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The role of dynamic digital menu boards on consumer decision-making and healthy eating

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The role of dynamic digital menu boards on consumer decision-making and healthy eating

by

Anicia Nicola Peters

A thesis submitted to the graduate faculty in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

Major: Human Computer Interaction

Program of Study Committee:
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Ames, Iowa

2011

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ABSTRACT

The rapid pace of Digital Signage’s technological advancements and price decline over recent years means plasma displays are becoming commonplace in public areas. These displays face the danger of simply being ignored because consumers’ limited capacity means higher selectivity in exerting cognitive effort in an effort to deal with the clutter and subsequent information overload. Companies, such as Intel and Microsoft, have joined the race in trying to find new avenues for the displays to grab and hold consumer attention. Dynamic digital menu boards represent an important type of digital signage that has begun to be deployed in some fast food outlets. These displays combine the power of vibrant video and high-speed Internet to enable remote controlled digital displays at the Point-of-Purchase (POP). Despite the prevalence and ubiquity of these displays, the effect they have on the consumer has received very little attention in the academic literature.

This thesis reports on research designed to examine the role of embedded imagery (i.e., video and still images) in dynamic digital menu boards to influence consumer decision-making. Specifically, this study examines how the vividness of video influenced consumer decision-making and whether consumers could be influenced to make healthier food choices. To achieve this, a 2x2 experimental laboratory study was conducted to investigate the effects of embedded video ads in menus. This study also resulted in the development of a preliminary psychometric measurement tool for the vividness construct.

The results show a main effect for healthy food choices and for video ads, but it failed to show an interaction effect between these two variables. A three-factor vividness construct was derived from an examination of the data.
CHAPTER 1. INTRODUCTION

Flat panel LCDs and plasma screens are becoming ubiquitous in public spaces and retail locations. Most public displays are linked to digital private networks to feed information to the public and are referred to as Digital Signage (Burke, 2009; Dennis, Newman, Michon, Brakus & Wright, 2010). Digital Signage’s popularity can be attributed to low deployment and maintenance costs, plus the ability to control and manage content at the click of a button (Dennis et al., 2010; Müller, Wilmsmann, Exeler, Buzeck, Schmidt, Jay & Krüger, 2009). Digital Signage offers a variety of capabilities, such as gesture-based and mobile-based interactive screens, 3d auto-stereoscopic screens where no 3d glasses are needed for the display, anonymous audience measurement displays where gender, age, race, gaze, and proximity to the screens are monitored (DigitalSignagetoday.com, 2011; Intel, 2009).

Given the rapid advances in Digital Signage, the fast-food industry has welcomed this change, as Digital Signage helps cut costs, increase customer turnaround times, and moves slow-selling stock. Since 1998, fast food outlets, such as Wendy’s, exploited the capabilities of Digital Signage to upgrade their static menu boards to Dynamic Digital Menu Boards (DDMB) or video menu boards (see Figure 1.1); whereby, the content could be updated in-store from a central server (Burke, 2009). DDMB are plasma or LCD screens that integrate static menu text with high quality images, videos, slideshows, animation, and live news feeds, and are used as menu boards, too (The Buzz, 2009).

![Figure 1.1. A dynamic digital menu board at Wendy's](image)

DDMB enable consumers to view food advertisements with similar quality to that seen with HD television (Burke, 2009), although the displays often focus on showing the features and textures of the food in highly detailed videos. For example, typically the images do not show actors or other objects other than detailed portrayals of the food items. Additionally, promotions, news feeds,
weather information, or other content can be coupled with the food displays. Many fast food restaurants now have at least one video display, showing content relevant to the restaurant’s offerings.

1.1 Research Problem

Although fast food stores and restaurant owners might be thrilled with faster turnaround times and higher sales (The Buzz, 2009), the effects this embedded video has on consumer decision-making processes have not been examined in academic literature, yet. In fact, very little academic research exists in the sphere of Digital Signage (Burke, 2009).

One of the effects of the embedded video on DDMB is to capture consumers’ attention through what might be termed a vividness effect. The existence of a vividness effect has been debated often in the literature, but according to Taylor and Thompson (1982) this vividness effect’s existence has not yet been proven conclusively. To determine if the video influences consumer decision-making, this study will need to analyze the reasons videos could cause such a change or influence.

A further problem facing the United States, in particular, is obesity. Obesity in the United States has been linked negatively to fast food consumption and fast food restaurants (Drewnowski & Darmon, 2005). Commercial research and trade reports indicate video ads cause an increase in fast food sales (The Buzz, 2009). While this researcher postulates consumer decision-making will be influenced by the video ads on DDMB, it is also foreseen that consumers might make even more unhealthy food choices. However, by the same token, video food ads on DDMB might also influence consumers to make healthier food choices. This influence will be investigated in this research.

1.2 Research Questions

So, the main question is: if the vividness of videos on DDMB might indeed influence consumer decision-making, can it be used to influence healthier food choices for consumers? To answer this question, this study will investigate three research questions.

1. How are consumer decision-making processes influenced by videos on DDMB?
2. Does a vividness effect exist for videos on DDMB?
3. Can the vividness of videos on DDMB influence consumers to make healthier food choices?
1.3 Interaction Defined

Since this research is conducted in the discipline of Human-Computer Interaction, the interaction part deserves explanation. Interaction between DDMB (computer) and users (human) happens in two different ways. On one hand, the interaction happens between the computer system and humans at the back-end, e.g., interface designers, system administrators and content managers design and manipulate content, display modes, user administration, and physical hardware configuration among others. On the other hand, interaction also happens when consumers view the display content and changes his/her resultant behavior (Peters & Mennecke, 2011). Huang, Kosher and Borchers (2008) defined the second type of interaction as eliciting human action, such as glancing or fixations from the observer via the display. This research will focus on the latter description of interaction, since this human action has an important role in designing future displays and understanding their roles in decision complexity.

1.4 Interdisciplinary Nature of Research

This research is conducted across four disciplines. The discipline of Human Computer-Interaction looks at the interaction effect between the digital displays, and how it alters human behavior and cognition, as well as phenomena surrounding the displays in the environment. This interaction effect then informs future development of digital displays to optimize cognitive resources for humans. The disciplines of Consumer Behavior and Marketing are interested to understand consumer decision-making and behavior to discover new avenues of marketing strategies to reach consumers. Information Systems seeks to develop new theories for management and design of such digital displays, and its information content.
CHAPTER 2. REVIEW OF LITERATURE

2.1 Digital Signage and DDMB Overview

Signage has been around for a very long time. Think back to the earliest days when rock art was used to convey messages and information, or when entertainment-advertising messages were printed on papyrus posters (Mondschein, 2009). Since 1835, large posters were printed to advertise entertainment events and, in 1867, the first leasing of billboards was recorded (Chien, 1990). Neon lightning dominated the signage scene in the U.S. from 1930-1960, especially in Times Square in New York (Van Dulken & Phillips, 2002). In the 1970s, electronics stores selling VCRs and televisions started playing pre-recorded advertisements and announcements on television for their customers (Aranda, 2007). This marked the beginning of Digital Signage, as we know it today. In the 1980s, companies used projection screens and video walls to broadcast to bigger audiences (Stead, 1998) and during this time, large digital billboards appeared next to highways.

In the 1990s, after 40 years in development, plasma display panels became available cheaply and in varying sizes (Weber, 2006). Plasma screens, high speed Internet, inexpensive storage and processing capabilities, as well as the spread of graphics expertise, made conditions ideal for out-of-home networks (Aranda, 2007). Digital Signage then started to appear everywhere as advertising medium on plasma and LCD screens. The displays can be controlled remotely and no expert knowledge is required to manipulate content. They are designed to capture attention with high quality graphics, text, audio, video, live Internet feeds, animated and still images, and are very prevalent in public spaces nowadays.

Fast food restaurants traditionally made use of printed color posters mounted in backlit frames, static menu boards displaying text only, and chalkboards to advertise their menus and specials of the day. However, with the rapid advances in Digital Signage and DDMB in combining the power of television with signage, low deployment and maintenance costs, plus their ability to be controlled centrally and/or remotely with an immediacy of content manipulation, Wendy’s rolled out this new medium for menu boards in their fast food outlets in 2008 (Burke, 2009; The Buzz, 2009).

2.1 Information Overload

In today’s information age (Mason, 1986), the Internet-enabled consumer must make decisions, based on increasing amounts of information. All this information is displayed in different
formats the consumer must interpret/process and make optimal decisions based on it. Bettman, Luce, and Payne (1998) observed information display formats could either aid decisions or increase decision complexity and, thus, are a contributor or inhibitor of information overload. As Digital Signage becomes ubiquitous, consumers are confronted with extraordinary amounts of information outside their homes over which they have no control. Although the amount of information increases, the consumer’s working memory capacity, time, and money remain limited, leading to a situation where information sources compete for processing time. Therefore, the consumer may experience a phenomenon dubbed “information overload” (Bettman, Johnson, & Payne, 1991; Malhotra, 1982; Scammon, 1977).

Eppler and Mengis (2004) defined information overload as “… when too much information affects a person and the person is unable to recognize, understand or handle this amount of information.” An alternative definition is when the consumer has too much information to process within a limited time period because his/her working memory capacity is limited (Bettman, Johnson, & Payne, 1991; Malhotra, 1982; Scammon, 1977).

Consumers manage such a situation of information overload by processing information less in-depth, ignoring less relevant information, taking a longer time to reach a decision, and if they are under time-pressure, they do not make optimal decisions (Eppler & Mengis, 2004; Jacoby, Speller, & Kohn, 1974).

Some coping strategies for information overload were suggested in the literature. Jacoby, Speller, and Kohn (1974) found that one coping strategy is that the consumer devotes either voluntary or involuntary attention to select what information should be processed. Involuntary attention is captured by events in the environment that, according to Bettman, Luce, and Payne (1998), are “… surprising, novel, unexpected, potentially threatening or extremely perceptually salient ….”

