

THE EFFECTIVENESS OF “IN-GAME” ADVERTISING

Comparing College Students’ Explicit and Implicit Memory for Brand Names

Moonhee Yang, David R. Roskos-Ewoldsen, Lucian Dinu, and Laura M. Arpan

ABSTRACT: In-game advertising has become a major advertising outlet. The current study examined the effect of brand names placed in video games on college students’ memory. Both implicit and explicit memory for brands placed in two sports computer games were tested using a word-fragment test and a recognition task, respectively. The results indicated that college students had low levels of explicit memory (recognition test) for the brands, but they showed implicit memory (word-fragment test) for the brand names placed in the video games.

The expansion of the video and computer game industry has made advertisers aware of the potential of video and computer games as an advertising vehicle (Kelly 2003). The placement of brands in games is called “in-game advertising.” It is reported that one game company alone—Electronic Arts Inc. (EA)—recorded \$9 billion in annual sales, which is almost the equivalent of yearly box-office revenues for the movie industry in the United States (Young 2004). In addition to the sales of the games, the increasing numbers of game users make video and computer games an attractive format for brand placements.

According to the Entertainment Software Association (ESA 2005), computer and video game sales grew to \$7.3 billion in 2004, with over 248 million computer and video games sold in the United States. Indeed, 50% of Americans play video games, and video game players are found among people of all ages, with 35% of video game players under the age of 18, 43% between the ages of 18 and 50, and 19% over 50 years old. There were 108 million video game players in 2004. This number is projected to grow to over 126 million players by 2008 (eMarketer 2004). In 2000, the average person played 70 hours of video games, and this

was projected to grow to 115 hours by 2005 (Census Bureau 2002). Today, more and more brand names are appearing in games, although the placement of brand names in games can be traced back to the late 1980s (Reuters 2002). For the video and computer game industry, the placements of brands in games can mean additional revenue and enhanced realism of the games. In 2003, \$79 million was spent on in-game advertising, and it is estimated that by 2008 this will increase to over \$250 million (eMarketer 2004). Advertisements were often found to contribute to the perceived realism of the games, particularly in sports games (Nelson 2002; Nelson, Keum, and Yaros 2004).

Given the increasing practice of in-game advertising and its potential as an alternative advertising medium, surprisingly little research has been done regarding the effects of in-game advertising. Little is known about whether in-game advertising influences gamers’ memory for the brand, attitude toward the brand, purchase behavior, and so forth. Clearly, players’ awareness of the brand name is one of the important goals of in-game advertising (Nelson 2002). Therefore, the current study explored this virtually unresearched area and asked whether in-game advertising influences the memory of the players for the embedded brands, especially among college students—one of the groups that most frequently plays video games. In fact, 70% of college students report playing video games (Jones 2003). Following the practice established in television and movie research, the current study employed measures of both implicit (unconscious) memory (with a word-fragment completion test) and explicit (conscious) memory (with a recognition test) for ads placed in two popular sports games (Law and Braun 2000; Law and Braun-LaTour 2004; Yang, Roskos-Ewoldsen, and Roskos-Ewoldsen 2004). Testing two different types of memory for in-game advertising effectiveness is expected to benefit both scholars and practitioners in this area.

Moonhee Yang (Ph.D., University of Alabama) is a senior researcher, Munhwa Broadcasting Corporation, Seoul, Korea.

David R. Roskos-Ewoldsen (Ph.D., Indiana University) is a professor of psychology, University of Alabama.

Lucian Dinu (Ph.D., University of Alabama) is an assistant professor of communications, University of Louisiana.

Laura M. Arpan (Ph.D., University of Alabama) is an associate professor of communications, Florida State University.

