

THE EFFECTS OF VARYING LEVELS OF OBJECT CHANGE ON EXPLICIT AND
IMPLICIT MEMORY FOR BRAND MESSAGES WITHIN ADVERTGAMES

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THE EFFECTS OF VARYING LEVELS OF OBJECT CHANGE ON EXPLICIT AND
IMPLICIT MEMORY FOR BRAND MESSAGES WITHIN ADVERGAMES

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DEDICATION

To Kim, whose support, friendship, patience and love help me through every single day. Thank You.

To Taya, you weren't here when I started this but you were the biggest reason that I wanted to finish.

To Mom and Dad, for everything the two of you have given me, during my academic journey and otherwise. A little more of that painting is revealed...

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ABSTRACT

This study examined the effects of varying levels of object change in advergames on implicit and explicit memory for the brand sponsoring the game. For the purposes of this thesis, object change was defined as an object entering the screen of an advergame to which a player must react to with a motor response using a mouse or keyboard.

This study utilized a 2 (level of object change) x 5 (advergame) repeated-measures experiment. Explicit memory was measured using a speeded recognition test. Implicit memory was measured via a word-fill task assignment.

A signal detection analysis of explicit memory data revealed that participants were less able to recognize brands they had seen in high object change games versus brands in low object change games. Variations in the levels of object change created no significant differences in implicit memory.

CHAPTER 1: INTRODUCTION

The purpose of this study is to examine how varying levels of object change in an advergame affect implicit and explicit memory for the brand sponsoring the game.

Advergames are a growing method of brand messaging in which products or brands are placed within a playable online gaming environment. For the purposes of this thesis, object change is defined as an object entering the screen of an advergame to which a player must react to with a motor response using a mouse or keyboard.

As an advertising practice, advergaming is growing incredibly fast as marketers seek out new ways to create a relationship with their target audience. According to the Yankee Group, the market value of advergaming will reach \$732 million by 2010 (Video Games, 2006). More and more brands are using advergames to try and create a meaningful interaction with potential consumers (In-Game Branding, 2006).

While spending on advergaming continues to increase, there is at this point still little research that focuses on advergaming and product placement in video games. Therefore, there is not a great deal of information on how people pay attention to and remember messages in this particular media message environment. It is clear that scholarly research should begin to examine the methods used in the practice of advergaming to create those meaningful relationships with consumers. This study will serve as an early examination of one of the structural features of advergaming and the effects of variation in that structural feature on information processing evoked by advergames. Interactive media, such as the Internet and video games, have unique cognitive task demands. For example, when a person is watching television they must use

cognitive processing resources to process both what they are viewing on the screen and what they are hearing through the speakers, storing the information for later retrieval. Advergaming contains much of the same cognitive sensory processing demands as television or movies, but adds on the task of participant action. The game player must react to what occurs on the game screen by using a mouse button and/or a keyboard button press. This study will examine how the unique demands associated with an interactive environment influence cognitive processing of a message memory for brands sponsoring advergaming.

The results of this study will test how the assumptions of the Limited Capacity Model of Motivated, Mediated Message Processing (LC4MP) (Lang, 2006) hold up in an interactive environment. This model serves as the theoretical framework for this study. This model has traditionally been tested in scholarly research on radio, television, and movies (Bolls, Lang & Potter, 2001; Lang, 2006). Processing within interactive media environments is more likely to require more cognitive resources than passive environments, such as television, due to the addition of behavioral response by the audience member. Cognitive resources need to be allocated to executing motor movements needed to react to the events occurring during an advergaming. This demand on cognitive resources is not present in traditional media.

This study used repeated-measures experimental design to examine how levels of object change in advergaming affect brand recognition. Based on the assumptions of Lang's (2006) model, object change is hypothesized to impact the level of cognitive resources required to engage in the task of playing an advergaming. It is theorized that high object change games will require greater levels of cognitive resources to encode

stimuli that are a part of the advergaming environment. In this experiment, the level of object change in an advergaming was manipulated. Therefore, the amount of cognitive resources required to play the game should also vary with that manipulation of object change.

The findings of this thesis will be of some interest to advertising practitioners who are looking to break through the cluttered landscape with a message that both reaches and creates a relationship with their target. Findings reported in this thesis should inform advertisers as to the effects of object change, a variable that the game creators can readily control, on brand recognition in advergaming. This is of particular relevance for those brands that are attempting to create not only an enjoyable advergaming but also a game that is effective at communicating their targeted message. Advertisers will want to know that they are doing their best to maximize the impact of that message and the findings of this study will help them to maximize that impact.

Advergaming as a Brand Message

Advergaming is a type of hybrid message, much like product placement, wherein the brand is placed within an entertainment vehicle. In scholarly research, product placement is generally defined as: “A paid product message aimed at influencing movie (or television) audiences via the planned and unobtrusive entry of a branded product into a movie (or television program)” (Balasubramanian, 1994). This statement can now be adopted to include both console and online video games. The statement could also be adapted to exclude the word “unobtrusive.” Paid brand appearances in television, movies,

and video games are skyrocketing in terms of the amount of placements and the prominence of the placements. (La Ferle & Edwards, 2006; Manly, 2002). Advergaming are now being used to market brands to audiences online. Online video games are slightly different from movies, television and traditional video games in that the advertiser is responsible for constructing the game's content, whereas for more traditional product placements, the advertiser pays to have its product included in a privately developed media vehicle. One example of advergaming is the travel booking website Orbitz. In addition to its traditional website where customers can book flights, rent cars, etc. the company also maintains a website (www.orbitzgames.com) in which people can play a variety of games each with the Orbitz logo prominently displayed. Advergaming are meant to function as an advertising or brand message, but are also meant to serve as an entertainment vehicle. These entertainment vehicles contain a brand logo and/or message and thus this study posits that advergaming are related to traditional product placements in television, movies, or console video games given the above definition used in much of the scholarly research on product placements.

Measures of Explicit and Implicit Memory

What may be most important to advertisers and media producers regarding advergaming is the question: "Do they work?" If not, then the millions exchanged in the name of a new advertising method is really quite pointless. One way in which advertisers can define advertising objectives and success is with the DAGMAR (defining advertising goals for measured advertising results). This model is often used in advertising textbooks

(Wells, Burnett, & Moriarty, 2003) to define advertising objectives. The first step in this model is awareness (Wells, et al., 2003), which is directly tied to recognition.