This coping strategy is consistent with Müller et al.’s (2009) finding of a “display blindness” effect for Digital Signage, similar to banner blindness for website banner ads. Display blindness occurs when consumers mostly ignore all public displays because they feel overwhelmed by the amount of information (displays) and because they expect the displays to have uninteresting or irrelevant content (Müller et al., 2009). In two studies conducted by Huang, Koster, and Borchers (2008) and Müller et al. (2009), consumers paid more attention to displays when video was playing on the screen than when animated content or slideshows were playing. This suggests that something
more than just imagery movement in video is attracting attention. Nordfält (2010) also stated Digital Signage as a POP device with many colors and movement is an attention-capturing device. The use of audio is also recommended as attention-capturing stimuli (Dennis et al., 2010; Newman et al., 2010; Nordfält, 2010).

A potential for DDMB and the information overload paradigm is the 2010 Health Care Reform Act requires restaurants chains with 20 or more outlets to display fast food’s nutritional information (Rosenbloom, 2010). This new law might force more restaurant and fast food outlet owners to consider using these boards to avoid the cost of updating static information regularly. Displaying the nutritional information next to the food items will not only further increase the information the consumer is exposed, but it will also increase cognitive load as the consumer will need to process this information in addition to the exhaustive lists of food options and price information available to him/her on the DDMB.

From the above overview, it becomes clear that consumer decision-making processes are susceptible to conditions of information overload. Then, the question is whether the vividness of video, as an involuntary attention cue, can reduce information overload and, thus, influence consumer decision-making processes.

2.3 Vividness

The vividness effect has been argued ad infinitum in literature of whether it exists or not (Taylor & Thompson, 1982). Nisbett and Ross (1980, p. 45) stated “information may be described as vivid, that is, as likely to attract and hold our attention and to excite the imagination to the extent that it is a) emotionally interesting, b) concrete and imagery provoking, and c) approximate in a sensory, temporal, or spatial way.” Additionally, Steuer (1992) defined vividness as having a sensory dimension—breadth (color, graphics, etc.), and another dimension—depth (quality of presentation). Steuer (1992) argued that, along with interactivity, vividness is the most important factor needed to create a perception of telepresence in online environments, a feeling of being somewhere when not physically present at that location (Steuer, 1992).

Vividness has been studied differently in various domains and disciplines. In marketing and psychology, it has been studied in the context of advertising in Digital Signage, print media with pictures and text, television, websites, and online advertising, as well as audio with mental imagery
(Babin & Burns, 1997; Bone & Ellen, 1992; Childers, Heckler, & Houston, 1986; Childers & Houston, 1984; Keller & Block, 1997; Kisielius & Sternthal, 1984; Stern, 1988; McGill & Arnard, 1989; Nordfalt, 2010; Sundar & Kim, 2005; Taylor & Thompson, 1982). In technology domains, vividness has been studied mostly in combination with interactivity as two subdimensions of telepresence for websites, e-commerce stores, and other virtual environments (Coyle and Thorson, 2001; Jiang & Benbasat, 2003; Rodgers & Thorson, 2000; Steuer, 1992). In the technological and psychology domains, vividness is also studied in relation to visual attention (Henderson, 1992).

Taylor and Thompson (1982) reviewed several studies for a vividness effect and concluded insufficient evidence that a vividness effect had been observed. Taylor and Thompson (1982) further suggested this absence is attributed to the fact that most studies manipulated only absolute attention by using a between-participants design and manipulating either only vivid or only non-vivid information at a time. Differential attention effects should be investigated by manipulating both vivid and non-vivid material simultaneously, since this is how it is encountered in real-world environments (McGill & Anand, 1989; Smith & Shaffer, 2000; Taylor & Thompson, 1982; Taylor & Woods, 1983).

Stimuli with moving visual images, color and vividness to attract consumers’ attention are processed more often, since people have limited cognitive resources (Li & Bukovac, 1999). Dennis et al. (2010) investigated vividness in mall atmospherics and looked particularly at how the Limited Capacity Model (LCM) by Lang (2000) can be used to predict the effectiveness of vivid moving visual images with Digital Signage as a stimulus. Moving images, such as those on television, may elicit emotional arousal per research based on the limited-capacity theory of television viewing (Lang 1990, 1994). This theory states that certain structural features of television messages, such as cuts, pans, scene changes, pacing, and arousing content automatically elicit orienting responses (OR) in viewers and entail greater involuntary allocation of cognitive resources to encode the message. The end-result of this process typically includes a stronger skin conductance response and a slowing heart rate in viewers (Lang, 1994). This heightened state of physiological response, in turn, mediates the processing, as well as evaluation of media messages (Lang, 1994; Sundar & Kim, 2005). Burke (2009) and Dennis et al. (2010) equated the attention-attracting power of video in Digital Signage with the power of television. Therefore, a psychometric measurement tool for the vividness construct, in terms of the video food ad, will be developed to answer the question on the existence of the vividness effect.
2.4 Consumer Decision-Making

Consumer decision-making has been studied in depth as part of the Consumer Behavior discipline and earliest models capturing consumer decision-making were developed since the 1960s. Kassarjian (1982) called the early models, the “grand models,” which portrayed consumer decision-making as multi-staged, complex, with a logical progression, as can be seen in the Nicosia model (1966), Engel, Kollat and Blackwell (1968), Howard-Seth-model (1969), Frank and Kuehn (1962), Andreason (1965), and Haines (1969) (Erasmus, Boshoff, & Rousseau, 2001; Kassarjian, 1982). Other models were developed by Hansen (1972) and Markin (1968/1974) (Erasmus, Boshoff, & Rousseau, 2001). There are alternative views that not all decisions go through a pre-defined process with decision rules (Olshavsky & Granbois, 1979; Wright, 1975; Hoyer, 1984).

2.4.1 Consumer decision-making stages

Most researchers still generally refer to five basic stages of consumer decision-making—need recognition, information search, alternative evaluation, choice, and outcome evaluation (Engel, Blackheart, & Kollat, 1978; Engel, Blackwell, & Miniard, 1995; Erasmus, Boshoff, & Rousseau, 2001). The stages were later increased in the Engel, Blackwell and Miniard (EBM) 1995 model (see Figure 2.1) to comprise seven steps influenced by environmental influences, individual differences, and psychological processes (Engel, Blackwell, & Miniard, 1995). Engel Blackwell, and Miniard (1995) defined the seven stages—need recognition, search, pre-purchase alternative evaluation, purchase, consumption, post consumption evaluation and divestment.

The EBM model classifies individual differences as consumer resources, knowledge, attitudes, motivation, personality, values, and lifestyle. Environmental influences are culture, social class, personal influence, family, and situation. Finally, psychological processes influence consumer decision-making through information processing, learning, attitude, and behavior change.

Engel, Blackwell, and Miniard (1995) pointed out that not all consumers go through the elaborate decision-making stages, since it depends on the degree of complexity and involvement levels of the purchase. Consumers are further classified as initial, repeat, and habitual (Engel, Blackwell, & Miniard,1995). Initial consumers have never purchased the product or have been to the store before; repeat consumers buy the product or frequents the store on an ad-hoc basis, and can be influenced to buy a different product; and habitual consumers buy the same product or frequents the same store regularly, e.g., brand loyal consumers. The seven stages are described next.
2.4.1.1 Need Recognition

The EBM model describes this stage as when the consumer recognizes or is made aware of a need and activates the search process. There must an arousal factor present to activate the need. This stage is influenced by environmental variables and individual differences.

2.4.1.2 Search

Information processing plays an important role during the external and internal search process, and consists of exposure, attention, comprehension, acceptance, and retention (Engel, Blackwell & Miniard, 1995). Information processing will be discussed in-depth under the Framework in Chapter 3. Consumers scan both the environment and their internal memory to gather information on what options they have available in their consideration set. How much information is sourced from the external environment is dependent on individual differences and environmental factors; for example, how involved is the consumer in the purchase?

2.4.1.3 Pre-purchase Alternatives Evaluation

The various options, gathered during the search stage, are compared against each other to satisfy the need. Consumers use different evaluative criteria to compile their consideration set, such
as price, brand name, motivation, involvement, etc. (Engel, Blackwell, & Miniard, 1995). They use different decision rules or heuristics to consider their options and finally make a choice.

Table 1.1 provides a summary of Bettman, Johnson, and Payne’s (1991) description of choice heuristics used by consumers.

**Table 1.1. Summary of Choice Heuristics (Bettman, Johnson, & Payne, 1991)**

<table>
<thead>
<tr>
<th>Heuristic</th>
<th>Description</th>
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<tr>
<td>Weighted adding strategy:</td>
<td>A weight is assigned to each relevant attribute and its relative importance to the decision-maker. The weight is multiplied by the importance value to derive an overall score. The highest scored attribute wins. This heuristic is compensatory and would rather be used for planned, more complex decisions with sufficient time to execute, and would probably not be used with DDMB decisions.</td>
</tr>
<tr>
<td>Lexicographic strategy:</td>
<td>The consumer selects the most important attribute and places a value on it, then weighs similar attributes of all other alternatives against it. This non-compensatory strategy is most often used when decisions must be simplified (Wright, 1975), and might be applicable to the initial and repeat consumers, when faced with less severe time pressure.</td>
</tr>
<tr>
<td>Satisficing:</td>
<td>The alternatives are considered as they appear against a predetermined cut-off level. Selection occurs for the first alternative meeting the requirement. It is a non-compensatory heuristic. Thus, quite often the order of the product is important for selection. In the DDMB case, when the video information is evaluated and the consumer deems the food items would satisfy his/her hunger or are good enough, it would be ordered; but, if not, then the consumer might visually scan the remainder of the menu board or wait for the next featured item to display. This heuristic might be used by consumers facing severe time constraints or low involvement levels.</td>
</tr>
<tr>
<td>Elimination-by-Aspects (EBA):</td>
<td>Another non-compensatory strategy that involves determining the most important attribute and a predetermined cut-off level. It cycles through all alternatives, eliminating those below the cut-off level. This strategy can be employed by consumers facing moderate time constraints and could be used by the DDMB consumer.</td>
</tr>
<tr>
<td>Equal Weight:</td>
<td>This strategy examines all the alternatives and all their attribute values for each alternative. No weights are assigned for relative importance and attribute values are simply summed to provide a ranking score for the alternative. A compensatory strategy can be used as an accurate simplification strategy (Bettman, Johnson, &amp; Payne, 1991). It is uncertain whether this strategy could be employed with DDMB consumers, unless it is used in a combination form.</td>
</tr>
<tr>
<td>Majority of confirming dimensions:</td>
<td>This compares two alternatives at a time, retaining the alternative with the higher ranked attribute score and compares against a new competitor. It is a compensatory strategy.</td>
</tr>
</tbody>
</table>
Table 1.1 Continued