LITERATURE REVIEW

In-Game Advertising Versus Brand Placements in Television Programs and Movies

The similarities between brand placements in television programs and movies and in-game advertising offer research on brand placement in video games a solid starting point. More specifically, in-game advertising shares many of the strengths of brand placement in television programs and movies. First, brand placements in movies are often associated with well-known actors or actresses, with the result that the placements function as celebrity endorsements (Avery and Ferraro 2000). In video games, brand placements are aided by consumer identification with famous sports figures, such as Tiger Woods in *Cyber Tiger* or Michelle Kwan in *Michelle Kwan Figure Skating* (Nelson 2002). In fact, 17.9% of regular video game players consider the celebrities involved in the games as one of the main reasons for playing them (ESA 2005). Second, a brand placed in a movie or television program has a longer lifetime than a typical advertisement (Brennan, Dubas, and Babin 1999; d'Astous and Chartier 2000). The lifetime of brands placed in video games might also be considerable (Nelson 2002), especially in the case of heavy game players. Third, research has found that audiences seem to have more positive attitudes toward brand placements than toward advertisements (Nebenzahl and Secunda 1993). Moreover, some studies report that audiences indicate that brand placements actually enhance the viewing experience by increasing the realism of the television show or movie (Avery and Ferraro 2000). Similarly, Nelson (2002) found that the realism of sports games benefited from brand placements (see also Nelson, Keum, and Yaros 2004). Furthermore, most players do not have a critical attitude about brand placements in video games and seem not to consider the practice of brand placements as deceptive (Nelson 2002).

One difference, however, lies in the interactive nature of video games (Vorderer 2000). Unlike most television shows or movies that are simply watched, video games require players to respond by manipulating the game controller to progress through the game (Liu and Shrum 2002, 2005). The interactive characteristics of video games could interfere with players' memory for in-game advertising. Indeed, unlike the generally passive audiences of most television shows or movies, video game players are more active, and their attention is divided between what they are watching and the game controls (see, e.g., Grodal 2000), which may interfere with memory for the in-game brand placements (Liu and Shrum 2002, 2005). For example, Shapiro and Krishnan (2001) found that when people's attention was divided between visually presented advertisements and listening to a broadcast, their memory for the advertisements was diminished. Nevertheless, it is not yet

clear how the interactivity of video games might influence the effect of brand placements on memory.

The Effect of Brand Placements on Memory

In television and movies, one of the goals of brand placements is to increase the audience's familiarity with the brand so that consumers are more likely to remember it (d'Astous and Chartier 2000). Consequently, much of the empirical research on brand placements has focused on viewers' memory for the brands placed within a movie or television show (Karrh 1998; McCarty 2004; Yang, Roskso-Ewoldsen, and Roskos-Ewoldsen 2004). Generally, the research on the effect of brand placement on brand memory has yielded rather mixed results (Babin and Carder 1996; Ong and Meri 1994; Yang, Roskos-Ewoldsen, and Roskos-Ewoldsen 2004). For example, Ong and Meri (1994) found little improvement in memory for some brand placements and remarkably large improvements in memory for other brands. Seventy-seven percent of viewers recalled viewing Coke while watching the movie *Falling Down*, but only 18% recalled seeing Hamm's Beer in the movie (Ong and Meri 1994).

Although academic research regarding the effect of brand placements in video games is rare, the influence of in-game advertising on the audience's familiarity with the brand seems as important in this context as it is in television programs and movies (Nelson 2002). Across two studies using sports games, Nelson (2002) found that players recalled 25% to 30% of brands immediately after playing the game, and 10% to 15% of brands after a five-month delay. In addition, in Nelson's study, participants' recall for novel brands or brands that were personally relevant to the game players, such as local brands, was greater than their recall of standard national brands, such as Pepsi. Indeed, in a recent telephone survey conducted by Activision and Nielsen Entertainment, samples of males (only) ages 8 to 34 indicated that more than 25% of gamers could recall in-game advertising from the last game they played (Activision 2004). More interesting to note is that about 33% of gamers in this survey responded that the in-game advertising influenced their brand purchase behavior (Activision 2004).

More recently, Chaney, Lin, and Chaney (2004) found that participants playing a first-person shooter game recalled going past billboards in the game, but they had little memory for brands—or even for the product category—on the billboard. Similarly, Grigorovici and Constantin (2004) found a complex relationship among the type of placement (billboard versus the actual object), the players' immersion in the game, how arousing the game was, and brand recall. For example, participants tended to recall brands when they were placed on a billboard but not when they were actually present in the game world, except when the brand was an automobile. Likewise, higher levels of immersion in the game interfered with players' recall for brands placed in the game.

However, studies that measured recall or recognition as the effect of brand placements in television shows, movies, and video games suffer from two major limitations. First, most studies have not assessed whether recognition and recall of brands occurred because the participants specifically remembered seeing them in a movie or video game, or just by chance—perhaps because some brands are more popular than others and participants guessed that these popular brands had been present given the nature of the game (e.g., guessing that Firestone was present in a racing game). To control for the influence of guessing on participants' recognition scores, signal detection measures were used in this experiment to measure how well research participants could differentiate brands that were present versus brands that were not present in the video game by correcting for participants' bias to say an item was present. *A'*, a nonparametric signal detection measure, was used in this study. Second, most studies have focused on either recall or recognition as measures of memory for the brand placement. We argue that traditional recall or recognition tests may not properly assess the extent of brand placement's influence on memory because a different type of memory—implicit memory (Graf and Schacter 1985, 1987)—may be influenced by brand placements even though viewers have no explicit memory for seeing the brand (Auty and Lewis 2004; Law and Braun 2000; Law and Braun-LaTour 2004).