One method of defining advertising success in scholarly research has been through the use of measures of memory. These measures are used to determine if audience members actually remember the brand messaging they are exposed to. Recognition is often used as a memory measure in scholarly research, as will be discussed in a moment. To be more specific, in this thesis brand recognition is meant to indicate how well a game player encoded the brand within the game they played, and if that player can differentiate brands they saw during game play from brands that they did not see in game play. Recognition tests are often referred to as tests of explicit memory. Explicit memory retrieval refers to conscious memory retrieval, wherein a person actively tries to remember information from a previous occurrence or task (Duke & Carlson, 1993,1994; Shapiro & Krishnan, 2001).

In addition to explicit memory retrieval, consumers often use low-effort processing to make purchase decisions on non-risky products (Duke & Carlson, 1994). Researchers have pointed out that consumers also do not shop in a vacuum. Due to interference, consumers are also not always able to consciously retrieve product information previously stored in memory (Duke & Carlson, 1994). One example of interference might be an instance in which a consumer is engaged in conversation while deciding on which pack of gum they will purchase. In instances such as these, an implicit memory test can reveal information about product-information retrieval that occurs automatically and unconsciously. We move now to a discussion of implicit memory tests

and their use in advertising research. Subsequent to this, a discussion of explicit memory tests in advertising research will be provided.

CHAPTER 2: LITERATURE REVIEW

Implicit Memory Tests in Advertising and Product Placement Research

Implicit memory refers to automatic and unconscious memory retrieval of previously encountered information (Duke & Carlson, 1993; Shapiro & Krishnan, 2001). In other words, a person may undergo memory retrieval for previously seen information, such as brand names or brand information, without realizing he/she is doing so. Such memory retrieval is thought to be particularly common in low-effort purchase situations (Duke & Carlson, 1993; Shapiro & Krishnan, 2001). Implicit tests of memory are thus thought to be ideal for testing of brand memory and/or purchase situation under which this type of automatic and low effort processing might occur (Duke & Carlson, 1993). Ultimately, implicit memory tests provide an experimental tool to investigate attention, processing and retrieval that occur automatically (Duke and Carlson, 1993).

One method used to measure implicit memory effects is a word-fill task (Duke & Carlson, 1993, 1994; Leshner & Coyle, 2000; Yang, M., Roskos-Ewoldsen, D.R., Dinu, L. & Arpan, L.M., 2006). In such a task, participants are exposed to a target word in some form of media. For advertising research, this would likely be a brand name or logo in an advertisement. Subsequent to viewing the media in question, the participant would be asked to complete a test in which their task is to fill in the blank spaces to make any word (i.e. Tide might be tested as _ i _ e). Any instructions given to the participant make no reference to the previously completed task. Often target words are placed along with

foil words on the test. A word is scored as correct if it matches the target word exactly in spelling. The goal of this type of experimental measure is to examine whether priming has occurred. Priming is thought to have occurred if the completion rate for target words the participant has previously viewed is higher than foil words that have not been previously viewed. If this is the case, then the participant was thought to have been primed to automatically and unconsciously retrieve the previously viewed word/information (Duke & Carlson 1994).

This is the type of word fill task measure researchers Yang, Roskos-Ewoldsen, Dinu and Arpan (2006) used in their study on video game product placement. The authors found that participants' implicit memory was influenced via brands placed in video games. The authors used three groups for their study. One group played a soccer video game, a second group played a racing game, and the control group played no game. Each of the games contained brands placed within the gaming environment. All three groups completed the same word fill task wherein brand names from each game (no brands appeared in both games) and several foils made up the word-fill targets on the test. The authors found that game players completed the word fill tasks at a higher rate for brands that appeared in the specific game they played compared to foil brands. Both groups who played games completed the words at a higher rate than the control group. Due to their findings, the authors noted that studies using explicit memory should also supplement their study with implicit memory, noting game players may remember brands without being consciously aware of it.

Law and Braun (2000) used an implicit product choice test to measure the impact of product placement features on purchase intention. The authors also discussed

and compared the use of implicit memory tests and explicit memory tests, arguing that implicit test are more appropriate tests of memory as past experiences can shape the responses of a participant.

Participants in Law and Braun's (2000) study watched clips from the show *Seinfeld* that contained products placed audibly and/or visually. After watching the clip and completing a distraction task, they were given the implicit product choice test. This implicit test was operationalized as a shopping list wherein each participant was asked to check the products they would buy for a friend. The list contained the placed products as well as products that served as foils. This implicit task made no reference to the clip of *Seinfeld* they had watched. Overall, the products placed within the video clips were chosen at a higher rate than products that were not featured. Visually placed products were chosen the most, followed by seen-only products. Products that were featured both audibly and visually were chosen the least. This finding is particularly interesting, as explicit memory tests found the products featured in these types of placements were the most recalled and recognized. The authors also investigated the affect of visual prominence on implicit product choice, but prominence was found to have no effect on the variable.

Law and Braun's (2000) findings are but one example of research results that have indicated that explicit and implicit memory tests often have disassociated results. Another example of such findings is provided by Shapiro and Krishnan (2001), who tested both implicit and explicit memory for advertisements displayed on a slide projector. These researchers used an explicit recognition test and an implicit product choice test. Their findings indicated that participants who viewed the advertisement

chose the products featured in those advertisements more than non-viewed (foil) brands. Additionally, explicit memory was negatively affected by both divided attention during advertising exposure and by a one-week delay in between exposure and the recognition test. The same did not hold true for implicit memory, where products actually seen during the experiment were still chosen at a higher rate than foil brands.

As the results from several studies (Yang, et al., 2006; Law & Braun, 2000; Shapiro & Krishnan, 2001) indicated, it could helpful to include tests of both explicit and implicit memory in advertising experiments in order to gain a better picture of memory effects in brand messaging. Specifically, in the case of this thesis, the effects created via formal features of advergaming messages on both implicit and explicit memory should be examined using both of these memory tests.

The Explicit Memory Test of Recognition in Product Placement Research

Brand recognition is an often-used method of measurement of memory effects in research involving product placement in television, movies, and video games. This study will examine the result of differing levels of object change on brand recognition, and thus a review of the literature involving brand recognition and product placements is relevant.

As previously discussed, recognition tests are one example of an explicit memory test. In advertising research it is common for participants to be asked to think back to a previously viewed advertisement and to attempt to remember if they saw a particular brand or not. Additionally, it is common for these tests to include foil brands

(or brands that were not viewed by the participant). The participant must then consciously attempt to distinguish the information that was actually seen (experimental brands) from that which wasn't seen (foil brands).

Such a test was used by researchers Babin and Carder (1996) in their examination of viewer memory of brands placed within films. The researchers used the films *Rocky III* and *Rocky V* in order to test recognition of the brands therein. Viewers of both films were generally able to accurately identify brands from either film. They were also able to differentiate brands used in the film from brands not listed within the film. The authors found that viewers remembered brands used as on set placements (defined by the authors as prominently placed and/or touched or used by a character) at a higher rate than placements placed in the background of the scene.

