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# Audio and Visual Distractions and Implicit Brand Memory: A Study of Video Game Players

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**Utilizing a computerized racing game, the experiment investigates the influence of sensory distractions on implicit brand memory. The results suggest that auditory distraction inhibits retrieval of implicit brand memory, but visual distraction causes no significant effect. The effects of the character's sensory distractions appear only for familiar brands, probably because relatively less attention enhances the interference on implicit memory. Comparatively, novel unfamiliar brands attract more attention, which nulls the character's sensory distraction. Therefore, relatively higher distraction effects on implicit memory occur for familiar brands.**

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The video game industry, its customers, and its technology have grown dramatically in recent years, so that today nearly 68% of U.S. households play computer or video games (Entertainment Software Association 2009). The global market for ads in video games is expected to grow from \$3.1 billion in 2010 to \$7.2 billion in 2016. Market researcher DFC Intelligence (2011) notes that advertisers are spending more money in games via in-game ads, around-game ads, and advergames. In North America, advertisers spent \$1 billion in video game ads in 2010. The number is expected to grow to \$2 billion by 2014 (DFC Intelligence, 2011). Accordingly, advertising in video games has received a substantial amount of scholarly attention.

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Previous video gaming studies have primarily investigated the effects of game violence on players' feelings, emotions, or arousal (Anderson et al. 2010; Arriaga et al. 2008; Hartmann and Vorderer 2010; Ivory and Kalyanaraman 2007). Others have investigated the influence of brand placement and prominence on players' memory (Hernandez and Chapa 2010; Lee and Faber 2007; Nelson, Yaros, and Keum 2006; Reijmersdal et al. 2010). Increasingly, researchers have become interested in gamers' responses to persuasive messages within the game (Cauberghe and De Pelsmacker 2010). However, extant studies have not considered various sensory stimuli within games that may distract players from processing embedded advertising messages. Studies of visual brand-name memory concur that audio and visual elements unrelated to the advertising tend to inhibit players from processing words (e.g., Ahn and La Ferle 2008; Tavassoli and Lee 2003). Thus, sound effects and color displays can make computer games addictive and playable (Chumbley and Griffiths 2006; Griffiths and Dancaster 1995) but often negatively affect brand memory (Grigorovici and Constantin 2004; Hernandez and Chapa 2010). Despite the importance of audio and visual distracters in video games, little research has examined how sensory distracters irrelevant to brand information may affect the brand memory of video game players.

In a study of advertising in video games, Moore and Rideout (2007) stated that game players are exposed to brand placement advertising while paying little attention to it. Playing the game consumes the majority of a player's cognitive resources, leaving little capacity to elaborate on brand placement. If they are hardly capable of attending to the embedded brand information, video game players are more likely to process it unconsciously rather than consciously. This implies that the traditional cognitive model of advertising processing is insufficient to examine the effects of sensory distractions on brand placement in video games. Therefore, the purpose of our study is to explore how

audio and visual distracters in video games affect the player's unconscious processing of the brands, both familiar and unfamiliar, that are placed in the video games. Using a word-fragment completion task, the study sheds light on the effects of audio and visual distracters on the players' implicit brand memory in a lab experiment.

## LITERATURE REVIEW

### Unconscious Processing of Video Game Advertising

Games featuring rich sound and visual stimuli involve players in an engaging media environment. For instance, action video games require players to process audio and visual sensory information rapidly and respond more quickly than typical, everyday decision making requires (Dye, Green, and Bavelier 2009). Further, video games offer a highly immersive environment that requires more cognitive resources to be allocated for fulfilling the game tasks (Grigorovici and Constantin 2004). Therefore, how much attention can be paid to brand placement in video games deserve further research, especially when it remains unclear whether brand information is processed consciously or unconsciously.

In general, unconscious processing has been considered as unawareness of stimuli or their effects during a task (Krishnan and Trappey 1999). Velmans (1991) describes unconscious processing as being fast, unintentional, automatic, not subject to capacity limitations, and always triggered by response to a certain cognitive input. Previous research on unconscious processing has demonstrated that the presence of visual or audio stimuli enhances unconscious processes (Treisman 1980). This is particularly true in highly arousing media environments, in that Dye, Green, and Bavelier (2009) reported cognitively busy environments such as those in video game make it more difficult to process brand information that is irrelevant to performing the game task successfully. Klimmt and Vorderer (2003) further suggested that this can happen when consumers are highly involved with media use, that is, when consumers are not aware of their exposure to an advertising message. Li, Daugherty, and Biocca (2002) found that rich media such as 3-D visualization immerses consumers and inhibits their self-consciousness.