In-Game Advertising: Implicit Versus Explicit Memory

Explicit memory occurs when people intentionally and consciously try to recollect a specific past event. The two standard measures of explicit memory—recognition and recall—measure different aspects of explicit memory (Townsend and Ashby 1984). In contrast, implicit memory involves memory effects that occur without intentional or conscious recollection of such an event (Graf and Schacter 1985, 1987; Law and Braun-LaTour 2004). The essence of implicit memory is the process wherein a specific event can influence the perception and interpretation of subsequent events without recall of the prior event (Jacoby and Kelley 1987). Therefore, implicit memory is demonstrated by the change in task performance for tasks that do not rely on explicit memory. Examples of implicit measures of memory include a word-fragment completion task or a preference for a given stimuli (Schacter 1987). In a word-fragment completion task, participants are asked to make a word fragment (e.g., A_ _A_ _IN) into a meaningful word by filling in the missing letters (Tulving, Schacter, and Stark 1982). Notice that when completing a word-fragment completion task, participants are not asked to recall items they had been exposed to previously, but exposure to earlier items does tend to improve their ability to complete the word fragment.

The research on implicit memory suggests that in earlier brand placement studies, although the audience members

could not directly recall or recognize brand names to which they had been exposed, the brand names may still have influenced familiarity with and preference for the brands (Auty and Lewis 2004; Yang, Roskos-Ewoldsen, and Roskos-Ewoldsen 2004). The disassociation between implicit and explicit memory has been suggested by numerous scholars (Graf and Schacter 1985, 1987; Jacoby and Dallas 1981; Richardson-Klavehn and Bjork 1988; Roediger 1990; Schacter 1987; Tulving, Schacter, and Stark 1982). Indeed, in a recent study on implicit and explicit memory for brands placed in movies, there was no relationship between implicit and explicit memory (Yang 2004; see also Auty and Lewis 2004; Shapiro and Krishnan 2001).

Implicit memory has been proposed as an important concept in advertising research (Duke and Carlson 1993, 1994; Krishnan and Chakravarti 1999). Indeed, the limitations of explicit memory measures in evaluating advertising effects has led researchers to consider implicit memory as a supplementary way of measuring advertising effects (Shapiro and Krishnan 2001). First of all, explicit memory measures can only reveal advertising effects that are accessible to conscious retrieval (Krishnan and Chakravarti 1999). However, advertising effects might influence conscious as well as nonconscious memory processes (Krishnan and Chakravarti 1999). In particular, Duke and Carlson (1993) suggested that consumers' purchase decisions could be influenced not only by conscious processes, but also by unconscious processes, especially at the time of purchase. Second, measures of implicit memory can detect advertising effects resulting from incidental advertising exposure that occurs when people are not fully attending to the advertisement (Shapiro and Krishnan 2001). Thus, implicit memory may reveal a relatively important effect of the brand placements even though the details of the original exposure were not remembered (Sanyal 1992).

Still, only a small number of advertising studies have examined implicit memory in advertising (Duke 1995; Duke and Carlson 1994; Krishnan and Chakravarti 1993; Krishnan and Shapiro 1996; Shapiro and Krishnan 2001). While few in number, these studies support the use of implicit memory measures to reveal advertising exposure effects that are not detectable with an explicit memory measure.

Implicit Memory in Brand Placements Research

Law and Braun (2000) used an implicit memory test to measure the effectiveness of brand placements on television. They found that brand placements influenced not only explicit measures of memory, but also implicit measures of memory. In their study, Law and Braun (2000) had participants imagine that they were helping a friend purchase items for the friend's new apartment. They found that participants

were more likely to choose items for the friend's new apartment that had appeared in an episode of *Seinfeld* they had just watched than the control items, which did not appear in the specific episode they watched. Law and Braun's findings suggest that placements may have primed the brands, which influenced later judgments (Roskos-Ewoldsen, Roskos-Ewoldsen, and Carpentier 2002; Yang 2004; Yang, Roskos-Ewoldsen, and Roskos-Ewoldsen 2004). Likewise, Yang (2004) found that brand placements in 15 different movies increased participants' implicit memory for the placed brands. In her study, Yang (2004) used a word-fragment completion task to measure implicit memory. The present study also used a word-fragment test to measure implicit memory, which is a common measure of implicit memory in advertising research (Duke 1995; Duke and Carlson 1994; Krishnan and Shapiro 1996).