| Frequency of good and/or bad features: | For this strategy, good and bad features are counted, and a selection based on the score of either. According to Wright (1975), consumers focus on negative attributes elimination and, thus, this strategy would be applicable in such a case. If consumers encounter a negative attribute in the video featured item, they might scan the menu board for an alternative selection or wait for the next featured item. |
| Componential context model: | Simonson and Tversky (1992) suggested this decision heuristic is relational and perceptual in nature. This heuristic can be used where diagonal salient alternatives are present, such as on menu boards. Perhaps it could be used on video-featured items as a choice heuristic – like a recommended choice. |
| Habitual heuristic: | Consumers chooses what they chose the previous time. Consumer do not necessarily go through a set of decision rules, mainly to avoid cognitive load (Wright, 1975). The habitual consumer and the repeat consumer would most likely make use of this heuristic. |
| Affect referral: | Wright (1975) suggested the consumer might recall from memory a previously formed evaluation for each alternative and select the most highly evaluated alternative. The repeat or habitual consumer might make use of this strategy, using the video or menu board as memory cue. |
| Combined heuristics: | Consumers can construct strategies on the fly, as the situation dictates; heuristics can be combined or used in phases. One example is the EBA used quite often with the weighted strategy. |

The interested reader is also referred to Engel, Blackwell, and Miniard (1995) for some additional rules suggested.

As mentioned previously, there are alternative views that not all decisions go through a pre-defined process with decision rules; whereas, other decisions rely on prior knowledge (Hoyer, 1984; Olshavsky & Granbois, 1979; Wright, 1975) like habitual or common repeat purchases. Burke (1990) argued that consumers use alternative consumer decision-making strategies, if they are faced with missing information. Chhabra and Olshavsky (1986) proposed that consumers use so-called “scripts”—previous experiences in decision-making retrieved from memory. Bettman, Johnson, and Payne (1991) proposed that consumers might have the heuristics rules stored in memory and can invoke them in their entirety or develop new heuristics as fragments from the stored rules when needed. The types of decision heuristics are very much dependent on the individual and the context environment in which decisions are taken (Wright, 1975).
Another factor to consider during this stage is decision complexity, which will influence how large the consideration set is and which decision rules will be invoked. Decision complexity is defined in terms of problem size, time pressure, and information format. Engel, Blackwell, and Miniard (1995) considered these as situational factors.

**Problem Size:** Problem size can be described in terms of the number of alternatives to evaluate within the available time, information load, purchase importance, and involvement levels of the consumer. When a novice consumer is faced with a DDMB and must make a decision under severe time pressure, s/he might experience a condition similar to information overload. This researcher suggests the most perceptually salient cue, the video in this case, would capture selective attention (either voluntary or involuntary) and if the featured video item would conform to the consumers’ goals, such as price, healthy eating, etc., the consumer will not evaluate any other items. If however, the consumer does not opt for the item, then alternatives are evaluated from other items on the menu board. Since the number of alternatives has increased, but the consumer remains under time pressure, noncompensatory decision strategies to eliminate alternatives will be used (Bettmann, Luce, & Payne, 1998).

Another information source, which might also contribute to information overload, is sensory information (Malhotra, 1984). According to Peck and Childers (2008), each of the primary human senses is potentially important for information processing. Consumers at the POP are faced with sensory information like the aromas of food (olfactory system), auditory cues like knives and forks against plates, sizzling meat (auditory system), and visual stimuli, such as the video or prepared food on display (visual system). In turn, these can stimulate psychological and physical responses, such as salivating or hunger pangs, much like in the classical conditioning experiment where visual imagery was used to create positive associations with a brand (Shrimp, Stuart, & Engle, 1991). Under these conditions of information overload, the consumer might very well use non-compensatory heuristics like satisficing.

Another factor that might impact problem size is information control. Typically, consumers would have no information control over content featured on DDMB. Low information control can increase cognitive load (Hansen, 2005) and, thus, increase information overload. Consumers might need to wait for the video to loop through several video items or wait until the beginning of a particular segment. This might slow down the decision process, as alternatives can only be evaluated once the video item is seen.
Problem difficulty is further increased or reduced by the involvement levels of the consumer. Under conditions of low involvement, consumers might not wish to expend much cognitive efforts (Hoyer, 1984) and might settle for the first best option featured in the video or something they had eaten previously. Likewise, high involvement consumers might evaluate all alternatives fully and completely.

**Time Pressure:** Consumers would adapt their decision strategies according to the amount of time they have for the decision (Bettman, Luce, & Payne, 1998). Moderate time pressure allows for each item of information to be processed more rapidly; whereas, more severe time pressure accelerates the process, increases selectivity, and decision strategies are changed to more attribute-based processing (Bettman, Luce, & Payne, 1998). Severe time pressure causes selectivity, but consumers would examine at least some information from each alternative, rather than limited in-depth examinations (Bettman, Luce, & Payne, 1998; Wright, 1975). Wright (1975) also found that consumers tend to use the negativity bias and eliminate alternatives accordingly.

Consumers might feel pressured when waiting their turn in a line with people standing behind them, when facing the sales staff at the POP counter, or they might simply feel very hungry. Depending on the type of consumer, this time pressure could contribute to decision complexity and different decision strategies will be deployed. The video ad might catch the attention of the consumer (whether voluntary or involuntary) and alternatives on the menu board might be weighed against this. If under severe pressure, negative weighting of alternatives might imply the consumer first evaluates the video ad for negative information, such as nutritional content, e.g., “I do not feel like eating chicken,” etc. and then compares alternatives during a quick visual scan of the menu board.

**Information format:** Bettman, Johnson, and Payne (1991) and Bettman, Luce, and Payne (1998) found the more complex the information is structured on the display, the heavier the cognitive load, since consumers need to process the information. On DDMB, the consumer views the information simultaneously and in a list-type format, which should make decisions slightly easier than sequential formats (Bettman, Johnson, & Payne, 1991). DDMB can trigger stimulus-based decisions where all information is externally available on the board, memory-based decisions where information is retrieved from memory, and also mixed decisions, i.e., information is retrieved from memory and externally to inform the decision (Lynch & Scrull, 1982). Both types of decisions are prevalent. The stimulus-based and mix decisions are more prevalent with DDMB where information
stored in memory is complemented by external memory as decision aids, depending on the type of consumer.

Traditional menu boards often display multiple information in a list format with some menu items accompanied by its image and corresponding price. Oftentimes, boards might be cluttered with too much information displayed (Jansson, Marlow, & Bristow, 2004). Colors, images, and placement positions, as well as varying font styles can also be used to declutter boards, i.e., to simplify or visually reorganize items on the menu board (Huang, Koster, & Borchers, 2008; Jansson, Marlow, & Bristow, 2004). Just like in Jansson, Marlow, and Bristow’s (2004) study of optimal screen target placement positions, designers of the DDMB should pay attention to where the video is placed on the board. Placing the video in central view of the consumer when standing in front of the POP makes it optimum to capture and hold the consumer’s selective attention. When the consumer wanders in or waits in line, other videos and animations placed in the peripheral field vision of the consumer might cause consumers to direct their gazes in the direction of the movement and pay attention to the display (Müller et al., 2009).

Another factor relevant for selectivity is the video should be task relevant (Burke, 2009; Müller et al., 2009). Videos playing food advertisements can be considered as task relevant, but sometimes news-related videos on DDMD are also played. As videos are placed in a loop, its timing and the number of videos displayed within a loop is central to attract the consumer’s attention when wandering in the store during the beginning, middle, or end of the message. Placement of video boards and display sizes are also factors featured under information display complexity. Burke (2009), Huang, Koster, and Borchers (2008), and Müller et al. (2009) found that if displays were not in the line of sight of the consumer, it would not attract their attention. Displays are also ignored if they are not placed at eye-level (Huang, Koster, & Borchers, 2008). Huang, Koster, and Borchers (2008) found that people are generally more attracted to videos than to animations and text.

2.4.1.4 Purchase

This stage means the consumer acquires the best choice among the alternatives. Engel, Blackwell, and Miniard (1995) warn this stage is not automatic and can be aborted or delayed by factors, such as changed motivations, changed circumstances, new information, and when desired, alternatives are no longer available.
2.4.1.5 Consumption
How consumers consume purchased goods. The importance thereof for future product modification is the goal of this stage.

2.4.1.6 Post Purchase Alternative Evaluation
This stage considers the evaluation of the purchased product against expectations. The outcome of this stage is also critical for future purchases, since this evaluation of the product is stored in memory for future retrieval. In case of the video ads for DDMB, this stage is also important as a discrepancy between the image of the food in the video ad versus how the food actually looked and tasted will result in dissatisfaction and possible negative attitude towards the video ads.