Russell's (2002) examination of plot and presentation characteristics found an advantage of audio placements over visual placements when it came to recognition. Visual placements were recognized at a higher rate when they were not as congruent with the vehicle's overall plot line. Brands were also recognized at a higher rate when they were presented both audibly and visually, compared to visual-only placement. The authors inferred that this was due to audio information being more meaningful than visual only information. They also argued that visual information has the ability to be made more meaningful through its connection to the plot of the media in which it is placed by audibly placing the product in the media.

As previously discussed, Law and Braun (2000) used clips from *Seinfeld* in which brands were placed visually and/or audibly. The authors found that products placed centrally onscreen had better memory effects than did non-prominently placed

products. The authors argued that this might have taken place due to the potential for greater processing of an item that is more visually available compared to a less visually available item. Placements that occurred both visually and audibly were recalled better than visually only placed products or audio only placed products. Recognition scores were highest with audiovisual placements. Audio-only placements were recognized at higher rates than visual-only placements. Here the authors argued that modality of placement could be affected by how participants coded information present in the placement. For instance, while a visual placement might be coded as a picture, an audio placement might be coded as a word. Thus, recognition might be improved for an audio placement as recognition tests tend to use words, not pictures or logos, as the items actually making up the test. Interestingly the authors' findings in this study indicated recognition tests were likely more indicative of exposure effects of product placement than was free recall. This is a key reason that this thesis uses recognition as an explicit test of memory rather than recall.

Researchers have also examined factors affecting audience memory of product placements (d'Astous & Chartier, 2000). Findings from their research indicated that both brand recall and recognition increased when a key actor was present for the placement in the vehicle and when the placement was more overt. The authors argued that having a key actor present likely would have increased recognition as it would increase product relevant thought on the part of the viewer. They also noted that prominence would seem to fall in line with logic that easily viewed information would be easier to recognize than something that was not as easy to be seen. The findings in this study are another

example of research that shows that memory effects can vary based on the way in which product placements are presented to the viewer.

Research has also been conducted in order to investigate memory effects for brands placed within video games. Schneider and Cormwell (2005) found that short-term memory has been found to increase when the player directly manipulates the brands in question or the brand is central to the action of the game. The authors also found that prominence of display of the brand in video games impacted recall and recognition of the brand. Specifically, more prominent display of the brand within the playing environment led to higher rates of recall and recognition. The authors argued that players gained more interaction within the game with these placements, and this was likely the reason for the greater memory effects. This argument was based on qualitative interviews with participants that took place after game play and explicit memory tests were completed. The authors also hypothesized, based on those same post-test qualitative interviews, that brands with large market share that have top of mind awareness might also be easier to recognize in tests such as the one in their study. Another interesting finding of this study was that experienced game players displayed higher rates of recognition and recall compared to less experienced game players. The authors argued that this could have been due to the fact that experienced game players are better able to track items or information in the periphery of their vision compared to less experienced game players (an argument based on psychological findings of Greenfield, DeWinstanly, & Kaye [1996]). Schneider and Cormwell (2005) also offered the argument that experienced game players, being more used to playing games in general, are simply more adept at game play than their less experienced counterparts, and are thus able to take in more of

the game's environment visually. The authors' final theory was that experienced game players might be better able to cognitively reconstruct their game play experience, enhancing memory of details within that experience.

Yang et. al's (2006) investigation of product placements in two separate video games (a soccer game and a racing game) found that game players were able to recognize the brands featured in the games they played and were also able to differentiate the brands in the games they played from brands that did not appear in the games.

However, the authors also found that in their study recognition rates were low. The authors ran a signal detection analysis to verify that participant recognition rates were above chance (in short, that the participants were not in fact guessing). Recognition rates were found to be above the level of chance. However, the authors point out that given their implicit memory results (see previously reviewed literature of Yang et al., 2006 under *Implicit Memory Tests in Advertising and Product Placement Research*) studies using explicit memory should also supplement their study with implicit memory, noting game players may remember brands without being consciously aware of it.

Research has thus shown that recognition of a brand placed within a vehicle is affected by how the brand or brand message is placed within a media vehicle. While this thesis will not manipulate how brands are placed, it is clear that not all product placements create similar explicit memory effects. This literature review has also shown that brand recognition is a commonly used measure of memory in scholarly research on product placement advertising.

The Limited Capacity Model of Motivated Mediated Message Processing

Critical to this study's examination of advergames is Annie Lang's LC4MP model (Lang, 2006). The model is fundamental to understanding how advergame features (such as the amounts of object change discussed in this thesis) can create desired or undesired audience memory effects. Specifically, the model's discussion of how resources are allocated to visual stimuli on an automatic and controlled basis is important to this thesis' discussion of object change in advergames.

Lang's (2006) model posits that people have a limited amount of cognitive resources to use on the cognitive "...tasks of perceiving, encoding, understanding, and remembering the world they live in." (Lang, 2006, p. 559). The process of perceiving, encoding, and storing information is ongoing as resources are allocated to stimuli in a person's surrounding environment. Media messages contain visual and/or audible stimuli. As such, these messages have the ability to activate allocation of these cognitive resources via stimuli in the message.

Resources are allocated according to the appetitive and aversive motivational systems. Both the appetitive, or "approach", system and the aversive, or "avoidance", system are activated via stimuli that are motivationally relevant in a person's surrounding environment. Both systems also influence how information in the surrounding environment is processed (Lang, 2006,). The appetitive system is focuses on taking in information regarding important stimuli in a person's surrounding environment. The activation of this systems is also responsible for increasing cognitive resources such that

a person can remembering the stimuli. (Lang, 2006) The aversive system is focused on protecting the individual, and as such, focuses on identifying potentially dangerous stimuli in a person's surrounding environment (Lang, 2006). The aversive system is then responsible for allocation of resources to the sub-processes of memory in order that a person can remember important information regarding the potentially dangerous stimuli in order to better protect themselves (Lang, 2006). During game play, events likely occur that evoke appetitive and aversive activation. However, measuring activation in these systems is outside the scope of this study.

Lang's model (2006) assumes that cognitive processing has three sub-processes: encoding, information storage, and retrieval of the stored information (Lang, 2006). Encoding involves the selection of information to be stored for later retrieval. This selection can be automatically activated via orienting responses, which are automatic responses to novel stimuli in a person's environment. Media messages, which contain audio and visual sensory information, have the ability to activate these orienting responses in a person via stimuli in those messages. Examples of stimuli that evoke orienting responses in traditional media are cuts and edits in television (Lang, 1990). An example of stimuli that causes orienting responses in interactive media is animation in web-banner advertisements (Lang, Borse, Wise, & Prabu, 2002).