HYPOTHESES

The current research investigated memory for brands placed in sports video games. One question resulting from previous research was whether exposure to the brands placed in video games has an effect on implicit memory. Interactive video games require players' visual attention and motor actions (Grodal 2000), and the player may therefore pay less attention to the brand names that are placed as background features. If this is the case, then players of video games should show better performance on an implicit memory measure than on an explicit memory measure because implicit memory is not influenced by whether or not the viewers are attentive to the brand information (Shapiro and Krishnan 2001; Yang 2004).

In the present study, participants played either a soccer video game or a car racing video game, or they played no game (control condition). Two different video games were used in this experiment to decrease the likelihood that any results were due to the unique characteristics of a particular game. In addition, racing games and sport games are typically considered to be two different genres of games within the gaming community (ESA 2005). Furthermore, racing and sports games are considered to be the two genres of video games where in-game placements are most appropriate (Nelson 2002). After playing the game, the participants completed a measure of implicit memory (a word-fragment completion task), followed by a measure of explicit memory (a recognition task). Players of the video games were expected to show better implicit memory for brands placed in the game they played than for brands placed in the game they didn't play and for brands that did not appear in either game (foils). Specifically:

H1: Participants will show better performance on an implicit memory measure (i.e., they will have higher word-fragment completion rates) for the brand names that appear in the game

they played compared with participants who played a different game or were in the control condition.

As previously mentioned, video game players immediately recalled an average of 25 to 30% of brand names (Nelson 2002). We predicted similar results in the present experiment. It is important to remember, however, that recognition rates are generally higher than recall rates. Moreover, as mentioned previously, to control for participants' guessing, signal detection analysis was used. In signal detection analysis, sensitivity (A') is used to detect how accurately participants can recognize what they had seen before (old) from what they had not seen (new) (Shapiro 1994). Perfect performance (hits = 1.00, false alarms = 0) results in $A' = 1.00$ and chance performance (hits = false alarms) results in $A' = .50$.

H2: Recognition rates for brand names placed in the game that the participants played will be greater than chance levels of performance.

METHOD

Design and Participants

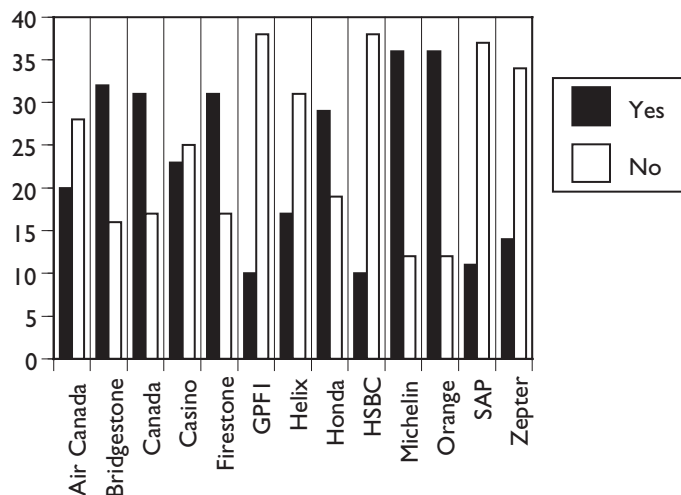
A 2 (game condition: a racing game versus a soccer game) \times 2 (memory measure: implicit versus explicit) mixed experimental design plus control group (no game) was used in the current experiment. Game condition was a between-subjects factor, and memory measure was a within-subjects factor. The control group completed the word-fragment test but not the recognition task because it would not make sense to ask participants to explicitly remember brands placed in a game they had not played. The control group could complete the word-fragment completion task, however, because that task does not require participants to have been exposed to the words. Consequently, the control group provides a baseline completion rate for the word fragments.

A total of 153 students from two major state universities in the southeastern United States participated in the study. Participants completed the experiment one at a time. Participants were randomly assigned to one of the three conditions. Forty-eight participants played a racing game, 52 played a soccer game, and 53 were assigned to the control group. The average age of participants in this study was 20. In exchange for their participation, participants received either credit toward a class requirement or extra credit.

