arousal effects on memory, participants were passive, that is, they were simply watching static stimuli such as arousing pictures (e.g., bloody casualties, sexual scenes) (e.g., Bradley et al. 1992; Maljkovic and Martini 2005). Increments in arousal may not influence memory in highly interactive environments to the same extent as in low or noninteractive ones. In passive environments, aroused users (viewers) would focus more resources (attention) on central information than those in interactive (dynamic) environments. Users in interactive environments need to allocate comparatively more resources to their interactive activities as well (e.g., aiming at opponents, shooting). Future studies could examine the arousal effect on memory at different levels of interactivity.

Brand logo memory, on the other hand, was significantly predicted by the user’s sense of presence in the game. A player’s level of spatial presence was the biggest predictor of brand logo memory in the game. This is consistent with previous studies showing a link between presence level and increased memory (Kim and Biocca 1997; Lombard and Ditton 1997). The current results imply that enhancing presence in violent games will lead to increased brand logo memory.

It is important to note, however, that although a player’s level of arousal has a positive effect on brand attitudes, their level of spatial presence led to negative change in brand attitude in the violent game. It appears that a strong sense of spatial presence in violent games leads to negative changes in brand attitude, but with an increase brand logo memory. Players remember the brand logos more, but with negative changes in brand attitude.

This was clearly evident for the highly recognized brand logos in this study. When we checked the correlation between recognition and attitude change for the logos that were highly recognized over the median of recognition (.49), there was a significant negative relationship to attitude change (r = –.27, p < .05). We refer to this result as a “boomerang effect” for the highly recognized brand logos, as it presents a paradox for advertisers interested in utilizing popular violent games. Higher spatial presence in highly immersive violent games could accompany negative attitude change toward the highly recognized brands.

The negative association between spatial presence and attitude change is, in some ways, consistent with previous studies. Cowley and Barron (2008) reported that prominent product placement in television programming led to negative change in brand attitude for viewers who were highly interested in the program’s content, and may have been more sensitive to disruption by ad placement (see also Edwards, Li, and Lee 2002). In game studies, players higher in spatial presence are likely to enjoy the game more (see Lee, Jin, and Park 2005), but could become more sensitive to disruption of their sense of presence by the occurrence of prominent real-world brand logos. This
could lead to negative feelings toward these brands. In the current study, brand logos were made very prominent.

Sensory realistic violence cues (blood and pain sounds) has an effect on the player’s brand logo memory, but was mediated by the user’s sense of presence, specifically the engagement dimension. Of the sensory cues of violence, the audio cues led to increased brand logo memory as well as higher change in brand attitude compared with the visual cue, the presence of blood. The path model suggests that pain sounds may increase logo memory through engagement and enhance change in brand attitude via arousal. Although both blood and screaming increased physiological arousal, blood negatively impacted engagement, while screams of pain had the opposite effect. It seems possible that graphic effects such as realistic blood depiction may be more disturbing to users engaged in the game.

Some limitations of the study should be considered. The measurement of arousal might provide better sense of its effect if linked continuously to measure of emotional valence during game play, to assess whether the arousal is positive or negative. Valence has been reported to increase user preference to brands of various types (e.g., Brendl et al. 2005). It might also be helpful to explore the relationship between valence and spatial presence. Although arousal may affect user preference in games, such effects could depend on game type (e.g., shooting, adventure, sports, simulation); therefore, the scope of the findings need to be determined by genre.

CONCLUSIONS

In sum, the current study shows two results. First, realistic cues of violence affect a change in brand attitude by increasing user arousal. Second, placement of brand logos in violent games could increase brand logo memory by increasing spatial presence and engagement. However, increased spatial presence may lead to negative change in brand attitude in violent games, particularly in highly recognized brands. Even though the number of violent games is increasing, and likely will include a considerable number of blockbuster titles, advertisers should carefully consider the potentially negative outcome of advertising in violent video games.