Unconscious processing of information depends on the allocation of limited attentional capacity (Bahrami et al. 2008). According to the limited-capacity model of attention, consumers have a limited capacity to process information. Under multitasking conditions, the more capacity one task uses, the less capacity is available to perform other tasks (Kahneman 1973). Particularly, unconscious processes can be enhanced when video game players are highly involved with the game task. Thus, they may have difficulty with selective and focused attention.

### Implicit Brand Memory

Researchers of the unconscious impact of brand placement have used implicit memory as complementary and alternative measures to assess the effects of brand placement (Auty and

Lewis 2004). Studies on brand placement in video games have also applied implicit measures to investigate the unconscious impact of brand placement (Glass 2007; Yang et al. 2006). When consumers experience an event with a brand, they encode multiple representations of the brand in memory. Memory may work implicitly without intention or awareness (e.g., Yang et al. 2006; Yoo 2008). Exposure to the brand name embedded in game advertising is incidental and thus can be more relevant to implicit memory processes.

The task consumers are undertaking determines whether explicit or implicit brand memory is more appropriate to measure. Explicit memory involves memory effects that occur with intentional or conscious recollection of a specific past event; recognition and recall are two standard measures of explicit memory (Townsend and Ashby 1984). In contrast, implicit memory occurs without intentional or conscious recollection of an event; an example of an implicit measure of memory is a word-fragment completion task (Schacter 1987). When completing a word-fragment completion task, participants are not asked to recall items they were exposed to previously but are asked to make a word fragment into a meaningful word by filling in the missing letters (Schacter 1987). Advertising studies have often measured brand recall and recognition, which are examples of explicit memory. However, measuring explicit memory is less effective in explaining memory for brands placed in video games (Grigorovici and Constantin 2004) because brand placement is a "nonconscious" form of marketing communication (Russell 1998).

Many studies have investigated the relationship between attention and implicit memory (for a review, see Mulligan and Brown 2003). Studies suggest that attention plays a larger role in encoding for explicit memory than for implicit memory because automatic encoding processes are generally responsible for implicit memory (e.g., Bentin, Kutas, and Hillyard 1995; Besson et al. 1992; Jacoby, Toth, and Yonelinas 1993). However, studies of perceptual implicit tests have produced mixed results, with some finding no effects of divided attention on perceptual priming (e.g., Mulligan 1997; Mulligan and Hartman 1996) and others reporting substantial reductions (e.g., Crabb and Dark 1999; Stone et al. 1998). Typically, studies reporting attention effects have employed selective attention tasks (e.g., Stone et al. 1998), and studies reporting null effects have used divided attention tasks (e.g., Mulligan 1997; Mulligan and Hartman 1996). A recent meta-analysis indicates that even divided attention negatively affects implicit memory (Spataro, Cestari, and Rossi-Arnaud 2011). Those studies suggest that irrelevant sensory elements tend to take attention from brand information and deteriorate implicit memory.

### Effects of Audio Distractions on Implicit Brand Memory

A stimulus in a video game can be presented in different modalities, such as visual or auditory. Russell (2002) argues that an auditory stimulus may be different from a visual stimulus in the amount of meaning it carries, and thus these two

types of stimuli can be processed differently. This is because stimuli in different modalities may require different cognitive resources (Tavassoli 1998). Research suggests that stimuli in multiple modalities interrupt attentional process (Cauberghe and De Pelsmacker 2010; Ryu et al. 2007; Tavassoli 1998). For instance, Tavassoli (1998) found that presenting stimuli in different modalities can interrupt information processing, with participants being exposed to a stimulus in multiple modalities displaying less attention than those exposed to a stimulus in a single modality. Ryu and colleagues (2007) further suggest that this effect may happen when participants are not aware of being exposed to stimuli. Stimuli in video games may distract from the attention paid to embedded brands because most players are unconsciously exposed to stimuli during video game playing.