Procedure

In both game conditions, participants were asked to fill out a questionnaire regarding their previous video game experience. They were then asked to read a page of instructions on how to play the video game they were assigned. About 10

FIGURE 1
Recognition of Brand Names in Formula 1
Video Game



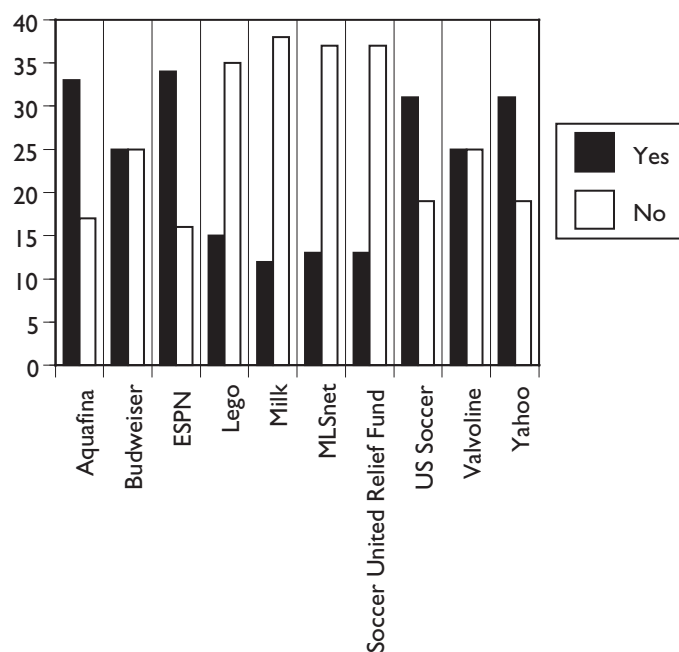
N = 48.

minutes of practice time were given for them to learn how to play the assigned game. After practicing the game, participants were asked to play the assigned game for 20 minutes. Having the participants play for 20 minutes guaranteed that participants were exposed to all of the brands in the game. Right after playing the game, participants completed several questionnaires in order to clear their short-term memory prior to completing the word-fragment completion test. The questionnaires took approximately 12 minutes to complete. In the word-fragment completion task, the participants were instructed that this was a word game. There was no mention of the video games that they had just played. After the word-fragment completion task, the participants were given the list of brand names and were asked to indicate whether they had seen each brand in the game they played earlier in the session. Finally, participants were asked for demographic information and whether they had played the game before participating in the experiment. Participants were also queried for their hypotheses concerning the goal of the study. No participants thought the study involved in-game advertising until they were asked to complete the recognition task. Participants were then thanked for their participation and debriefed.

Stimuli

Two sports video games were selected for the current research; (1) EA's Formula 1 2001, a racing game, and (2) EA's FIFA 2002, a soccer game. Both games were selected for the following reasons: First, each game contained fairly equal numbers of large, easy-to-see brand placements—13 in the

FIGURE 2
Recognition of Brand Names in FIFA 2002
Video Game



N = 52.

racing game, and 11 in the soccer game (see Figures 1 and 2 for a complete list of the brands in the two games). All of the placements were either billboards or signage on the end of the track/field. Second, the nature of the placements guaranteed that all participants would be exposed to the placements regardless of their playing ability. For the driving game, one circuit was chosen that showed only brands available to the American public. In the soccer game, two American teams of equal strength confronted each other on a field decorated with brands available in the United States. Finally, both games involved relatively simple playing controls. Anecdotal evidence indicated that most people require a few minutes of training before mastering the playing controls of each game at a beginner's level.

The games were played on a computer with a 17" screen. All placements were visual; there were no verbal mentions of any of the brands. The game's sound was on while participants played the games.

Measurements

Implicit Memory Test

Implicit memory was measured using a word-fragment completion test. Twenty-four brand names were identified as in-game advertisements across the two games (see Figures 1 and 2 for details). EA Sports, the game producer, was an in-game advertisement in the soccer game, but it was not included as

a target. Therefore, 13 brand names from the racing game and 10 brand names from a soccer game were used in the word-fragment test. Seven brand names not present in either game were also included as foils. Thus, a total of 30 brand names were used for the word-fragment test. Participants from both game conditions and the control condition were asked to complete the words by filling in the blanks (e.g., Y_ H_ O for "Yahoo"). For each game condition, the brand names from the other game operated as foils. The data from the control group provided a baseline measure of how easy it was to complete the word fragments correctly.