2.4.1.7 Divestment
Divestment refers to the various disposal options the consumer has, such as outright disposal, recycling or remarking (Engel, Blackwell, & Miniard, 1995). In the case of fast food restaurants, another disposal option is that consumers can take the remaining food home for later consumption or feed the dog.
CHAPTER 3. FRAMEWORK

To derive a research model and hypotheses, this study will look at the five stages in consumer decision-making (i.e., need recognition, search, alternatives evaluation, purchase, and consumption) (Engel, Blackwell, & Miniard, 1995; Erasmus, Boshoff, & Rousseau, 2001). However, other variables will also be considered, such as type of consumer, situational factors, relevance of ad, personal preference, motivation, personal preference, information overload, and display layout conditions.

Situational factors also impact the decision-making process. Such factors might include whether it is a family/friend’s decision, and how many friends or family members are involved in the decision, motivational goals, cultural considerations, involvement levels, or monetary resources available, information display formats, and time pressures.

It is also useful to classify three broad categories of consumers—habitual, repeat, and novice (initial)—as described by Engel, Blackwell, and Miniard (1995). Because it was difficult to examine all three types of consumers for this research, an item measuring habitual choice was included.

3.1 Hypotheses

To derive the hypotheses, it is useful to present them in the context of the five basic consumer decision-making stages offered by Engel, Blackwell, and Kollat (1978).

Need Recognition Stage: For the purposes of this thesis, the consumer has already recognized the need to buy food or drink, and is standing in line, money in hand at the POP, so the need recognition stage will not be considered.

Search stage: In this iteration, the search process might vary, depending on the type of consumer and his/her particular goals. The search for alternatives is limited to the display boards and internal memory, and is dependent on goals, time, monetary resources, and sensory information. Information processing, comprising of exposure, attention, comprehension, acceptance, and retention, is crucial in the search stage (Engel, Blackwell, & Miniard, 1995). Consumers will be exposed to the video ad, while they stand at the POP and have no choice but to look at the DDMB. DDMB are often cluttered with too much information in the form of text, graphics, colors, etc., and may overwhelm consumers so they exercise selective attention. The video will most likely attract attention, due to its
vividness. Vividness is considered a multidimensional construct and Babin and Burns (1998) as well as Bone and Ellen (1992) used several measurement items to identify and define vividness such as color, movement, lifelikeness, intense, sharp, etc. In this study, movement of imagery was relied upon as the primary mode of enabling a vivid display, i.e. the video images were not more colorful or more lifelike than the static images. However, the manipulation of movement was an important distinguishing feature for identifying the vividness aspect of the display.

The video could be analyzed and compared against prior knowledge or experiences stored in memory, but since different video ads in a loop are short in duration and sequentially, it is more than likely to hold the customer’s attention and, thus, comprehension and acceptance might take place as consumers cannot screen out the video completely. As far as retention of video imagery is concerned, it is hypothesized the vividness of the video will make the ads very memorable as a future influencer. For this stage, the following hypotheses include:

\[ H1: \text{A video in a dynamic digital menu board will draw more attention than an image in a static menu board.} \]

\[ H1a: \text{Moving imagery via video in a dynamic digital menu board will be more salient than an image in a static menu board.} \]

**Evaluation of alternatives:** During this phase, alternatives are evaluated, based on available information the consumer has at hand. Bettman, Luce, and Payne (1998) and Bettman, Johnson, and Payne (1991) have proposed several variables that play a role in decision complexity and alternative evaluation, namely—problem size, time pressure, attribute correlation, completeness of information, information format, and comparable versus noncomparable choice. This research will analyze alternative evaluations according to some of these factors. Therefore, the following hypotheses are proposed:

\[ H2: \text{The video in a dynamic digital menu board will lead to the evaluation of fewer alternatives than an image in a static menu board.} \]

\[ H2a: \text{The video in a dynamic digital menu board will reduce the consumer’s perception of decision complexity more than an image in a static menu board.} \]
H2b: The video in a dynamic digital menu board will lead to higher levels of involvement than an image in a static menu board.

Choice/Purchase: Past research shows the same individual may use a variety of different strategies when making decisions. Such strategies are dependent on the prevailing situation (Bettman, Johnson, & Payne, 1991; Bettman, Luce, & Payne, 1998; Olshavsky & Granbois, 1979). Choice complexity is influenced by a number of factors, such as number of alternatives and attributes, processing difficulty, uncertainty, small shared attribute sets, the decision problem, characteristics of the person, and the social context, such as family decision-making versus individual choices (Bettman, Johnson, & Payne, 1991). Therefore, the following hypotheses are proposed.

H3: The video in a dynamic digital menu board will become a reference heuristic for decisions more than an image in a static menu board.

H3a: The availability bias of the video in a dynamic digital menu board will increase the likelihood of the featured item being purchased more than an image in a static menu board.

H3b: The persuasiveness of the video in a dynamic digital menu board will increase the likelihood of the featured item being purchased more than an image in a static menu board.

Outcomes/Post-purchase alternative evaluation: A positive evaluation between the food advertised in the video ad and the actual product will result in a memorable experience (retention during information processing). This memory might be triggered if the consumer searches for food on a different occasion or searches for a place to eat during the need recognition stage. Since no actual food items would be consumed, no hypotheses can be derived and tested for the outcomes stage.

3.2 Vividness Construct

Considering consumer information processing and information format, in particular, the video ad and its vividness effect, play a big role in the search stage, it is also necessary to investigate the vividness construct. Vividness in the context of this thesis is defined as the ability of the video ad on DDMB to attract and hold consumers’ attention. The video ad contains enough attention capturing
ability and salience because it is related to hedonic purchases, is task-centered (food ad), at the POP (Burke, 2009), and possesses sufficient distinctiveness, and the uniqueness of moving imagery, which cause it stand out in the visual field (Gati & Tversky, 1987; Nairne et al., 1997). It is also important for the DDMB to be in the line of sight for the consumer, otherwise it will not attract attention (Burke, 2009; Huang, Koster, & Borchers, 2008; Müller et al., 2009). The video ad should be related to the task at hand, i.e., it should show a food ad available in the restaurant and not something unrelated, such as news or weather (Burke, 2009).

3.3 Research Model

Based on the hypotheses derived previously, a research model is proposed in Figure 3.1. The research model summarizes the five stages and the hypothesized influences of the video ad on DDMB. This model served as the guide to develop the individual measurement items that made up the dependent variables in this experimental study.

Figure 3.1 Proposed Research Model
CHAPTER 4. METHODS

4.1 Study Design

This chapter describes the study design of an experimental laboratory study that was conducted to test the hypotheses and develop a psychometric tool for the vividness construct.

4.1.1 Experimental Design

A factorial 2 x 2 study was completed with independent variables—health condition (healthy, unhealthy) and visuals (video, static). The static condition was the control group—none of the images moved. A menu board was simulated in the study (see Figure 4.1). The menu consisted of pictures of two unhealthy items (salty: chips; sweet: cookies) and two healthy items (salty: peanuts; sweet: raisins) and eight additional items (12 total text items) displayed in plain text. The video condition either had moving images of chips (unhealthy condition) or peanuts (healthy condition). The healthy/unhealthy condition was assigned, based on subjects’ rating during a pilot study.

![Figure 4.1 Menu board simulation during study](image)

4.1.2 Subjects

Subjects were either marketing or management students at a large Midwestern university, who signed up for the study via a website and received research credit for participation. Subjects were undergraduate students with an average age of 18-22. A total of 134 subjects (129 valid cases: 51 (39.5%) male and 78 (60.5%) female) participated in this study with 32 subjects per static visual cells, 34 subjects in the video healthy condition, and 36 subjects in the video unhealthy condition. Subjects were randomly assigned to one of four treatment groups. However, this study was run in 30-minute segments. Those subjects, who signed up for a particular time period, were assigned to the
same health condition and visual, but with randomization of visuals placement. This study took 15-25 minutes to complete, depending upon the speed the subject worked, but overall time was limited to 30 minutes. The cells were randomized to time of day to control for hunger at certain times of the day.

4.1.3 Visuals

All images were of the same dimensions, same background color, and items were also of similar colors. The images were randomized in placement, i.e., the same image was placed top left, top right, bottom left, bottom right and subjects were randomly assigned to the condition. The movement of the images was effected, using what is popularly called the “Ken Burns effect,” which involves a panning and zooming image movement that offers an appearance suggesting the object is moving. Serving sizes were also standardized on the same size. This was achieved to avoid any bias based on color, size, movement, serving size, or placement for any of the items.

Introductory visuals were displayed prior to proceeding to the study’s menu board. The introductory visuals were displayed to familiarize the subjects with both moving and static images on the same display. Introductory visuals consisted of abstract images of lights and raindrops, one image remained static and three images moved in sequence (see Figure 4.2). The images were displayed on a computer monitor from the time subjects entered the experiment room, until the subjects were instructed to touch the keyboard and begin the study. The room had several computers placed on desks next to each other and behind each other. Subjects were instructed to leave one space between themselves and the next person. Multiple subjects completed the study during the various timeslots. Prior to the start of the session, the visuals were loaded onto each computer. The visuals were presented using Microsoft Powerpoint.

![Figure 4.2 Pre-study visuals](image-url)
4.1.4 Procedure

Subjects were invited into the room and asked to take a seat at any computer, but not touch the computer’s keyboard or mouse because the introductory visuals were playing on the computer. After attendance was taken, instructions were provided to the subjects to complete their informed consent forms. Then, the subject could touch the right arrow key on the keyboard to advance the introductory slide. Subjects’ screens then displayed a message to read the instructions sheet turned face down in front of their computer screen. The instruction sheet asked them to choose an item to eat on the next slide and then complete the questionnaire. Subjects were then provided an opportunity to inspect the menu board for 20 seconds. Following this, a slide appeared with a website link. Next, subjects were instructed to click on the website link to complete the questionnaire.

4.1.5 Measures

The questionnaire was delivered to subjects using Qualtrics. Most items were measured on a 7-point Likert-type scale. A full version of the questionnaire is attached in Appendix A.