Cognitive resources can also consciously be allocated to encoding through controlled processing (Lang, 2006). Like any other mediated message, cognitive processing in advergimes involves both automatic and controlled allocation of resources. As is certainly the case with advergimes, both modes of resource allocation will be affected by stimuli in the message. Even though this study is not focused on specifically

identifying the structural features of advergames that evoke orienting responses, it would seem likely that stimuli within advergames, such as objects entering the game screen, would evoke orienting responses and as a result, automatic resource allocation. As an interesting and engaging media message, it is also likely that controlled resource allocation would take place in playing of advergames, specifically when a game player must react with a motor response to stimuli in the environment.

Storage requires the linking of newly encoded information to previously stored old information through simultaneous activation (Lang, 2006). The more links newly encoded information has to previously stored information, the better it will be stored for later retrieval. Lang's model also posits that motivation, through personal relevance, can lead to higher levels of resource allocation to storage.

Under the third and final sub-process of the model, resources must be allocated in order to retrieve the information that has been previously stored (Lang, 2006).

Lang (2006) notes that cognitive resources are simultaneously and continuously allocated to encoding, storage, and retrieval. However, each person has only a limited amount of resources he/she can allocate to these three processes. When there are not enough resources to allocate to stimuli in the environment, cognitive overload occurs and at least one of the three sub-processes will suffer (Lang, 2006).

This model of motivated, mediated message processing is the fundamental basis for how this study will examine processing of information in an advergame.

I-Squared

In order to more accurately apply Lang's Limited Capacity Model of Motivated Mediated Message Processing (2000, 2006) to study resources allocated to new information presented in a media message, a new measure was developed (Lang, Bradley, Park, Shin & Chung, 2005). This measure, known as I-Squared (short for Information Introduced) was developed in order to measure how camera changes, in the form of cuts and edits, can affect resources required for processing of a media message in different ways (Lang et al., 2005). Specifically, certain types of message content and structure within those cuts and edits were theorized to create instances where more capacity to process information would be required. The seven constructs the authors identified for this measure are as follows: object change, novelty, relatedness, distance, perspective, emotion, form change. If one of these constructs appeared after a camera change, the authors argued more cognitive resources would be required to process the new information onscreen.

This study on advergames extends the construct of object change. Lang et al. (2005) note that prior research has indicated that new objects appearing in a person's environment are given a high priority by that person's visual attention system. These new objects then result in the automatic allocation of cognitive resources (Lang, et. al, 2005; Lang, Bolls, Potter & Kawahara, 1999; Yantis & Jonides, 1990).

Critical to note is the fact that I-squared was designed to measure allocation of resources following a cut or edit in television. Most advergames generally do not contain

screen cuts during game play. Rather, any cutaways usually occur before or after game play, when setup screens or score-information screens are displayed. In this thesis' experiment, participants only played the levels of each game, and were instructed to navigate to a blank web page after each game play session so as to limit exposure to any additional brand messaging outside of the game play environment. All object change then occurred on the game screen without any shifts or changes in the angles or presentations of the game.

Games in this thesis' experiment were chosen to be as representative of the overall advergaming environment as possible. High object change advergaming games tended to feature object changes on which some manner of branding (usually via logo representation) took place prominently on the game screen. For instance, in this thesis' experiment, one advergaming game used was a skiing simulation sponsored by Winterfresh. Game players encounter numerous Winterfresh logos designed for the controlled skier to run into and over. However, game players also have to watch for trees, gates, mounds of snow, and rocks in addition to the brand placements.

Low object change games tended to not have brand logos or messages on the object changes. However, the low object change games tended to have strong branding on the surrounding environment. They also tended to specifically keep brand placement on the location where the game play action was taking place. For instance, one low object change game in this thesis' experiment was an air hockey simulation. In this game, all the action took place on a simulated air hockey table with the Juicy Fruit logo prominently placed, such that the game player would play out the entire game on top of

the logo. The only object change appearing in the game was the puck, which would drop into play to start the game as well as following each scored goal.

For the purposes of this thesis, placement of brands in the game was split into two categories, central placement and peripheral placement. Central placement was categorized as games that featured branding logos on the character/item being controlled by the game player. Peripheral placement was categorized as brand message or logo placement on objects entering the screen or on items in the surroundings of the game environment. Only games with peripheral placement were used for this thesis, in order to attempt to establish as much control as possible over the type of brand placement.

Based on Lang's (2006) theory of Limited Capacity of Motivated Mediated Message Processing, the game players in this study are expected to use greater amount of processing for higher object change games. Because they will be required to use greater amounts of resources for processing and playing the game in reacting to the object changes, fewer resources will be available for processing of brand messaging in the higher object change games, whereas in low object change advergmes, there should be more resources available for brand message processing. Thus, this study posits that:

H1: Brand recognition will be lower in high object change games compared to low object change games.

Research (Duke and Carlson, 1994; Law and Braun, 2000; Shapiro and Krishnan, 2001) has indicated that explicit and implicit memory tests often have disassociated results. Shapiro and Krishnan (2001) specifically found that while the explicit measure of recognition was affected by time delay and divided attention in viewing print advertisements, the implicit test used in their study was not.

Given that little research exists on advergaming as a whole and also given that research such as the above has shown various factors such as time delay or divided attention in the viewing of traditional media to create differing results for explicit and implicit measures of memory, this thesis seeks to investigate the following:

RQ1: Will there be any significant difference between the mean number of brand names completed for high object games and the mean number of low object games on an implicit word fill task?

CHAPTER 3: METHODS

Experimental Design

This study used a 2 (object change) x 5 (advergame) within-subjects repeated-measures design experiment. Each of the games selected for the study had one of two levels of object change: high or low. Five high-level and five low-level object change advergames were played, each with a different brand sponsoring the game.

Independent Variable

Object Change.

The independent variable (IV) in this study is object change. Object change is conceptualized as an object appearing onscreen in the gaming environment to which the game player must react with a motor response using either the keyboard or mouse. Objects to which a game player must react to with a motor function were specifically included in the conceptualization due to the fact that advergames are a more interactive media environment than television or movies, which are generally considered passive media. Object change was manipulated by selecting existing, professionally produced advergames that appeared to have either a high or low level of object change as part of

Table 1. Brand Names and Game Specifics

Brand	Game Length	Object change Levels	Object Changes Per Second
Big Red	39 seconds	High	1.51
Gummi Savers	1 minute	High	.48
Orbitz	1 minute	High	.50
Sour Skittles	39 seconds	High	1.92
Winterfresh	53 seconds	High	1.79
Burger King	45 seconds	Low	.24
Extra	45 seconds	Low	.02
Juicy Fruit	1 minute	Low	.08
Planters	1 minute	Low	.36
Ritz	45 seconds	Low	.36

the game play. Mean object change was found by having a research assistant play the game 3 separate times while the experimenter counted the object changes with a tally counter. Averages were then compiled for each game over the three game play sessions. Average object changes in the high level were 57.9 per game while the low level had an average of 11.2 object changes. Table 1 provides a list of average object changes by game, with the mean number of object changes per second of gameplay.