Explicit Memory Test

Explicit memory was measured using a recognition task. The same 23 brand names used in the implicit memory test were also used in the recognition task. Unlike the previous task, for the recognition task, the participants from the two game conditions were only given the list of brands that appeared in each game and foils. As a result, the participants who played the racing game and those who played the soccer game were presented with 25 brand names (13 targets and 12 foils) and 21 brand names (10 targets and 11 foils), respectively, and were then asked to indicate whether they could recognize the brand names or not. For each game condition, different brand names were used as foils. The control group did not complete the recognition task.

ANALYSIS AND RESULTS

Video Game Experience

Most of the participants had no previous experience with the two games used in the current study. Although two of the participants had previously played each game used in the study, they were included in the analysis because the version of the games they had played contained advertisements that were different from the ones used in the current experiment. Exclusion of the data did not change any of the reported results. Fifty-five males (36%) and 98 females (65%) participated in this study. According to the Entertainment Software Association (ESA 2005), 43% of video game players are female. While the sample is weighted toward females, there were no differences between males and females on any of the measures used in the study. Most participants were regular computer or video game players. A slight majority ($n = 87$; 56.9%) had played computer or video games for two years or more, whereas 15.7% ($n = 24$) had played for less than two years. About 28% of participants ($n = 42$) responded that they never had played computer or video games. These numbers suggest that participants in the current study were typical in terms of game playing (ESA 2005). There were no differences in

game playing experiences between the samples from the two universities, $\chi^2(4) = 6.14$, *n.s.*

Implicit Memory Test: Word-Fragment Test

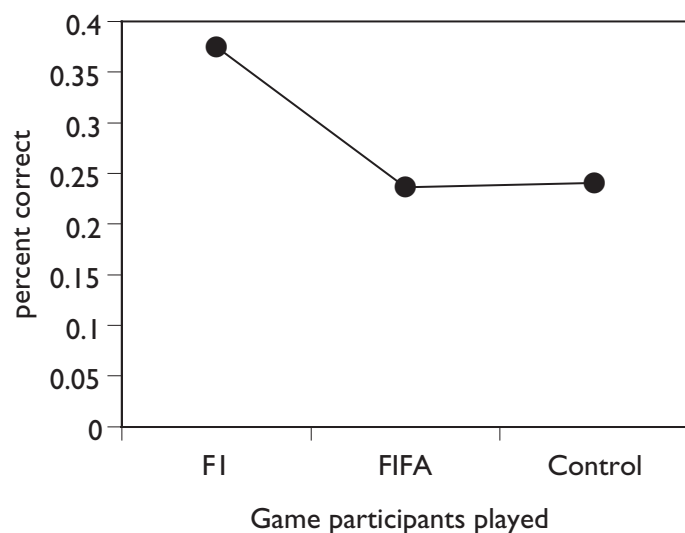
To examine the implicit memory performance on brand names from the racing game, the proportion of the 13 target brand names correctly completed by each participant was analyzed using a one-way ANOVA (analysis of variance) with three conditions (soccer game, racing game, or control). The results of this comparison for the racing game are presented in Figure 3. As expected, the proportion of the 13 target brand names correctly completed was higher for those participants who played the racing game, $M = .38$, $SD = .22$, $F(2, 152) = 12.12$, $p < .001$, than the proportion correctly completed by those participants who played the soccer game, $M = .24$, $SD = .13$, and by those participants in the control condition who played no game, $M = .24$, $SD = .12$. Planned contrasts confirmed that the performance of players from both the soccer game condition and the control condition were not significantly different. There were no differences between the two university samples, $t(151) = -.95$, *n.s.* Therefore, H1 was supported for the racing game. Participants who played the racing game completed a higher proportion of the word fragments for target brands that appeared in the racing game than the participants who played the soccer game or participants who played no game.

Implicit memory performance for the brand names from the soccer game was analyzed in the same way for the 10 target brand names from the soccer game. The results of comparison of the three groups' performance on brand names from the soccer game are presented in Figure 4. As expected, the proportion of the 10 target brand names from the soccer game that was completed correctly was higher for those participants who played the soccer game, $M = .50$, $SD = .17$, $F(2, 150) = 7.34$, $p < .01$, than for those participants who played the driving game, $M = .42$, $SD = .17$, and those participants in the control condition who played no game, $M = .38$, $SD = .15$. Indeed, planned comparisons confirmed that the performance of participants from both the racing game condition and the control condition were not significantly different. Again, there were no differences between the two university samples, $t(151) = -.85$, *n.s.* Therefore, H1 was also supported for the soccer game. Participants who played the soccer game completed a higher proportion of the word fragments for target brands that appeared in the soccer game than the participants who played the racing game or participants who played no game.