- The first question asked subjects to choose a food item to eat from the previously displayed menu board visual.
- A 29-item question measured the study’s hypotheses, information load, habitual choice, and perception of healthy choice. All items were self-generated, except two items taken from the Cognitive Absorption scale by Agarwal and Karahanna (2000).
- A 50-item question measured the vividness construct with a combination of self-generated items and items from previous scales. The original scales are attached to indicate which items were retained (see Annexure I). The items from previous scales include:
  - Three items from the Ad Message Involvement scale from Ha (1996).
  - Six items from the vividness scale from Bone and Ellen (1992) and Miller and Marks (1992) (two items overlapped with Babin and Burns’ scale).
  - Ten items from the vividness scale from Babin and Burns (1998).
- A 17-item scale adapted from a 20-item flow scale measuring telepresence (Agarwal & Karahanna, 2000)
- A 10-item social desirability scale from Crowne and Marlowe (1960)
- A health perception scale, a price reference scale, and a demographics section completed the instrument.
• Demographic and general questions were about subjects’ age, gender, and place of permanent residence.
• Questions were also asked about whether they had seen a DDMB before and whether they considered themselves health conscious.

4.1.6 Pilot study

A pilot study, to test the display of visuals, was completed beforehand with subjects from Management Information Systems (video unhealthy: 30; static unhealthy: 16; and video healthy: 16). Visuals consisted of only images and no text. However, this researcher soon realized the information load was insufficient to generate perceptions of overload. Images included almonds, chips, cookies, and raisins. The image of cookies showed chocolate chips and each item had a unique serving size. The chocolate chip cookies were selected by 50% of subjects during each condition, which led the researcher to conclude the chocolate, coupled with a smaller serving size, led to this outcome. In the actual study, the image of cookies was changed so the cookies included no chocolate chips, and all serving sizes were controlled. This researcher also realized that more plain text should be included on the display to add clutter to the menu board. Therefore, an increase in the information load for subjects to process was realized (i.e., this made it more similar to real-life menu boards).

The pilot study also provided a baseline of what items subjects rated as healthy. Subjects were asked to rate a list of items on a seven-point likert scale. The list of items was included in the final menu visuals for the study.
CHAPTER 5. RESULTS

5.1. Data Analysis

This chapter will report on the results of hypothesis testing as well the psychometric measurement instrument for the vividness construct.

Data collected from the questionnaires were used to test the research model and its hypotheses. Additionally, they were used to construct and evaluate a measurement scale for the vividness construct.

Data were analyzed utilizing the statistics package, SPSS version 19. The four cells’ data were merged into one file with IDs assigned to the independent variables—health condition (healthy 1, unhealthy 2) and visuals (video 1, static 2). All items and item groups were tested for reliability and subjected to a Principal Components Analysis (PCA) with Varimax rotation to examine factor structures and ensure uni-dimensionality. ANOVAs were then conducted for each composite of dependent variables to examine each set of hypotheses. Some items were reverse scored—Q2_4; Q2_6; Q2_8; Q3_13; Q3_22; Q3_35; Q4_7; Q4_14.

134 subjects across 4 treatment cells participated in the study. Table 5.1. summarizes the distribution of subjects in each of the treatment conditions.

<table>
<thead>
<tr>
<th>Health Condition</th>
<th>Static (Control)</th>
<th>Video (Treated)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy</td>
<td>32</td>
<td>34</td>
<td>66</td>
</tr>
<tr>
<td>Unhealthy</td>
<td>32</td>
<td>36</td>
<td>68</td>
</tr>
<tr>
<td>Total</td>
<td>64</td>
<td>70</td>
<td>134</td>
</tr>
</tbody>
</table>

5.1.1 Hypothesis testing

Research model and hypotheses

An ANOVA (see Tables 5.2 and 5.3 for a summary of the results and items) was utilized for hypotheses testing. The study was a 2 x 2 factorial design with two independent variables, visuals and health condition, and 28 dependent variables. In the end, 24 measurement items were
used in the ANOVAs to test the entire model and the various hypotheses. Dependent variables were pre-grouped according to the various hypotheses. Factor and reliability analysis were completed on these hypotheses groups to determine inter-item reliability because most items were self-generated. Factor structures were also examined to ensure hypothesis groups were uni-dimensional. It was necessary to consider Cronbach’s alpha for all hypotheses groups, since most items were self-generated. Cronbach’s alpha ($\alpha$) scores should exceed .7 to provide good inter-item reliability, but scores of .6 have been accepted for social science studies (Cortina, 1993).

Some items were included in the questionnaire to measure different effects on the dependent variables and some items were used as covariates in the analysis. The ANOVAs were completed with and without covariates to assess the impact on the interaction effect and power of the hypotheses groups (Hair, Black, Babin, Anderson & Tatham, 2006).

Additional items tested as covariates:

- Q2_1: Time was too short to make a selection. (time - covariate)
- Q2_28: I usually choose something similar to what I chose today. (habit - covariate)
- Gender (Q9), age (Q8), health consciousness (Q12), and information load (Q2_2) were also tested as covariates against all hypotheses. Neither showed any significance for this study. Therefore, they were not included in the analysis.

Characteristics and assumptions of the data:

1. The group sizes of 32, 32, 34, and 36 exceeded the number of dependent variables (28) and were nearly equal. Therefore, the ANOVA is robust against normality violations and homogeneity of variance.

2. Independence of observations: because subjects were randomly selected into four treatment groups, independence of observations is assumed.

3. Outliers: several outliers were detected and investigated, to ascertain whether they were also multivariate outliers. Outlier scores were calculated as Mahalonobian distances and one outlier was identified as being very influential in the scores. This influential outlier variable was deleted from the analysis.
4. Correlation of dependent variables: no correlations above .9 were detected, indicating that multi-collinearity was not a problem.

This researcher began the ANOVA by testing dependent variables per hypothesis. Thereafter, all variables were tested in the combined hypothesis group, e.g., H1 combined consisted of all variables in H1 and H1a (see Table 5.2). Finally, all the dependent variables in the entire model were tested to arrive at an overall conclusion. The ANOVA results are reflected in Table 5.3.

**Environmental and Individual Variables**

**Information Overload:** Subjects did not experience feelings of information overload (Q2_1 & Q2_2). Seventy-three percent (73%) indicated they did not believe the information was too much and 63% did not believe that the time was too short to make a selection. These percentages were derived by adding together all disagreement scores (completely disagree, disagree, somewhat disagree).

**Type of consumer (habitual):** Items Q2_28 and Q2_29 measured whether consumers usually choose the items they chose (64% agreed) or whether they usually like to eat the items they chose (83%) agreed.

**Perceptions of health consciousness:** Subjects rated raisins and peanuts to be very healthy (5.76/7 and 5.38/7); whereas, chips and cookies (1.91/7 and 2.30/7) were rated as unhealthy. These four items were included among 12 items and rated on a 7-point Likert-type scale.

The majority of subjects indicated they considered themselves as health conscious (Q8)—63% agreeing, 20% were uncertain, and 17% disagreeing. Subjects were also asked whether they perceived they chose a healthy option (Q2_27)—44% disagreed and 49% agreed, about 7% were uncertain. Of the items rated as healthy, 48.1% were selected, including popcorn, which had a borderline rating of 3.38/7. This percentage agreed with the perception of subjects they chose a healthy item (49%).
Table 5.2. List of hypotheses and their dependent variables.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Hypothesis</th>
<th>Dependent Variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Search</td>
<td>H1: A video in a dynamic digital menu board will draw more attention than an image in a static menu board.</td>
<td>Q2_3, Q2_4, Q2_5, Q2_6, Q2_7</td>
<td>I noticed the video food ad immediately. I did not see the video food ad at all. The video food ad attracted my attention. It was easy to ignore the video food ad. When I looked at the video food ad, I wondered what would come next.</td>
</tr>
<tr>
<td>H1a: Moving imagery via video in a dynamic digital menu board will be more salient than an image in a static menu board.</td>
<td>Q3_12, Q3_15, Q3_16, Q3_17, Q3_18</td>
<td>The brightness of the video food ad attracted my attention. The motion of the video food ad attracted my attention. The colors of the video food ad attracted my attention. The lifelikeness of the video food ad attracted my attention. The liveliness of the video food ad attracted my attention.</td>
<td></td>
</tr>
<tr>
<td>Alternatives Evaluation</td>
<td>H2: The video in a dynamic digital menu board will lead to the evaluation of fewer alternatives than an image in a static menu board.</td>
<td>Q2_10, Q2_11</td>
<td>The video food ad made it easy to compare choices. The video food ad made deciding what to eat easier.</td>
</tr>
<tr>
<td>H2a: The video in a dynamic digital menu board will reduce the consumer’s perception of decision complexity more than an image in a static menu board.</td>
<td>Q2_12, Q2_23</td>
<td>It was difficult to decide what to choose. I played around with several choices before settling on a final decision.</td>
<td></td>
</tr>
<tr>
<td>H2b: The video in a dynamic digital menu board will lead to higher levels of involvement than an image in a static menu board.</td>
<td>Q2_13, Q2_14</td>
<td>I imagined what it would be like to eat the item shown in the video food ad. I found the video food ad very interesting.</td>
<td></td>
</tr>
<tr>
<td>Choice / Purchase</td>
<td>H3: The video in a dynamic digital menu board will become a reference heuristic for decisions more than an image in a static menu board.</td>
<td>Q2_15, Q2_17</td>
<td>I compared the other items against the item in the video food ad. I waited for the video food ad to finish to see what was next.</td>
</tr>
<tr>
<td>H3a: The availability bias of the video in a dynamic digital menu board will increase the likelihood of the featured item being purchased more than an image in a static menu board.</td>
<td>Q2_19, Q2_26</td>
<td>When I had to write down my choice, I knew what I wanted. I feel happy about my final selection.</td>
<td></td>
</tr>
<tr>
<td>H3b: The persuasiveness of the video in a dynamic digital menu board will increase the likelihood of the featured item being purchased more than an image in a static menu board.</td>
<td>Q2_18, Q2_20, Q2_22, Q2_25</td>
<td>I decided to choose the item featured in the video food ad. When I had to write down my choice, I chose the item in the video food ad. It seemed like a good idea to choose what was shown in the video food ad. The video food ad influenced my decision.</td>
<td></td>
</tr>
</tbody>
</table>