Dependent Variables

Brand Recognition

Recognition is conceptualized as how well information was encoded in working memory. This study featured 10 different advergames (5 high object change, 5 low object change). Each advergame featured a different brand sponsor. Recognition was measured with a speeded recognition test taken on a laptop computer. Participants were asked to indicate if they played a game that was sponsored by a brand with the only possible answers being yes or no. Participants answered via a mouse left button press on one of

two boxes, one displaying the “yes” option and the other the “no” option. The test included the 10 brands as well as 10 foils, with 1 foil for each brand. Each foil was in the same product category as the actual placed brand. Brand names appeared onscreen for 500 milliseconds. Participants were instructed to answer as fast as possible and given a maximum of three seconds to respond.

Scores for dependent variable brands were compiled such that a “1” was scored when a participant correctly indicated with a “yes” that they did play a game for the sponsoring brand. This will be subsequently referred to in this thesis as a hit. A “0” was scored if they chose “no” to indicate that they hadn’t played a game for the indicated brand when in fact they had played a game sponsored by that brand. This is referred to as a miss. For foil brands, scores were compiled such that a “1” was scored when a participant indicated that they had played a game sponsored by the indicated brand when they had actually not done so. This will be subsequently referred to in this thesis as a false alarm. A “0” was scored if the participant correctly indicated that they had not in fact played a game by the foil brand. This is referred to as a correct rejection.

This scoring system allowed the experimenter to compile a total score of hits and false alarms at each level of object change for each participant. Thus, each participant would have four final scores, each ranging from 0-5: total hits high object change, total false alarms high object change, total hits low object change, and total false alarms low object change.

Using these scores, the mean percent of hits and false alarms were calculated and a t-test run to compare the means. Following this comparison, a signal detection analysis was then run in order to investigate participants’ sensitivity (A prime) and

criterion bias (B prime). Sensitivity indicates participants' ability to accurately recognize an item as having previously been seen before while criterion bias indicates whether participants are liberal or conservative in indicating that a target has been previously seen before (Shapiro, 1994). Thus, for this thesis, sensitivity indicates if participants have the ability to recognize the brands they saw in the games they played, while criterion bias would indicate how liberal/conservative they are in guessing if they did or did not play a game featuring an indicated brand or foil.

Implicit memory for brands featured in advergames.

Implicit memory is conceptualized as the unconscious and automatic retrieval of memory traces. In this experiment, participants were exposed to a target brand word by playing a game wherein a brand logo was placed. Subsequent to playing the advergames, the participants were each asked to complete a word fill task. They were instructed to fill in the blank spaces to make any word. Instructions made no reference to the previously played games. No foils were included in this measure. A word was scored as correct if it matched the target word exactly in spelling. An attempt was made to construct word-fill tasks that would all have roughly the same number of possible alternate spellings other than the target word. In order to do this, the test was constructed with the use of a website (www.morewords.com) that allows a user to insert a combination of letters and blank spaces. The website then lists all possible word combinations using the provided letters and blank spaces. For the purposes of this study, the attempt was to create word

fill tasks that had 10-20 possible words that could then be filled in to complete the task (this included the target word).

Stimulus Derivation

Advergames were selected from the following websites: www.candystand.com, www.orbitzgames.com, www.kewlbox.com, and www.nabiscoworld.com. The experimenter played each available advergame on each website scanning for potential candidates for the experiment. Games selected fit in with identified levels of object change as well as game length. Games were selected to be 40-60 seconds long. A list of game web locations and information is available in Table 1.

For this thesis' experiment, brand placement was categorized as either central or peripheral placement. Central placement is conceptualized as a brand message or logo that appears on the user controlled item/object in the game. Peripheral placement would then be brand message or logo placement otherwise not associated with the above but still within the actual game play screen (background or periphery of screen, or on items classified under this thesis' definition of object change). The stimuli in this thesis were controlled for brand placement by including only games with peripheral brand placement.

Games were also selected such that an attempt was made to vary other formal features across both levels of object change. High object change games tended to take place in a scrolling environment in which object changes were introduced, while low object change games tended to take place in a static location with the objects appearing onto or into the stationary location.

Procedure

Before beginning the study, participants signed an informed consent form in order to comply with campus IRB regulations.

Games were setup online in the Mozilla Firefox browser. Tabbed browsing was setup up such that each game tab was followed by a tab that opened to a blank window with nothing onscreen. Two games were setup such that they had to be opened from the bottom screen toolbar.

The experiment lab was set up such that two participants were able to participate at the same time when scheduling would allow.

To begin, participants received their first set of instructions, informing them that they would be playing a number of online games. Participants were given brief instructions in how each game was played. This was necessary as controls varied somewhat across games. These instructions consisted of informing them that they would be using the mouse or keyboard (game dependent) and what buttons they would be using. After these instructions, they were told to click into the next available game tab and begin playing. Using tabbed browsing, they moved to a blank web page once they had completed the level. In this way, the participant(s) moved through the experiment game by game, receiving instructions before each game. If two participants were run simultaneously, each of the tests and the distraction task were completed at the same time, with participants receiving identical instructions at the same time. If one participant finished before another, they were instructed to wait with the blank window in front of them until the other participant had finished playing.

Each advergaming was played for a time of 40-60 seconds. Table 1 shows the length of time each game was played. Thus, participants played a total of roughly 4.2 minutes at each level of object change, high and low.

Following the playing of the selected advergaming, participants spent five minutes working on the implicit memory word-fill task. This test was issued via pencil and paper. Following the implicit memory test, a three-minute distraction task was implemented in order to clear short-term memory. This distraction task consisted of a roughly 3 minute video clip of a Saturday Night Live skit played on a separate laptop from the game play laptops. This permitted the experimenter to prep the participant laptop computers for the recognition test while they viewed the distraction task. Following the distraction task, participants returned to their original game play laptop computers and were administered the posttest examining brand recognition. After completing the recognition test participants were debriefed and excused.