In a study of the role of modality on the effectiveness of product placements, Russell (2002) reported superior effects of sound over visuals on brand memory, explaining that information presented through audio is inherently more meaningful than visual information. Meaningful stimuli integrated in a person's cognitive structure are processed more actively. The limited-capacity model of attention suggests there is a single, higher-order limitation on processing central to either sensory modality (Kahneman 1973), and visual and auditory stimuli compete for attentional resources (Eimer 1999). The trade-off between attentional resource allocations across sensory channels (Bonnell and Hafter 1998) implies that audio placements are more meaningful and have a better chance of getting attention than visual placements.

The context of brand placement in video games often contains such visual stimuli as brand names and such auditory stimuli as background sounds. The presence of sound, when it is not related to a brand name, may hinder consumers from processing the brand name because irrelevant audio stimuli can divert attention from the task (Klatte et al. 2010). As cue utilization theory explains, arousal levels enhanced by sound stimuli influence information processing and determine how many information cues the subject can effectively monitor (Easterbrook 1959). Thus, irrelevant sound causes greater attentional selectivity by focusing attention on one source of information input while ignoring other sources. With irrelevant auditory stimuli, arousal might increase and thereby disrupt brand name processing. Thus, we propose the following:

**H1:** Higher levels of audio distraction lead to lower levels of implicit brand memory.

### Effects of Visual Distractions on Implicit Brand Memory

Players are exposed to many visual stimuli while playing video games. To make players more addicted, video games often contain arousing visual elements (Chumbley and Griffiths 2006). Visual stimuli that increase the level of physiological arousal can lead to higher player involvement with a game. For example, Barlett, Harris, and Bruey (2008) found that a medium amount of blood in a video game significantly raises physiological arousal, but a minimal amount does not have such

an effect. Detenber, Simons, and Bennett (1998) confirmed that visual stimuli, such as motion, in video games increase the game player's physiological arousal level. Online advertising research has shown the same results. For instance, Sundar and Kalyanaraman (2004) suggested that when Web advertising includes a visual stimulus like animation, viewers have higher levels of physiological arousal. These studies indicate that the presentation of various visual stimuli in video games affects the player's arousal and involvement with video games.

Involvement with a television program has been shown to be associated with an increase in arousal level (Murry, Lastovicka, and Singh 1992). Although involvement is a broad concept, it has two important dimensions: the direction and the intensity of involvement (Tavassoli, Shultz, and Fitzsimons 1995). Research on program involvement even conceptualizes the involvement intensity as the arousal level (Tavassoli, Shultz, and Fitzsimons 1995). For this study, the game involvement is directed toward playing the video game, and its intensity is the internal state of excitement experienced by the player.

Advertising research has shown that high involvement with a television program negatively influences the effectiveness of TV commercials. For example, Soldow and Principe (1981) found that when consumers are highly involved with a program, the advertising effectiveness is lower. As the program involvement increases, viewers pay more attention to and exhibit greater interest in the program than the commercials that interrupt the program (Celsi and Olson 1988). In a similar fashion, visual stimuli such as animated characters in video games may increase the player's arousal level and make the player more involved with the game. If the visual stimuli are irrelevant to a brand, they may inhibit the player's attention to the embedded brand, yet such visual stimuli may increase the involvement with the video game being played.

**H2:** Higher levels of visual distraction lead to lower levels of implicit brand memory.

### Moderating Role of Brand Familiarity

Brand familiarity is an important issue in brand memory research. A measure of the extent of a consumer's direct and indirect experience with a brand (Alba and Hutchinson 1987), brand familiarity depends on the association a brand evokes in consumer memory (Campbell and Keller 2003). In general, consumers have stored more elaborate and complicated schemas for familiar brands than for unfamiliar brands and thus can more easily retrieve information on them (Alba and Hutchinson 1987; Campbell and Keller 2003). When video game players are exposed to elements such as brand names and audio or visual input, brand familiarity can influence their brand information processing. When they are exposed to a familiar brand, they will tend to focus more on the brand than audio or visual stimuli. Furthermore, players can recognize and store the brand name in memory in the existing schema for the brand, regardless of visual or sound stimuli.