Independent variables: Visuals (video/static); Static (healthy/unhealthy)
Table 5.3 Results of the ANOVAs

<table>
<thead>
<tr>
<th>Stage</th>
<th>Hypothesis</th>
<th>Items</th>
<th>Covariate</th>
<th>Significance</th>
<th>$\eta^2$</th>
<th>Power</th>
<th>$R^2$</th>
<th>Main Effects</th>
<th>Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Search</td>
<td>H1</td>
<td>Q2_3,4,5,6,7 ((\alpha=.777))</td>
<td>Q2_28</td>
<td>Q2_28: .006</td>
<td>Visuals: .008 Health: .053 VxH: .850</td>
<td>.059</td>
<td>.799</td>
<td>.604</td>
<td>Visuals</td>
</tr>
<tr>
<td>H1a</td>
<td>Q3_12,15,16,17,18 ((\alpha=.936))</td>
<td>Q2_28</td>
<td>Q2_28: .006</td>
<td>Visuals: .000 Health: .005 VxH: .189</td>
<td>.059</td>
<td>.798</td>
<td>.230</td>
<td>Visuals</td>
<td>Health</td>
</tr>
<tr>
<td>Combined</td>
<td>Q2_3,4,5,6,7,Q3_12,15,16,17,18 ((\alpha=.901))</td>
<td>Q2_28</td>
<td>Q2_28: .002</td>
<td>Visuals: .000 Health: .007 VxH: .495</td>
<td>.074</td>
<td>.884</td>
<td>.224</td>
<td>Visuals</td>
<td>Health</td>
</tr>
<tr>
<td>Alternatives Evaluation</td>
<td>H2</td>
<td>Q2_10,11 ((\alpha=.884))</td>
<td>Q2_28</td>
<td>Q2_28: .006</td>
<td>Visuals: .315 Health: .088 VxH: .381</td>
<td>.058</td>
<td>.786</td>
<td>.088</td>
<td>None</td>
</tr>
<tr>
<td>H2a</td>
<td>Q2_12,23 ((\alpha=.469))</td>
<td>None</td>
<td>Visuals: .581 Health: .940 VxH: .988</td>
<td>.002</td>
<td>.085</td>
<td>.002</td>
<td>None</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>H2b</td>
<td>Q2_13,14 ((\alpha=.647))</td>
<td>Q2_28</td>
<td>Q2_28: .024</td>
<td>Visuals: .007 Health: .956 VxH: .753</td>
<td>.040</td>
<td>.618</td>
<td>.101</td>
<td>Visuals</td>
<td>No</td>
</tr>
<tr>
<td>Combined</td>
<td>Q2_10,11,12,13,14,23 ((\alpha=.696))</td>
<td>Q2_28</td>
<td>Q2_28: .008</td>
<td>Visuals: .341 Health: .418 VxH: .791</td>
<td>.055</td>
<td>.763</td>
<td>.071</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>Choice/ Purchase</td>
<td>H3</td>
<td>Q2_15, 17 ((\alpha=.688))</td>
<td>None</td>
<td>Visuals: .118 Health: .057 VxH: .524</td>
<td>.019</td>
<td>.345</td>
<td>.049</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>H3a</td>
<td>Q2_19,26</td>
<td>Q2_1</td>
<td>Q2_28: .024</td>
<td>Visuals: .000 Health: .133 VxH: .245</td>
<td>.040</td>
<td>.622</td>
<td>.173</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>H3b</td>
<td>Q2_18,20,22,25 ((\alpha=.879))</td>
<td>None</td>
<td>Visuals: .007 Health: .014 VxH: .172</td>
<td>.055</td>
<td>.769</td>
<td>.111</td>
<td>Visuals</td>
<td>Health</td>
<td>No</td>
</tr>
<tr>
<td>Combined</td>
<td>Q2_15, 17,18,20,22,25 ((\alpha=.696))</td>
<td>None</td>
<td>Visuals: .020 Health: .017 VxH: .366</td>
<td>.042</td>
<td>.650</td>
<td>.026</td>
<td>Visuals</td>
<td>Health</td>
<td>No</td>
</tr>
<tr>
<td>Full model</td>
<td>Q2_3,4,5,6,7,10,11,12,13,14,15,17,18,20,22,23,25,Q3_12,15,16,17,18 ((\alpha=.760))</td>
<td>Q2_28</td>
<td>Q2_28: .009</td>
<td>Visuals: .003 Health: .013 VxH: .959</td>
<td>.053</td>
<td>.751</td>
<td>.167</td>
<td>Visuals</td>
<td>Health</td>
</tr>
</tbody>
</table>

Independent Variables: V= Visuals (1 Video, 2 Static); H=Health Condition (1 Healthy, 2 Unhealthy)
VxHC: Interaction between Visuals and Health Condition. Covariates: Q2_1: “Time was too short to make a selection”; Q2_28: “I usually choose something similar to what I chose today.”
5.1.2 Vividness Construct

Operationalization

This study followed six of the iterative 8-step scale development model that Churchill (1979) proposed (see Figure 5.1). The six steps were construct domain, generate sample of items, collect data, purify the measure, recollect data, and assess reliability.

Figure 5.1 Iterative 8-step scale development model proposed by Churchill (1978)

Item 1: Construct Domain

To define the construct and its domain, first consider a definition and then the measurable indicators. In defining the concept, consider the theory as discussed in the literature review, as well as two more definitions from an online dictionary and a Webster’s dictionary. Nisbett and Ross (1980) stated that vivid information attracts and holds people’s attention, and the online dictionary Vocabulary.com defines vividness as “the power of attracting or holding one’s attention (because it is unusual or exciting)”.

The Merriam Webster’s Collegiate Dictionary (tenth edition) defined the term vivid as:
1. Having the appearance of vigorous life or freshness; lively.
2. Of a color: very strong: very high in chroma.
3. Producing a very strong or clear impression on the senses: sharp intense: producing distinct mental images.
4. Acting clearly and vigorously.

Based on these definitions, the construct is then defined as:

*Vividness of video ads in dynamic digital menu boards refers to the stimuli's capability to capture and hold one's attention.*

The domain of the construct deals mostly with video food ads on DDMB, and its attention attracting and attention holding capabilities. Persuasiveness to purchase items is also included in this domain.

**Step 2: Generate Sample of Items**

Fifty items to test the vividness scale were generated from theory and partially from existing vividness scales. Six items were included from the Bone and Ellen (1992), and Miller and Marks (1992) vividness scale; ten items came from the Babin and Burns (1998) scale, and three items from Ha (1996) Ad Message Involvement Scale (see Appendix B). Additional scales were also included—17 items from the 20-item, five dimensional Cognitive Absorption Scale (Agarwal & Karahanna, 2000), and the 13-item Marlowe-Crowne Social Desirability Bias (1960) scale. Telepresence has been captured through the flow items of the Cognitive Absorption Scale (Agarwal & Karahanna, 2000).

To check for content validity, this researcher considered the literature and previous scales. The assessment is the items (see Annexure A) sufficiently tap the construct’s domain. First, in terms of Steuer’s (1992) construct definition of vividness, the generated items can be split into two subdimensions—breadth (dimension items: color, clarity, lifelike, moving, graphic, intense, concreteness) and depth (dimension items: senses: attention capturing, attention holding, attention attracting, ease of recall, engaging (visual and audio), different).

Second, considering Nisbett and Ross’ (1980) definition, the items could be split into at least three dimensions 1) emotionally interesting, 2) concrete and imagery provoking, and 3) approximate in a sensory, temporal, or spatial way. However, a face validity check revealed the construct can be split into four dimensions—attention-capturing, emotional involvement, sensory involvement, and
persuasiveness. The attention-capturing dimension might be split further into attention-holding and attention-capturing, since these two seem to be distinctly different from each other and can have their own items. However, this must be investigated during the measure purification stage. The items generated are reflected in Annexure A.

**Step 3: Collect data**

Initially, for a pilot study data were collected from Management Information System students for the unhealthy video condition (30), healthy video condition (11), and the unhealthy static condition (16). Not all cells were tested because subjects did not sign up for the last cell (last day) and the number of subjects signing up per day was unpredictable.

**Step 4: Purify the measure**

Pilot data suggested that problems existed with the visuals displayed. The visuals featured chocolate chip cookies, which not only was better portrayed in the graphics, but also had a different serving size than the chips, almonds, or raisins featured. Furthermore, the difference in camera movement in the video clips also posed a problem. The almonds had a zoom-in, zoom-out effect; whereas, the potato chips had a panning movement. Also, the display of images and videos were not randomized, and could introduce another variable. The imagery was also displayed from an overhead projector as opposed to a desktop computer, where each stimulus could be randomized. None of the items were dropped, however.

**Step 5: Collect fresh data**

The visuals were updated to display the same serving sizes, same colors, same zoom-out/in effects, randomized placement positions, chocolate chip cookies were replaced with sugar cookies and almonds were replaced with peanuts. The researcher considered what products subjects considered in the pilot study as healthy to match the conditions (healthy/unhealthy) and visuals, accordingly. The peanuts (salty, healthy) vs potato chips (salty, unhealthy) were featured with raisins (sweet, healthy) vs cookies (sweet, unhealthy).

A 2 x 2 factorial design was completed (healthy/unhealthy, video/static) with 134 subjects (healthy/static 32, unhealthy/static 32, healthy video 34, unhealthy video 36). Only 129 cases were valid—40% males and 60% females. Subjects were primarily undergraduate marketing and management students, who received extra class credit for their participation.
Step 6: Reliability

The data from Question 3 was combined for all four treatment groups. They were reversed scored items where necessary.