Participants

Participants were selected from a classroom setting at a major university in the Midwest and received class credit for their participation. Game scores were kept separate from any post-test data in order to preserve confidentiality. Fifty-two participants took part in the study. Three data sets were thrown out due to experiment error. This left a total of 49 usable data sets.

CHAPTER 4: RESULTS

This thesis had the following hypothesis and research question:

H1: Brand recognition will be lower in high object change games compared to low object change games.

RQ1: Will there be any significant difference between the mean number of brand names completed for high object games and low object games on an implicit word fill task

Recognition Test

The recognition test was completed on a laptop computer. Participants used the left mouse button to click on a text box to answer “yes” or “no” as to whether they had played a game that was sponsored by a brand. For this experiment, one foil brand from the same product category was selected for each brand.

Scores were compiled automatically via the Medialab program on each laptop computer, and the output file was saved to SPSS for analysis.

An initial analysis of recognition test data using a paired sample T-test revealed that participants actually no significant differences in hits for high object change game brands when compared to low object change game brands (Table 2 Provides Statistics). The T-Test also showed participants as having more false alarms for high object change foils than for low object change foils.

Table 2: Differences by Level of Object Change – Paired Sample *t*-test

Participant	% - High	% - Low O.C.	<i>df</i>	<i>t</i>	<i>P</i>
Answer	O.C.				
Hits	.76 (.18)	.71 (.21)	48	1.589	.119
False Alarms	.18 (.22)	.08 (.13)	48	3.433	.001

Standard Deviation Appears in Parenthesis

To further analyze the results of the experiment, a signal detection analysis was run. This analysis revealed provided a different picture of the results of the experiment. Mean percentage of both hits and false alarms was calculated. Using this, A prime (A' = sensitivity) and B double-prime (B'' = criterion bias) were calculated. A' and B'' revealed that in actuality, participants displayed more sensitivity for brands featured in low object change games and were also more conservative in deciding whether or not they had seen brands in low object change games. Thus, for high object change games, participants appear to have been more liberal (in other words, they guessed more) in deciding if they had played a game sponsored by a particular brand. Table 3 provides statistics.

As sensitivity is higher for brands in low object change games compared to high object change games, indicating a better ability to discern the brands they had seen from the brands they had not seen, H1 is supported. Also, it should be noted that participants were more conservative in indicating which low object change game brands they had seen while they were more liberal in indicating which high object change game brands they had seen.

Table 3: Signal Detection – A' (Sensitivity) & B'' (Criterion Bias)

Participant	Mean High	Mean Low	<i>df</i>	<i>t</i>	<i>P</i>
Answer	O.C.	O.C.			
A'	.85 (.15)	.89 (.11)	48	-2.045	.046
B''	.27 (.60)	.62 (.63)	39	-2.854	.007

Standard Deviation Appears in Parenthesis

Implicit Word Fill Test

The implicit test was completed on pencil and paper. Four separate randomized lists of brands were compiled. A brand name received a score of “1” if the blanks were filled in to match the brand name. Any other results received a “0”. Due to an error in experiment setup, only 4 brands were included at each level. Each participant had a total score ranging from 0-4 for each level of object change. A total score was compiled for high object change brands and low object change brands for each participant. These scores were entered into SPSS for analysis. A paired sample *t*-test was run in order to compare the differences in means for each level of object change. Differences in mean word completion were not statistically significant. Table 4 provides statistics.

Table 4: Implicit Memory – Mean # of Words Answered

	High O.C. Games	Low O.C. Games	<i>df</i>	<i>t</i>	<i>P</i>
Words Completed	1.22 (1.04)	1.14 (1.25)	49	-.531	.598

Standard Deviation Appears in Parenthesis

CHAPTER 5: DISCUSSION

This thesis used an experiment to analyze whether two levels of object change in advergaming, high or low, created effects on explicit memory as measured by brand recognition (via sensitivity/A') and implicit memory (as measured via a word-fill task). Results indicated that recognition was better for brands in low object change game in comparison to brands in high object change games. There were no significant differences in levels of implicit memory as measured by the implicit word fill task.

The theoretical foundation for this thesis was Annie Lang's LC4MP (2006). Results for this study would follow with this theory and previous findings by other researchers studying radio, television, and movies. In this case, it appears people do have a limited capacity for processing media messages, and as this thesis shows, this would include advergaming. This cognitive capacity can be exceeded in high object change games where more objects are entering the playing screen to which players must respond to with a motor movement. Results seem to indicate that there are fewer resources available for processing of the brand message within the game. As a result, people are less able to distinguish brands they had previously seen while playing high object change advergaming from those brands that they did not see. Here it should be noted the importance of the signal detection analysis to this thesis. An initial examination using a comparison of mean percent of hits and false alarms with a paired sample *t*-test showed no significant differences in the mean percent of hits for high and low object change games. The test did show a significant difference in the percent of false alarms; with

participants showing a greater amount of false alarms for high object change compared to low object change games. However, it becomes clear with a signal detection analysis that this paired sample *t*-test does not tell the entire story. The signal detection analysis shows that in fact there was a significant difference in the results for sensitivity (A'), such that sensitivity was higher for low object change game brands compared to high object change game brands. Thus, participants in fact were better able to recognize what brands they had previously seen in the low object change games than for the high object change games. Sensitivity shows that in deciding what brands they had seen and hadn't seen, participants were able to better discern the two in low object change games as compared to high object change games.

Criterion bias (B'') was also calculated as part of the signal detection analysis. Criterion bias showed that participants were actually more liberal in deciding if they had seen brands previously for high object change games when compared to low object change games. When attempting to identify what brands they had seen, participants appear to have been guessing to a greater extent for high object change game brands as compared to low object change game brands. This thesis thus speculates that these criterion bias findings indicate that as participants appeared to be less willing to guess on brands for low object change game compared to high object change games, they in fact likely didn't have to guess at identifying low object change brands nearly as much. This would seem to indicate that participants seem to have been more confident in deciding which brands they had seen in low object change games as compared to high object change games, and this may have led to them being more conservative in identifying low

object change game brands while needing to be more liberal and thus guessing more, in attempting to identify high object change game brands.

Implicit memory findings displayed no significant difference for implicit memory between high and low object change game brands. It seems likely that the constructed test simply did not have enough power to display any significant effects.

From a practical perspective, the findings of this thesis regarding sensitivity and criterion bias reflect a crucial issue for advertisers who need to not only create awareness for their product or service, but also to differentiate their product from the competition. Explicit memory results would seem to indicate that advertisers should be motivated to find the proper amount of objects entering the game play screen, and to avoid inserting more objects than a person can cognitively process. Doing so would appear to take away processing of the brand message such that consumers would have a more difficult time distinguishing the advertised brand from competition. Awareness for the advertised product, as previously discussed, is often a key advertising goal. Thus, finding the correct balance of object change to accompany the game and the brand messaging is key, in order that consumers not only enjoy playing the game (in this case, the brand message) but also remember the key message and/or brand name from the game they have played.