Recognition of Brand Names

For the analysis of recognition rates, the hit response rate was determined by calculating the proportion of correct recognition of brand names appearing in each game. For example, if the par-

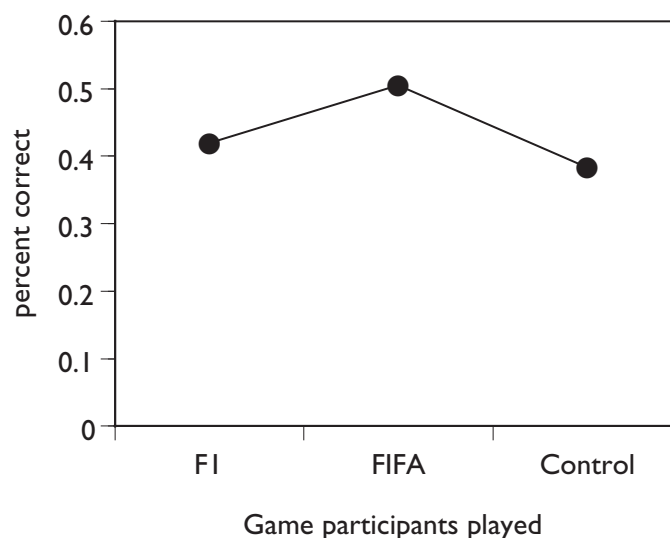
FIGURE 3
Comparison of Performance on
Word-Fragment Test of Brand Names
from the Driving Game



ticipants said “yes” for a brand name (Bridgestone) that actually appeared in a driving game, this response was considered a hit, or a correct response. False alarms were calculated if the participants indicated that they saw a brand name that did not actually appear in the target game. The results of hit and false alarm rates from both game conditions are presented in Table 1.

Overall, the correct response rate for the brands actually appearing in each game was 48% and 46%, respectively. This level of recognition is low given that participants were choosing between two options (either “yes” or “no”). Performing at 48% and 46% suggests that participants were guessing. Participants may have been conservative in indicating that a brand had been seen earlier, however, so a signal detection analysis was conducted to control for any bias they might have exhibited in how they responded to the recognition measures. To determine whether the recognition test results were above chance level, A' was calculated for each of the game conditions. An A' score of .50 indicates chance performance. There were no differences in the A' scores for the two university samples: driving game: $t(46) = .99$, *n.s.*; soccer game: $t(48) = .108$, *n.s.* The A' scores were tested using a one-sample t test, where the group score was compared to .50 to determine whether recognition was above chance levels. The t test result for the driving game was statistically significant, $t(47) = 20.19$, $p < .001$, which indicates that recognition of brand names in this game was above chance. Similar results were found for the brand names from the soccer game condition, $t(49) = 24.47$, $p < .001$. Hypothesis 2 was also supported: Participants did show above-chance recognition for the brands they were exposed to in the game they had played. It is possible, however, that the previous word-fragment test might have boosted

FIGURE 4
Comparison of Performance on
Word-Fragment Test of Brand Names
from the Soccer Game



participants' performance on the recognition task because performing the word-fragment completion task may have spontaneously resulted in participants remembering that they had seen the brand in the game. Yet this is unlikely because performance on the implicit memory task was not related to performance on the recognition task. The correlation between A' and the word-fragment completion task was not significant for either the racing game or the soccer game: $r(46) = .14$ and $r(50) = -.003$, respectively.

DISCUSSION

Academic research on the influence of brand placements on memory for the brand is mixed (Karrh 1998). In part, the failure to find clear effects of brand placements on memory may have resulted from a complex mix of factors that influence explicit measures of memory. For example, research has found that brands used by a character are recognized at higher levels than brands that are in the background, and brands that are part of the story are recognized at even higher levels (Yang 2004). Although the present study does not address the complexities involved in studying the effects of placements on explicit memory, it does demonstrate that in-game advertisements do influence implicit memory. Past research on print ads and brand placements in television shows or movies found effects of these placements on implicit memory (Law and Braun 2000; Shapiro and Krishnan 2001; Yang 2004). Perhaps the most important finding of the present study is that measures of implicit memory may provide more sensitive tests of the influence of brand placements than measures of explicit memory.