Several iterations of inter-item reliability tests were executed to eliminate any items with a substantially higher Cronbach’s alpha. Any items that had too low correlations (below .3) were deleted. There were no items higher than .9 in the correlation matrix.

From the theory review, four factors were specified (attention-capturing, attention-holding, involvement and salience. The first attempt at a Confirmatory Factor Analysis (CFA) with four factors revealed that two of the subscales (attention-capturing and attention-holding) should really be just one scale. Next, only three factors (Attentional Focus, Salience, and Attentional Cognition) were extracted, such as items responsible for any cross loadings or subscales were eliminated. The factor labels were agreed upon with a second researcher, since labeled factors were initially Attention Capture, Salience, and Involvement.

Confirmatory Factor Analysis:

A confirmatory factor analysis was conducted on each one of the three subscales and the combined model as well. The initial model subjected to a CFA was Factor 1: 1,7,8,9,12,15,17,20,21,27; Factor 2: 9,26,29,31,32,33, Factor 3: 4,6,9,38,40,41,43,44.

Factor 1 - Attentional Focus: From the initial result of items 1,7,8,9,12,15,17,20,21,27

This researcher deleted items 1,9,17, since these items had low factor loadings and high standard residuals. Furthermore, item 27 was deleted from factor 1, as this not only had a factor loading below .5, but also had a standard residual value of 4.56, which is above the upper limit of [4], that Hair et al. (2006) advocates. Its deletion also resulted in a significant drop in chi-squared values. Six items made up the final subscale and are reflected in Table 5.4.

The six items revealed a Cronbach’s alpha of .907, which indicated very good inter-item reliability. The Kaiser-Meyer-Olkin (KMO) was .902, indicating that sampling adequacy was superb (Field, 2009). The Bartlett’s Test of Sphericity gave p<.001, so relations between items were sufficiently large. Sixty percent (60%) residuals were extracted, which are above the >.50 cutoff
value recommended by Field (2009), but the researcher decided not delete any further items based on the good Cronbach’s alpha and KMO values.

For the CFA, all items loaded above .7 on the factor, which is good (Hair et al., 2006). No standardized residuals above |2| were encountered and there were no modification indices.

**Table 5.4: Factor loadings of Subscale 1: Attentional Focus**

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. The video food ad immediately caught my eye.</td>
<td>.83</td>
</tr>
<tr>
<td>8. I was curious about the content of the video food ad.</td>
<td>.82</td>
</tr>
<tr>
<td>12. The brightness of the video food ad attracted my attention.</td>
<td>.74</td>
</tr>
<tr>
<td>15. The motion of the video food ad attracted my attention.</td>
<td>.85</td>
</tr>
<tr>
<td>20. I felt influenced to buy the items shown in the video food ad.</td>
<td>.74</td>
</tr>
<tr>
<td>21. I thought about the video food ad after it has finished.</td>
<td>.78</td>
</tr>
</tbody>
</table>

**Factor 2 - Salience:** The initial results were items 9, 26, 29, 31, 32, 33. This researcher also deleted item 9 from this factor, since it cross-loaded with factor 3, as well as raised the chi-squared value and RMSEA to .13. Furthermore, a face validity check revealed that item 9 belongs to the content of factor 3. The final items are reflected in Table 5.5.

**Table 5.5: Factor loadings of Subscale 2: Salience**

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>26. The video food ad was very intense.</td>
<td>.64</td>
</tr>
<tr>
<td>29. The video food ad seemed so real.</td>
<td>.81</td>
</tr>
<tr>
<td>31. The video food ad was very salient.</td>
<td>.84</td>
</tr>
<tr>
<td>32. The food in the video food ad looked so attractive.</td>
<td>.72</td>
</tr>
<tr>
<td>33. The video food ad seemed so lively.</td>
<td>.70</td>
</tr>
</tbody>
</table>

**Factor 3 – Attentional Cognition:** Initial results were items 4, 6, 9, 38, 40, 41, 43, 44. Items 4 and 6 were deleted, due to high standardized residual values. Final items are shown in Table 5.6.
Table 5.6: Factor Loadings of Subscale 3: Attentional Cognition

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>9. It is hard to tear myself away from the video food ad.</td>
<td>.60</td>
</tr>
<tr>
<td>38. The food in the video food ad looked more appealing than those in the pictures.</td>
<td>.71</td>
</tr>
<tr>
<td>40. I only focused on the video food ad and forgot to look at other choices.</td>
<td>.71</td>
</tr>
<tr>
<td>41. I could imagine myself eating the food in the video food ad.</td>
<td>.66</td>
</tr>
<tr>
<td>42. I was thinking about the video food ad afterwards.</td>
<td>.78</td>
</tr>
<tr>
<td>44. I could not think of anything else but those foods in the video food ad.</td>
<td>.67</td>
</tr>
</tbody>
</table>

**Combined construct:** The subscales were combined and specified three latent constructs, Attentional Focus, Salience and Attentional Cognition, were determined. This final construct was a 17-item multi-dimensional construct (see Figure 5.2) with 3 factors reflecting Attentional Focus, Salience, and Attentional Cognition. The content and face validity of the items appeared good.

**Step 7: Assess construct validity**

For convergent validity, the standardized factor loadings, the Construct Reliability (CR) and the Average Variance Extracted (AVE) values were examined. There were no loadings below .5 for the split model at standardized factor loadings. However, for the merged model, four items loaded below .5, but not significantly. No Heywood cases existed, since all error variances were positive. The standardized loadings and their error variances also did not differ significantly between individual factors and the combined model, except for item 9 of factor 3, which had slightly higher loadings.

Next, this researcher tested for Construct Reliability (CR), which is similar to Cronbach’s alpha (Hair et al., 2006). The split model’s CR value was .955 (merged model=.929), which is very good, as this is well above the .7 value recommended by Hair et al. (2006).
This researcher also tested for the Average Variance Extracted (AVE) as part of construct validity and the AVE=.558 (merged=.442), which is above the recommended .5 value of Fornell and Larcker (1981). This indicated adequate convergence (Hair et al., 2006).

Next, the overall fit indices per subscale was considered and also the combined construct. Important model fit indices per subscale are reflected in Table 6.7. The Chi-squared, degrees of
freedom (df), normed chi-squared, p-value, RMSEA, GFI, and SRMR values were very good for each subscale.

Table 5.7: Important fit indices for the subscales and combined construct

<table>
<thead>
<tr>
<th></th>
<th>Attentional Focus</th>
<th>Salience</th>
<th>Attentional Cognition</th>
<th>Combined Subscales</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid N</td>
<td>128</td>
<td>129</td>
<td>129</td>
<td>125</td>
<td>Total N=134</td>
</tr>
<tr>
<td>Cronbach’s Alpha</td>
<td>.907</td>
<td>.857</td>
<td>.852</td>
<td>.930</td>
<td>&gt;.7 is good (Field, 2000; Cortina, 1993 &amp; Hair et al., 2006)</td>
</tr>
<tr>
<td>KMO</td>
<td>.902</td>
<td>.844</td>
<td>.879</td>
<td>.916</td>
<td>Should be &gt;.5</td>
</tr>
<tr>
<td>Determinant</td>
<td>.027</td>
<td>.109</td>
<td>.107</td>
<td>1.35E-005</td>
<td>If &gt;.00001, then no multicollinearity</td>
</tr>
<tr>
<td>Chi-squared</td>
<td>9.73</td>
<td>7.69</td>
<td>9.15</td>
<td>268.83</td>
<td></td>
</tr>
<tr>
<td>Degrees of freedom</td>
<td>9</td>
<td>5</td>
<td>9</td>
<td>116</td>
<td></td>
</tr>
<tr>
<td>Normed Chi-squared</td>
<td>1.08</td>
<td>1.54</td>
<td>1.017</td>
<td>2.318</td>
<td>&lt;2 good; 2-5: acceptable</td>
</tr>
<tr>
<td>P-value</td>
<td>.37</td>
<td>.174</td>
<td>.423</td>
<td>.000</td>
<td>&gt;.05 is good</td>
</tr>
<tr>
<td>RMSEA</td>
<td>.025</td>
<td>.064</td>
<td>.011</td>
<td>.10</td>
<td>Good, absolute fit index=.027, but &lt;.08 is good. Upper limit=.10</td>
</tr>
<tr>
<td>CFI</td>
<td>1</td>
<td>.99</td>
<td>1</td>
<td>.96</td>
<td>Good if it exceeds .9 (Byrne, 1998)</td>
</tr>
<tr>
<td>GFI</td>
<td>.98</td>
<td>.98</td>
<td>.98</td>
<td>.81</td>
<td>&gt;.9 is good (Hair et al. 2006)</td>
</tr>
<tr>
<td>SRMR</td>
<td>.022</td>
<td>.03</td>
<td>.031</td>
<td>.072</td>
<td>Below .05 is good (Grefen et al., 2000), but should be below .08 (Hu &amp; Bentler, 1999)</td>
</tr>
<tr>
<td>Factor loadings</td>
<td>All &gt;.7</td>
<td>One below &gt;.7</td>
<td>&gt;.6</td>
<td>&gt;.6</td>
<td>&gt;.7 good (Hair et al., 2006). But &gt;.5 ok</td>
</tr>
<tr>
<td>AVE</td>
<td>.631</td>
<td>.56</td>
<td>.477</td>
<td>.558</td>
<td>&gt;.5 Good (Hair et al., 2006)</td>
</tr>
<tr>
<td>CR</td>
<td>.911</td>
<td>.86</td>
<td>.845</td>
<td>.955</td>
<td>&gt;.9 good, but also &gt;.7 is good</td>
</tr>
</tbody>
</table>
The combined chi-squared=268.83 and the df=116 provide a normed chi-squared=2.318 (acceptable, as it is above 2, but below 5). However, the p-value of .000 was bad, since it was below .05, indicating the null hypothesis is rejected, which is not desirable. The RMSEA value of .10 was not such an ideal fit. Hair et al. (2006) indicate .027 as the absolute fit index (ideally, it should be below .05), but this RMSEA value is still just within the upper bound of .10. The lower bound of the confidence interval for the RMSEA is .084 (upper bound=.12), which is not such a bad value. Grefen, Straub, and Bondreau (2000) indicated that a RMSR >.05 means too much error. The SRMR of .072 is above that limit, but still below .08 and is still considered a good fit (Hu & Bentler, 1999). This researcher assessed the Goodness-of-Fit model, based on several indicators and decided the SRMR value was sufficient for the model, because the CFI of .96 indicated a very good fit. Although the overall fit of the combined model showed some fit issues, this researcher verified content and face validity of the items, and decided the individual subscales were sufficient for the overall construct. The subscales of the construct are considered uni-dimensional, as no standardized residuals are above |2|.