Limitations of This Study and Recommendations for Future Research

The above interpretations should be made within the following discussed limitations to this study.

This study tested only two levels or amounts of object change. Moreover, object change levels were not concrete, with amounts varying by game and even slightly by each game player depending on their own game play experience. Future research should address this by establishing more concrete levels of object change in order to help investigate if there is in fact a cognitive breaking point at which explicit memory decreases. Researchers should work with advergame programmers to develop testable and highly controllable games in order to test separate amounts of object change. By gaining more control over the precise number of object changes in an advergame, researchers could be better able to move towards findings that could reveal at what point recognition memory for brand messaging in advergames begins to increase, peak, decrease, and subsequently fall off. Doing so would establish a benchmark for game programmers to aim for in order to maximize the benefits of advergaming for brands seeking to spend their marketing budget wisely.

This study is one of very few studies at the current time that has investigated the world of advergaming as a media message device. One implication of this is that this study serves as an initial look into advergaming effects, and establishes some directions for future research in the area of advergaming. Another issue is that the theory that served as the foundation for the hypothesis in this study, Lang's LC4MP model (2006), had previously been used on television and movies. Results seem to indicate that the theory can be applied successfully to advergames. Future research on advergaming should use Lang's model in order to gain a better understanding of advergame effects on the process of encoding, as well as the processes of perception and retrieval. Doing so

will provide a better understanding of how cognitive processing is affected by this interactive media.

Participants in this thesis' experiment were college students from a major Midwestern university. Future research should establish whether the observed effects hold true with a more diverse age group of potential consumers. For example, it's possible younger generations who have grown up using multimedia to a greater extent might display different memory effects for brand messages in advergame messaging when compared to those who are not as experienced with interactive media. As Schneider and Cornwell (2005) noted, experienced game players have been shown to display greater recognition memory for video game product placement when compared to more novice players. Future research should address this topic in the field of advergaming. Additionally, different consumers of different backgrounds, ages, etc. might harbor different attitudes toward advergaming. This is another avenue that future research should address in order to gain a better understanding of how target markets will react to the messaging aimed at them.

This study only examined one feature of advergames that could potentially influence cognitive resource allocation. Future research should address game features such as motor function required for different games. Particularly, care should be taken to address how different amounts and levels of button presses and/or keyboard button presses create cognitive resource allocation. This study in essence manipulated this by having participants react at higher or lower amounts with keyboard button and/or mouse button presses to object changes. However, games that require mouse and keyboard combination controls were not separated from games that only required the game player

to hit one button on the mouse repeatedly to object changes onscreen. It's possible that a game in which a player must use a large amount of keyboard/mouse combination controls could create altogether different levels of cognitive resource allocation compared to a game in which the player would hit one button on the mouse or keyboard repeatedly. Games that require both hands to play might create different amounts of cognitive resource allocation compared to a game in which a player only uses their dominant hand.

The games in this thesis were not of uniform length in time (See Table 1). Future research should establish what effects varying lengths of time in exposure to advergames might have on brand recognition and implicit effects. Additionally, the time played may not represent actual online playing time. While time was limited to avoid ceiling effects in analysis of recognition data, the average consumer playing online might actually be engaged in game play for a longer amount of time. Consumers may play advergames for as long as 17 minutes (Hein, 2006), obviously a much longer overall exposure than this study utilized. Future research should take a look at such a time discrepancy between the average commercial time and possible advergame exposure time, wherein a game player is being exposed to a brand logo and/or message for a much longer time in advergames versus advertising in traditional media.

Regarding the implicit memory test used in this thesis, this study shows that implicit memory is also difficult to measure. Care should be taken to pretest implicit tests in order to establish a baseline against which to measure future performance, particularly with word fill task assignments. More test items are likely needed to gain the power necessary to display any significant effects.

The implicit test used in this study is but one example of an available implicit test, and this thesis did not attempt to measure word completion against any baseline performance of the task by people who had not played the advergames in this study (i.e. a control group). This is one avenue future research should explore, along with a test of how consumers perform on other implicit memory tests. Specifically, an implicit product choice test would be of great value to evaluate advergame effects. Product sales are often an important part of advertising goals and thus it is recommended that future research should analyze what effects advergame brand messaging has on implicit product choice. A test of unconscious processing during product choice would seem to fit well when testing games such as those featured, many of which might be classified as products that would fit into a low involvement purchase decision, where unconscious processing might be occurring.

Future research should also investigate whether brands that might be less familiar than those which were used as variables in this study show related or different memory affects. It's possible that consumers might be better primed for brand names that are already have top-of-mind awareness when compared to those brands that are not as heavily engrained in consumers' minds. For instance, a new product just released on the market would likely not be as primed in consumer memory as brands such as Coca-Cola or McDonalds, which have a long history of consumer interaction and advertising.

Regarding data analysis, the results of this study point to the need for a signal detection analysis as a very useful tool for examining the results of recognition memory test data for studies examining advergaming or other advertising methods. The signal detection analysis provided a completely different view of the results of this study, and in

fact pointed towards the hypothesis (H1) that this thesis sought to investigate as being correct. Had only the mean percent of hits and false alarms been tallied and then compared, this thesis would have missed a crucial finding.

Ultimately, as additional brands begin to use advergames as part of their marketing plan, research will need to continue in order to investigate the how brands can make the most of this new and burgeoning message format.

Conclusion

Advergaming is a new and booming avenue of advertising for brands (Hein, 2006; In-Game Branding, 2006). This study attempted to analyze object change, which is one formal feature of these games that can be varied. As this study shows, these variations can create differences in both explicit and implicit memory effects. Object change was found to have significant effects on explicit memory, which was measured with a recognition test. When asked if they had seen a brand in game play or not, participants were less able to recognize brands in high object change games compared to brands in low object change games. Results from this study indicate those seeking to use brand messaging in advergames need to be careful so as to avoid overloading their games with too many object changes, which can lead to lower recognition of their brand.

Variations in the levels of object change created no significant differences with implicit memory.

Currently, there are a large number of additional brands entering the arena of advergaming. Additionally, game programmers are already changing and altering their

games in attempt to create more meaningful and productive interactions with consumers. As such, there will be a greater need for research to examine how and if the games are providing any return on advertisers investment. This advertising method is currently under researched. However, judging from current market trends, which are continuing to push towards increasing product placements such as advergaming, advergaming should in the future provide fertile ground for researchers. This study provided an examination of one aspect of advergaming that can be controlled by game programmers as they work with advertisers. It is hoped that future researchers can use this study to help guide their research and to provide discussion for future research on this advertising method.