Familiarity works in an unconscious automatic process that demands minimal attention, and it “relies on perceptual characteristics and reflects the automatic or unconscious use of memory” (Yonelinas, Regehr, and Jacoby 1995, p. 622). In the *false fame effect*, familiarity drastically affects implicit memory: non-famous names presented initially are likely to be mistakenly identified as famous the next time they are presented (Jacoby, Kelly, and Jasechko 1989). In the same vein, Holden and Vanhuele (1999) found that a single auditory exposure to fictitious brand names created the impression that, one day later, the brand names actually existed. High-frequency brand names are more likely to appear on word-stem completion measures than low-frequency brand names did (Krishnan and Shapiro 1996), probably because implicit word identification priming reflects fluent perceptual reprocessing or perceptual familiarity (e.g., Jacoby and Dallas 1981). Brand awareness can develop without deliberate attention to advertising when consumers are already familiar with the brand (Shapiro, MacInnis, and Heckler 1997). Thus, brand familiarity can engender brand memory even though consumers unconsciously process the brand, which implies that brand familiarity may mitigate the effects of audio or visual distraction on implicit brand memory.

Distraction levels may vary with the degree of brand familiarity. Familiar brand names should require less attention than unfamiliar brand names because they are easier to process and require less to learn (Pieters, Warlop, and Wedel 2002). People skim familiar messages (Kolers 1976), and a quick glance can confirm their familiarity (Rayner 1998). Pieters, Rosbergen, and Wedel (1999) found that across three exposures to print ads, the overall amount of attention dropped more than 50%. These studies suggest that higher levels of distraction should hinder the implicit memory of familiar brands because consumers pay less attention to familiar brands.

**H3:** The interference of audio and visual distraction on implicit brand memory is greater for familiar brands than for unfamiliar brands.

## METHOD

### Participants and Design

In all, 80 undergraduate students in Seoul, South Korea, participated in the study. The average age of the participants was 21, and one-third were males. Their weekly video game playing time averaged 1.88 hours. They were randomly assigned to the conditions of a 2 (existence versus absence of visual distraction)  $\times$  2 (existence versus absence of sound distraction)  $\times$  2 (familiar versus unfamiliar brand) mixed design. Brand familiarity was a within-subjects variable. Participants were rewarded with extra credit for participating in the study.

### Procedure

Participants completed the consent form, received instructions about how to play the video game, and practiced for one minute prior to the game session. The practice session was conducted to ensure that the players would be sufficiently involved

in the game and to establish their minimal performance level. Participants were given a headset that provided audio stimuli: background music, car crash noises when cars collided, and the voice of a cartoon character that also appeared on the screen. After participants completed the game session, they answered a postexposure questionnaire that included implicit brand memory. They were then debriefed, thanked for their participation, and dismissed with extra credit.

### Developing the Stimulus Game and Brand Exposure

A simple version of a racing game was modified from gamemaker's website (<http://www.yoyogames.com/gamemaker/studio>) for this study. It manipulated the independent variables to generate four experimental conditions. A cartoon character appeared in one game as an observer but did not appear in another game. The two game conditions were further divided into games with and without sounds coming from the cartoon character.

The game task was to drive a simulated car rapidly, collecting gas cans on the road while avoiding collisions with other cars. The game was highly arousing and cognitively busy enough to test the effects of distracters on memory. In addition, the game represented an important genre for brand placements that translate into real-life purchases (Naughton 2003).

In both visual conditions, a two-dimensional, cartoon-like, casual-looking male character appeared at the bottom right corner of the game screen, apparently observing from the side of the road and praising the player for capturing gas cans. In the visual distraction condition, the character also exhibited body and facial motions such as raising his hands, blinking his eyes, opening his mouth, or turning to face the game player. Such motions were absent in the other visual condition. In the audio distraction condition, the cartoon-like character made clapping sounds and exclamations of “Yes” or “You got it” in the background, which also included occasional car crash sounds. Such audio effects were absent from the other audio condition (see appendix).

During the entire game, 24 brand names appeared on the road. Participants were asked how familiar they were with each of the brands. A median split of 3.83 ( $M = 3.82$ ,  $SD = .51$ ) was utilized to separate familiar brands from unfamiliar ones. Half of them were coded as familiar brands and the rest as unfamiliar brands. The familiar brands were mostly well-known global brands (e.g., Nike, Google), which were selected primarily from the top 100 global brands from the 2012 Interbrand Report. They represented various product categories such as beverages, sports products, electronics, automobiles, and Internet search engines. Most were U.S. brands (e.g., Starbucks, Gatorade) and some were Korean (e.g., Samsung, Hyundai). Unfamiliar brands were taken from unknown foreign brands among product categories unfamiliar to student subjects (e.g., European brands of financial companies). Two of the brands were fictitious (e.g., Renos, Sofie). Every brand was passive and static on the road, like billboard ads, and played no role in the game. Brands were

exposed randomly during game play to control possible order effects on brand memory.