NOTES

1. Arousal is defined as a physiological or psychological (perceived) state of being excited or activated. Physiological arousal is characterized by heightened activation of the autonomic nervous system, which generally implies the degree of physiologically evoked arousal (response) to stimuli, determined by measuring physiological variables such as skin conductance, muscle movement, or heart rate (see Stein and Levine 1987). Perceived arousal is a self-report measure often assessed using a questionnaire.

2. Trait aggression measures a user’s stable personality trait of aggression such as hostility and anger. The Buss-Perry Aggression Questionnaire (1992) is one frequently used questionnaire of trait aggression, which measures four dispositional subtraits of aggression: hostility “that consists of feelings of ill will and injustice, represents the cognitive component of behavior”; anger, “which involves physiological arousal and preparation for aggression, represents the emotional or affective component of behavior”; physical and verbal aggression, “which involve hurting or harming others, represent the instrumental or motor component of behavior” (Buss and Perry 1992, p. 457).

3. Participants were asked how often they play first-person shooter games. We used a seven-point scale, from (1) “never” to (7) “very frequently,” which was used in the study of Farrar, Krcmar, and Nowak (2006). Some examples of game type (e.g., Counter-Strike, Half-Life, Doom) were attached to the question \( M = 3.53, SD = 1.49 \). We checked whether there were significant differences between the four groups prior to the experiment, and no differences were found, \( F(3, 76) = 9.8, p = .41 \).

4. We asked familiarity toward brands prior to experiment (seven-scale; \( M = 3.95, SD = .82 \)). The brands in the game included both familiar (e.g., Samsung, Google, Boeing, Continental) and unfamiliar brands (e.g., Ithaca, EastAir, Bando, Revero). We checked whether there were differences in the means of the brand familiarity between four groups prior to the experiment. There were no significant differences between the four groups, \( F(3, 76) = .99, p = .42 \).

5. Participants viewed 40 brand logos in the memory test. They correctly identified 55.1\% \( (M = 22.02, SD = 5.92) \), significantly over chance \( (t = 2.66, p < .05) \). Spatial presence and engagement significantly increased logo recognition (spatial presence, \( \beta = .41, p < .01 \); engagement, \( \beta = .31, p < .05 \)), whereas arousal did not \( (\beta = .08, n.s.) \). The in-game logos were correctly identified 51.3\% of the time \( (M = 10.25, SD = 3.43) \). For the logos that were not in the game, 58.8\% were correctly recognized \( (M = 11.77, SD = 2.67) \). We also checked whether arousal and presence impacted the memory scores to the logos that were not in the game. Spatial presence and engagement showed significant effects on the logo recognition (spatial presence, \( \beta = .45, p < .01 \); engagement, \( \beta = .34, p < .05 \); arousal, \( \beta = .07, n.s.) \). Spatial presence and engagement seem to have improved the recognition scores for the logos significantly over chance \( (t = 5.15, p < .01) \).

6. For the higher-recognition logos (over the median), we checked the coefficients of physiological arousal, spatial presence, and engagement on recognition and attitude changes by conducting regression analyses. The overall effects of the three variables on dependent variables were in line with the results in the path analysis of this study. On logo recognition \( (R^2 = .20) \), spatial presence \( (\beta = .39, p < .01) \) and engagement \( (\beta = .25, p < .05) \) showed significant effects, whereas physiological arousal did not \( (\beta = .09, n.s.) \). On attitude changes \( (R^2 = .21) \), arousal \( (\beta = .27, p < .05) \) and spatial presence \( (\beta = -.50, p < .001) \) showed significant effects, whereas engagement did not \( (\beta = .18, n.s.) \). For the lower-recognition logos (less than the median of recognition), however, the correlation between recognition and attitude change was not significant \( (r = -.10, n.s.) \), although the three variables showed similar patterns with the path model in their effects on
logo recognition (spatial presence, $\beta = .38, p < .01$; engagement, $\beta = .32, p < .05$; arousal, $\beta = .05$, n.s.) and on attitude change (spatial presence, $\beta = -.25, p < .05$; arousal, $\beta = .21$, n.s.; engagement, $\beta = .23$, n.s.).

REFERENCES