APPENDIX A

Brands/Game Information

Table A1: Brands/Object Change Levels/Web Address at Time of the Experiment

Brand	Object change Levels	Web Address
Big Red	High	http://candystand.com/play.do?id=17869
Gummi Savers	High	http://candystand.com/play.do?id=17849
Orbitz	High	Orbitzgames.com
Skittles	High	http://kewlbox.com/games/GameLaunch.aspx?GameId=8
Winterfresh	High	http://candystand.com/play.do?id=17957
Burger King	Low	http://kewlbox.com/games/GameLaunch.aspx?GameId=212#
Extra	low	http://candystand.com/play.do?id=17832
Juicy Fruit	Low	http://candystand.com/play.do?id=17927
Planters	low	http://www.planters.com/games/gamepage.aspx?GameId=133
Ritz	Low	http://nabiscoworld.com/Games/game_large.aspx?gameid=10003

APPENDIX B

Experimental Orders – Game Play

All participants were randomly assigned to one of 5 orders prior to the experiment. Each experimental order was also randomly assigned an order in which games were to be played.

Table B1: Order of Games Played – Listed by Brand Sponsoring the Game

Game Play Order	Experimental ORDER 1	Experimental ORDER 2	Experimental ORDER 3	Experimental ORDER 4	Experimental ORDER 5
1	Ritz	Burger King	Winterfresh	Sour Skittles	Big Red
2	Big Red	Sour Skittles	Juicy Fruit	Ritz	Planters
3	Burger King	Extra	Gummi Savers	Winterfresh	Gummi Savers
4	Sour Skittles	Orbitz	Planters	Planters	Burger King
5	Juicy Fruit	Ritz	Orbitz	Orbitz	Winterfresh
6	Gummi Savers	Gummi Savers	Ritz	Extra	Ritz
7	Extra	Juicy Fruit	Big Red	Gummi Savers	Orbitz
8	Orbitz	Winterfresh	Burger King	Burger King	Juicy Fruit
9	Planters	Planters	Sour Skittles	Big Red	Sour Skittles
10	Winterfresh	Big Red	Extra	Juicy Fruit	Extra

APPENDIX C

Implicit Memory Test – Word-Fill Task

Based on their randomly assigned experimental order, participants completed one of 5 word-fill tasks. The order of word-fill tasks was randomly assigned to each order. It should be noted that due to experimenter error, orders 2-5 had an extra space added before “_ i g” making the task “_ _ i g”. Additionally, a game for the brand Wrigley’s Spearmint was switched out prior to the experiment for a game for the brand Ritz. The experimenter failed to make the switched on the word-fill tasks. Due to these two errors, only 4 brands at each level of object change were measured via this instrument. The heading of each order as on the following pages is for descriptive purposes only and did not appear on the actual sheet. Instructions were given to participants verbally.

Table C1: Target Word/Brands and Word-Fill Measurement

Brand	Implicit Word-Fill Task Measurement
Gummi Savers	s a _ e _ _
Orbitz	o r _ i _ _
Sour Skittles	s k _ _ _ _ e _
Winterfresh	_ _ n _ _ r _ _ e _ _
Burger King	k _ n _
Extra	_ _ t r _
Juicy Fruit	_ _ u i _
Planters	p _ _ n _ _ r _

Implicit Memory Test – Word-Fill Task (Cont.)

Order 1

1) _ i g

2) s p _ _ r _ _ _ _

3) k _ n _

4) _ _ t r _

5) o r _ i _ _

6) p _ _ n _ _ r _

7) s k _ _ _ _ e _

8) s a _ e _ _

9) _ _ u i _

10) _ _ n _ _ r _ _ e _ _

Implicit Memory Test – Word-Fill Task (Cont.)

Order 2

1) _ _ u i _

2) _ _ i g

3) s k _ _ _ _ e _

4) _ _ t r _

5) s a _ e _ _

6) s p _ _ r _ _ _ _

7) p _ _ n _ _ r _

8) o r _ i _ _

9) _ _ n _ _ r _ _ e _ _

10) k _ n _

Implicit Memory Test – Word-Fill Task (Cont.)

Order 3

1) o r _ i _ _

2) _ _ t r _

3) k _ n _

4) _ _ i g

5) s a _ e _ _

6) p _ _ n _ _ r _

7) s p _ _ r _ _ _ _

8) _ _ u i _

9) s k _ _ _ _ e _

10) _ _ n _ _ r _ _ e _ _

Implicit Memory Test – Word-Fill Task (Cont.)

Order 4

1) _ _ u i _

2) _ _ t r _

3) s p _ _ r _ _ _ _

4) p _ _ n _ _ r _

5) o r _ i _ _ _

6) _ _ n _ _ r _ _ e _ _ _

7) s k _ _ _ _ e _

8) s a _ e _ _ _

9) _ _ i g

10) k _ n _

Implicit Memory Test – Word-Fill Task (Cont.)

Order 5

1) k _ n _

2) p _ _ n _ _ r _

3) s k _ _ _ _ e _

4) _ _ n _ _ r _ _ e _ _

5) _ _ i g

6) o r _ i _ _

7) _ _ t r _

8) s a _ e _ _

9) _ _ u i _

10) s p _ _ r _ _ _ _

APPENDIX D

Explicit Memory Test – Recognition Test

Following the distraction task, participants completed a speeded recognition test on a laptop computer. The test was administered via the Medialab program. The program randomly brought up each recognition question. Participants were administered instructions in which they were told to indicate by clicking on either “yes” or “no” to indicate whether or not they had played a game featuring the brands that would appear onscreen. Below are each of the target brands, along with the foil brands. Brands and Foils appeared in a random order as determined by the Medialab program.

Table D1: Brands and Accompanying Foils

Brand	Foil
Big Red	Cinnaburst
Gummi Savers	Gummi Bears
Orbitz	Travelocity
Sour Skittles	Starburst
Winterfresh	Ice Breakers
Burger King	Dairy Queen
Extra	Trident
Juicy Fruit	Bubble Yum
Planters	Reeses
Ritz	Cheese Its

APPENDIX E

Formulas for Calculating Signal Detection - A' & B''

$$A' = 1/2 + [(H-F)(1+H-F)] / 4H(1-F) \quad \text{If } H \geq F$$

$$B'' = [H(1-H) - F(1-F)] / [H(1-H) + F(1-F)] \quad \text{If } H \geq F$$

H = Hit rate

F = False Alarm

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