### Measures

A word-fragment completion task measured implicit brand memory. To prime participants' attention, we disguised the study's intention as a tool to obtain preliminary measures for a separate study about cognitive processing of word forms. During the racing game, 24 brand names appeared as ads in the game. Six nouns (e.g., water, college, perfume) not present in the game were included as foils. Participants completed words by filling in the blanks (e.g., K\_E\_N\_X for "Kleenex").

### RESULTS

To examine implicit memory on brand names from the game, we used a one-way ANOVA to analyze the proportion of the 30 target brand names (including foils) each participant correctly completed. Three covariance variables—age, gender, and weekly game play hours—were controlled in the analysis.

The character's auditory distractions ( $F(1, 72) = 5.43, p < .05$ ) had significant main effects on implicit memory in that implicit memory was scored higher without sound distraction ( $M = 5.78$ ) than with sound ( $M = 4.62$ ). However, visual distraction did not significantly affect implicit memory because no significant difference was found between the condition without visual distraction ( $M = 5.14$ ) and the condition with visual distraction ( $M = 5.05$ ). Therefore, hypothesis 1 was supported and hypothesis 2 was rejected.

As expected, implicit memory was much higher for familiar brands ( $M = 4.24$ ) than for unfamiliar brands ( $M = .87, F(1, 72) = 7.36, p < .01$ ). Auditory distractions and brand familiarity showed interaction effects ( $F(1, 72) = 8.78, p < .01$ ) in that significant distraction effects existed for familiar brands but not for unfamiliar brands. Familiar brands were more memorable without sound distraction ( $M = 4.97$ ) than with sound ( $M = 3.74$ ). Comparatively, as Figure 1 shows, memorability of unfamiliar brands without sound ( $M = .84$ ) was not signifi-

cantly different from unfamiliar brands with sound ( $M = .89$ ). Thus, hypothesis 3 was partially supported, only for the audio distraction condition.

Next, an independent sample  $t$ -test was conducted to verify that individuals who did not play the game were less likely to fill in the missing letters (implicit memory) of both familiar and unfamiliar brands than those who played the game. The control condition ( $n = 60$ ) was compared to the conditions with sound distraction and without sound distraction separately. In comparison to the sound distraction condition, the total number of target brand names correctly completed was higher for those participants who played the stimulus game,  $M = 4.61, SD = 1.93, t(104) = 9.00, p < .001$ , than the number correctly completed by those participants in the control condition who did not play the game,  $M = 1.45, SD = 1.68$ . Game players showed higher implicit memory,  $M_f = 3.72, SD = 1.71; M_{unf} = .89, SD = .80$ , than nonplayers in both familiar brands,  $M_f = 1.27, SD = 1.50, t(104) = 7.83, p < .001$ , and unfamiliar brands,  $M_{unf} = .18, SD = .39, t(61.55) = 5.55, p < .001$ .

Compared to the no-sound-distraction condition, the total number of target brand names correctly completed was higher for those participants who played the stimulus game,  $M = 5.76, SD = 2.33, t(91) = 10.27, p < .001$ , than the number correctly completed by those participants in the control condition who played no game. Game players showed higher implicit memory,  $M_f = 4.94, SD = 1.93; M_{unf} = .82, SD = .88$ , than nonplayers in both familiar,  $t(91) = 10.15, p < .001$ , and unfamiliar brands,  $t(39.01) = 3.93, p < .001$ . Therefore, it was confirmed that the game play had a positive effect on implicit brand memory compared to nonplayers for both familiar and unfamiliar brands.