TABLE I
Comparison of Recognition for Brand Names
from Two Different Games

	Hit	False alarm	A'*
Formula I	.4804	.2795	.6522
FIFA	.4638	.3018	.6224

* $A' = \frac{1}{2} + \frac{\{(y - x)(1 + y - x)\}}{[4y(1 - x)]}$, where x is the proportion of false alarms and y is the proportion of hits (Grier 1971).

The current experiment departed from previous research on implicit memory by using a relatively new and less investigated medium—video games. Video games are an interactive medium, and by nature, they are often more vivid and active than other media. Consequently, brand placements might not work in video games because the interactivity involved in playing the game could distract people from noticing the brand placements. The present experiment sought to determine whether in-game advertisements in an interactive video game did influence implicit memory. The results of the current investigation clearly demonstrated that participants' implicit memory and explicit memory for a brand was influenced by in-game advertising. However, the results indicated only a small effect of in-game advertising on explicit memory for the brand. These results suggest that in-game advertisements in video games may show some promise for advertisers. Game players may or may not explicitly remember the brands they see in video games, but these placements may influence implicit memory and could therefore influence later decisions. By providing a different measure of the effects of brand placements, we believe that the present study provides a major benefit for practitioners of brand placements, especially in-game placements in video games. More specifically, for companies that plan to place their brand in video games and want to know the effect of this practice, these results show that traditional measures of explicit memory should be supplemented with measures of implicit memory, such as a word-fragment completion test.

What is the implication of the finding that brand placements have an influence on implicit memory? Although the present study did not test implicit attitude change, recent research regarding implicit attitudes has suggested that attitudes can be primed without explicit memory of previous exposure to the attitude object (Olson and Fazio 2001) and implicit attitudes have been demonstrated to be a good predictor of the related behavior (Fazio and Olson 2003). Our finding that in-game advertising influences implicit memory suggest the possibility that players' implicit attitudes toward the brands appearing in the video games may have changed as

well. In addition, several studies have demonstrated that brand placements in movies or television shows influence implicit choice tasks as well (Auty and Lewis 2004; Law and Braun 2000; Yang 2004).

More research is needed, however, to confirm and expand the present study's findings. Future studies should consider several factors related to in-game advertising. First, how frequent players of video games experience the game playing should be analyzed. Frequent players may show higher levels of involvement with the video game, which may influence the explicit memory of brands placed in video games. (It should be noted, though, that Grigorovici and Constantin [2004] found no effect of video game experience on recall for brands placed in a game.) Second, it is necessary to compare the long-term effect of in-game advertising. An earlier study found that recall of brand names placed in a video game diminished with longer delays before testing players' memory (Nelson 2002). Tests of explicit memory are influenced by time, whereas implicit memory tends to survive longer after the initial exposure to the stimuli (Shapiro and Krishnan 2001). Consequently, the implicit memory effect found in the present study may be found with longer delays between playing the game and testing memory. Third, in the present study we used a word-fragment test to examine the implicit memory effect of in-game advertising. Besides word-fragment tests, implicit memory tests such as preference or choice behavior should be tested in the future. Fourth, the results of this study may be limited to college students. It should be noted that about 30% of the most frequent computer game players are younger than 18 years old, and 19% of players are over 50 years old (ESA 2005). Therefore, future studies should investigate other age groups as well. Finally, more research is needed to test the effects of different types of in-game placements on implicit memory. There are many dimensions along which in-game placements can vary (Nelson 2002). For instance, there can be passive placements within games (such as billboards on a race circuit) or active placements (e.g., where the game player chooses the brand of car to drive in a race). Likewise, placements can be visual or verbal, such as in NCAA Football 2005, where a voice-over announces that a car company is sponsoring the summary of the scoring drive. Peripheral placements of a brand in movies result in lower levels of explicit memory than do placements that are visually prominent (McCarty 2004; Yang 2004). However, Shapiro and Krishnan's (2001) finding that divided attention did not influence implicit memory for print ads suggests that the nature of the brand placement will have less influence on implicit memory for the brand.

Brand placements are appearing in greater numbers and in more diverse places including video games. The present study demonstrates that video game players are processing the brand placements in video games and their implicit memory

is influenced by these placements. Future research needs to explore factors that influence implicit and explicit memory for brand placements in video games as well as the consequences of these placements for consumer behavior.

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