### SUMMARY AND DISCUSSION

The study investigated the influence of sensory distractions on implicit brand memory in a video game. The results suggest that auditory distraction inhibits the performance of implicit brand memory, but visual distraction causes no significant effect. The effects of the game character's sensory distractions appear

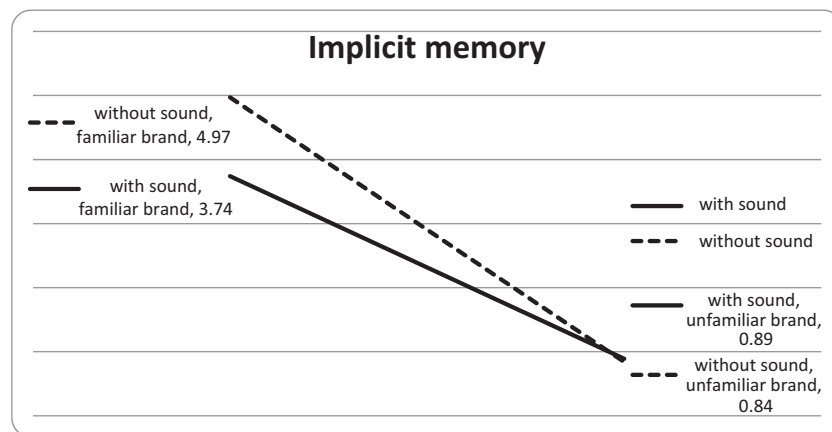


FIG. 1. Interaction effects of sound distraction and brand familiarity on implicit memory.

only for familiar brands, probably because relatively less attention enhances the interference on implicit memory. Previous knowledge about familiar brands makes their information less intriguing than unknown information about unfamiliar brands, so players fixate less on familiar messages (Pieters, Warlop, and Wedel 2002). Comparatively, unfamiliar brands attract more attention, which nulls the character's sensory distraction. Therefore, relatively higher distraction effects on implicit memory for familiar brands occurred.

Auditory distraction's negative effects on brand memory were more prominent than visual distraction effects. This result aligns with prior studies showing that sound often intrudes on perceptions, which are beyond an individual's control. Irrelevant sound tends to break through selective attention and impair cognitive performance. The degree of interference depends on the properties of the sound and the cognitive task (Simon et al. 2001).

Furthermore, message meaningfulness depends on communication modality. Studying modality's role in brand placement, Russell (2002) reported that sound has stronger effects than visuals on brand memory, and that auditory information is inherently more meaningful than visual information. Kahneman's (1973) capacity model of attention suggests a single, higher-order limitation on processing central to either sensory modality. Visual and auditory stimuli compete for attentional resources (Eimer 1999). The trade-off between attention allocations across sensory channels (Bonnell and Hafter 1998) implies that audio placements (e.g., characters' verbal messages) are more likely to attract attention and be remembered than less central visual placements (e.g., characters' appearances). Thus, irrelevant audio distracters will attract more attention and interfere more with brand memory than will visual distracters.

Another reason for the greater negative impact of auditory versus visual distractions can be found in the power of the human voice as spoken by the game character. Social agency theory (Mayer, Dow, and Mayer 2003) posits that verbal and visual social elements in computer-based environments can foster a partnership by causing learners to perceive that computer interactions are similar to what they expect from human conversation. Participants may have relied on the cartoon character's spoken rather than visual distractions because the character looked unrealistic and had limited nonverbal signals (e.g., gestures and facial expressions), possibly causing the sound to be more distracting.

The study provides insight into brand familiarity's moderating effect between sensory distraction and brand memory. The familiarity of a brand name positively affects brand memory. Also, brand familiarity plays a moderating role. In this study, sound distractions inhibited implicit brand memory for familiar brands but failed to impact unfamiliar brands. For implicit memory where perceptual processing is important, the novel stimuli of unfamiliar brands can attract more attention so that sensory distracters exert less impact. Comparatively, in the case of explicit memory, it is expected that sound distractions may not

influence the recall of a familiar brand because mental networks have already stored brand memory (Raaijmakers and Shiffrin 1992). If sensory distraction has less effect on explicit memory for familiar brands, more research will be necessary to investigate disassociations between explicit and implicit memory performance.

### Managerial Implications

Implicit brand memory measure can complement the limits of explicit memory measure. Particularly, when players ignore brand names peripherally placed into game contexts, measuring implicit brand memory based on unconscious processes can be more appropriate for evaluating game advertising. Since explicit memory measures are usually valid when consumers intentionally pay attention to the brand name, implicit measurements based on incidental encoding processes will be more relevant in low-involvement media contexts.

The results are especially important for game developers struggling to provide more exciting game experiences. Currently, multimedia content uses visual and audio elements. Game developers might add multimodal sensory elements to increase arousal levels, but they must determine how to combine various sensory elements.

However, simply adding more sensory elements is undesirable because irrelevant elements have distraction effects on brand memory. Therefore, game developers and advertisers should intertwine sounds and visuals with brand information. For example, advergames can employ sounds of jingles and visuals of brand logos or brand characters that are already familiar to consumers through TV commercials. Also, they can devise game scenarios in which sensory inputs enhance brand images or emphasize brand information. Sensory information that is more meaningful and relevant to a brand can enhance explicit memory. For implicit memory, frequency of brand exposure and attention-getting factors will be more important.

More pronounced effects of sound elements indicate that visual elements might be safer for making games more exciting but less distracting for brand-related information. To overcome negative effects of sound distractions on familiar brands, it would be desirable to choose games that rely more on visual animation and less on sound elements. Puzzle games would probably be better than violent shooting games for placing brand names. Also, practitioners for familiar brands should develop a strategy to give the brand a role in the game story rather than relegating it to the background. Displaying brand logos in central positions in novel settings could be another effective approach.

### Limitations and Future Research

Although the current study provides valuable insights into unconscious brand memory processes, we acknowledge several limitations. First, although this study shows no distraction effects of visual elements on brand memory, the stimulus design might have caused the results. Prior study showed the location of brand messages in the game to significantly influence brand

memory (e.g., Lee and Faber 2007). Similarly, if the character in our game had appeared in the focal position rather than the peripheral position, it might have exerted stronger visual distraction. Second, the study did not vary the frequency of visual and audio distraction. Future research should investigate how the degree or frequency of sensory distraction interferes with brand memory. Researchers who are interested in placing brands in multimedia contexts would find this useful because video games are multimedia contexts that continuously use sensory distractions. Also, our game experiment included only one session with five minutes of game time. The results might be different if participants were to undergo more gaming sessions. Third, future studies should determine whether differences occur depending on design formats. For example, outcomes could be different for heavily worded brand logos or for vivid pictorial logos. Finally, the results should be treated cautiously and more effort should be devoted to verifying the effects of sensory distraction in different settings, such as various types of participants (e.g., age, race, nationality), larger sample sizes, and different game stimuli that allow various levels of attention to distracters.

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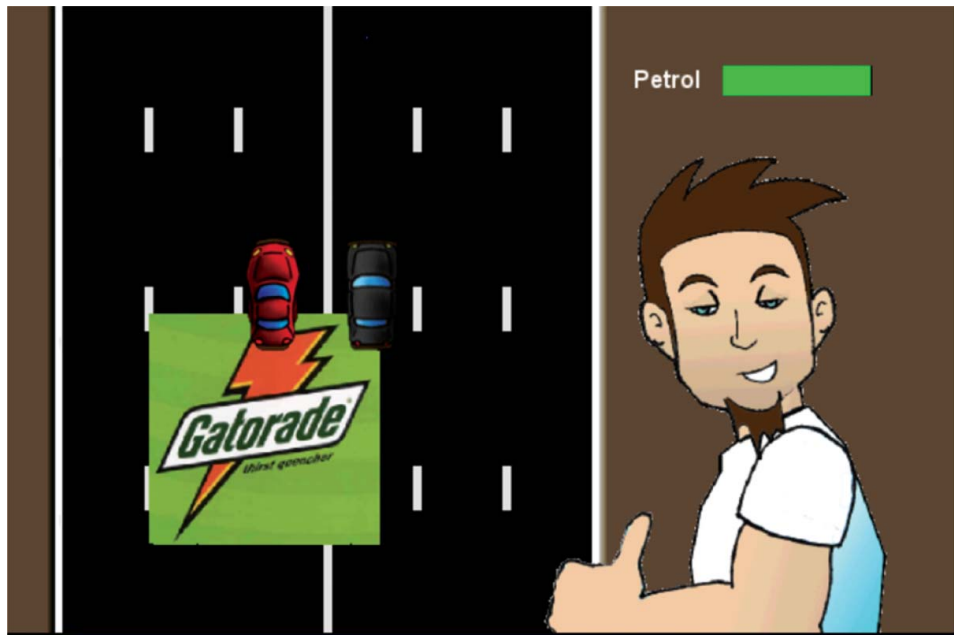
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## APPENDIX



A. Racing game with character's visual distractions. (Color figure available online).



B. Racing game without character's distractions. (Color figure available online).