This researcher further deleted item 27, as it was responsible for cross-loadings: F1 and F3 on items 44, 15, 21, F1 and F2=item 21,33; F2 and F3=item 31. Although more cross loadings were encountered between the factors, this researcher believed the model described the construct adequately.

**Convergent and Discriminant Validity**

**Subscales:** Three extra constructs were included in the measurement tool for the purpose of determining construct validity. Although a comprehensive list is contained in Appendix B, a brief summary is listed below:

- An 8-item Babin and Burns vividness scale (1998) consisting of items Q3_24,30,45,46,47,48,49,50. The RMSEA was .22 and Chi-squared was 237.03/df=20, p=.000. Two additional items from the full Babin and Burns (1998) construct were also included in the measurement items, namely Q3_14 and Q3_41, but these measured imagery elaboration.
- A 17-item scale on Cognitive Absorption measuring telepresence and flow from Agarwal and Karahanna (2000) was also included. Since the scale was multidimensional, only six items
were used to test discriminant validity. They were Q4_1,2,3,4,5,6. This subscale was called “telepresence involvement.” The six items’ statistics were: RMSEA=.31, Chi-squared=120.88/df=9, p=.000, AVE =.58, CR =.89

- The 6-item vividness scale from Bone and Ellen (1992) was also included in the measurement items. These items were Q3_17,24,26,45,47,50. The RMSEA=.179, Chi-squared=47.2/df=9, p=.000. AVE=.43, CR=.81

To test for construct validity, this researcher tested whether the three subscales were unidimensional. Since there were no standardized residuals greater than |4| and no modification indices, it was concluded that all subscales were unidimensional.

The convergent validity was determined from the following procedures. First, standardized loadings and error variances of the combined subscales were reviewed to determine whether they differed significantly from the individual subscales. Then, the calculated AVEs were reviewed to determine whether they are above .5 for adequate convergence (Hair et al., 2006). Finally, the CR was reviewed to determine if they are above .7 (Hair et al., 2006).

To test for discriminant validity of the vividness construct, the method advocated by Fornell and Larcker (1981) was utilized to compare the AVEs to the square of the correlation. The AVEs must be greater than the square of the correlation. The subscale and the scale were utilized to test discriminant validity into one construct (i.e., declaring 2 factors) and then tested discriminant validity for each of the three factors of the vividness construct in this manner.

**Factor 1 (Attentional Focus) vs Babin and Burns’ (1998) vividness scale**

There were no overlapping items: Attentional Focus (Q3_7,8,12,15,20,21) vs Babin Burns’ vividness scale (Q3_24,30,45,46,47,48,49,50).

Convergent validity: No significant changes occurred in the factor loadings and error variances, but three loadings of the Babin and Burns’ vividness scale still remained below .5. Factor 1 showed a CR of .91 well above the recommended .7 value. Its AVE,.62, was also still well above the .5 value. This indicated good convergent reliability.
Discriminant validity: Factor 1’s AVE=.30, Burns and Babin’s vividness scale, AVE=.62, were greater than the square of the correlation of .18. According to Fornell and Larcker (1981), this proves *adequate discriminant validity* between the constructs.

**Factor 2 (Salience) vs Cognitive Absorption (Telepresence Involvement) scale**

There were no overlapping items: Salience (Q3_26,29,31,32,33) vs Cognitive Absorption (Q4_1,2,3,4,5,6).

Convergent validity: No significant changes occurred in the factor loadings and error variances for factor 2. There were no factor loadings below .5. Factor 2 still showed a CR of .86 well above the recommended .7 value. Its AVE,.56, was above the .5 value. This indicated *good convergent reliability*.

Both AVEs from the 5-item factor 2 (Salience) (.56) and the Cognitive Absorption scale (Q4_1,2,3,4,5,6) (.58) were greater than the square of the correlation .07. This provides *adequate proof of discriminant validity*.

**Factor 3 (Attentional Cognition) vs Babin and Burns’ vividness scale**

There were no overlapping items: Attentional Cognition (Q3_9,38,40,41,42,44) vs Babin and Burns’ vividness scale (Q3_24,30,45,46,47,48,49,50).

Convergent validity: No significant changes occurred in the factor loadings and error variances for factor 3. There were no factor loadings below .5. Factor 3 still showed a CR of .85 well above the recommended .7 value. Its AVE of .494 was not significantly below the recommended .5 value. This result indicated *convergent reliability*.

Proof of discriminant validity was the Babin and Burns (1998) vividness construct. Both AVEs from the 6-item factor 3 scale (Attentional Cognition) (.50) and the .33 of Babin and Burns’ vividness scale were greater than the square of the correlation (.14), providing *sufficient proof of discriminant validity*.

**Combined Construct:** The combined Average Variance Extracted (AVE), according to Fornell and Larcker’s formula (1981), is .442, lower than the .5 cut-off value proposed by Hair et al.
(2006) for adequate convergence. Construct Reliability (CR=.929) is very good, since it is above the recommended .7 by Hair et al. (2006).

Since all AVE in the combined factor model were greater or equal to .5 and the Construct Reliability (CR) was in the good range (> .8), this researcher concluded the construct tested what it should test. The combined factor values were Factor 1: AVE=.621, CR=.908, F2: AVE=.56, CR=.863 with the square of the correlation between factors 1 and 2 being .314 (good discriminant validity). Factor 3: AVE: .495 and CR=.854 and the square of the correlation between factors 2 and 3 is .24 (good discriminant validity). However, the square of the correlation between factors 1 and 3 was .865, which does not reflect good discriminant validity between the two factors.

**Nomological Validity**

Comparing this construct with the Vividness and Cognitive Absorption scales assessed the nomological network of vividness of video ads on DDMB.
CHAPTER 6. DISCUSSION

6.1 Findings

6.1.1 Hypothesis testing

Subjects perceived they chose a healthy item (49%), which agreed with the figures for healthy items selected (49%). Nevertheless, this is in contrast to the statistics for health conscious perceptions, since only 20% of the subjects thought they were not health conscious. This could be attributed to the fact the items were only snacks and not necessarily what they would consider sufficient for a meal.

Information Search Stage (H1 and H1a): Partial support was found for hypothesis 1, search stage, that the vividness of video and healthy choice suggestions could influence consumers’ choice by attracting their attention to the video ad during the search stage. H1 (video catches attention more than static images) showed main effects for only visuals (p=.008). Since the effect size was low (R² =.144), the power analysis (.491) showed the healthy condition would have shown a main effect, if there were more subjects. The habitual choice covariate had an influence on the main effect. No support for interaction was determined.

H1a (motion of video attracts attention more than static images) showed main effects for visuals (p=.000) and healthy choices (p=.005). The habitual choice covariate had an influence on the effect size. However, there was no support for the interaction between visuals and healthy choices. H1a had partial support.

An examination of the combined hypothesis group showed main effects for both visuals (p=.000) and healthy choices (p=.007) with habitual choices showing an influence. No support for interaction was evident.

The results showed a significant influence of habitual choices when these variables were included as covariates in the analysis. Individual influences played a role, as the majority of subjects (64%) usually eat the item and 83% usually like to eat the item. Hence, there appears to be a familiarity bias, as well as a habitual decision-making style. Another contributing factor was low involvement in the purchase. Subjects seem to have invoked their prior knowledge, and blocked new information or unfamiliar products (Hoyer, 1984; Stijn, Van Osselaer, & Alba, 2000).
Alternatives Evaluation Stage (H2, 2a, 2b): H2 was not supported. No main effects were determined for either visuals (p=.341) or healthy choices (p=.418). No interaction effect was encountered. H2 (evaluation of fewer alternatives) showed no main effects for both healthy choices (p=.088) and visuals (p=.315), and no interaction effect was evident. Covariate habitual choice had a slight improvement. The effect size ($R^2=.088$) was very small and a power analysis indicated insufficient subjects. The covariate habitual choice had a slight increase in effect size. H2 was not supported.

H2a (reduction of perception of decision complexity) showed no main effects for either visuals (p=.581) or healthy choices (p=.940) with no interaction effect. Again, the effect size was extremely small ($R^2=.002$) and the power was also very low (below .1) for both independent variables. Therefore, more subjects might improve the significance level. H2a was not supported.

H2b (high involvement level) showed a main effect for only visuals (p=.007) and none for healthy choices (p=.956). No interaction effects were evident. Covariate habitual choice caused a slight increase in the effect size, but was still low ($R^2=.101$) and power was below .1 for healthy choices and the interaction effect. H2b had partial support.

The combined hypotheses group showed no main effects or an interaction effect. The habitual choice covariate increased the effect slightly to $R^2=.071$. Power was very low for the independent variables. The subjects seemed to have made habitual choices, so no decision rule or choice heuristic was employed (Wright, 1975). An increase in sample size might improve these results.

Purchase/Choice Stage: Partial support was determined for the overall hypothesis 3, stage that consumer choice can be influenced by video (main effect p=.020) and by healthy options (main effect p=.017). However, no interaction effects were found. No covariate had a significant effect on the overall group hypothesis.

H3 (reference heuristic) showed no main effects for visuals (p=.118) or healthy choice (p=.057). No interaction effects were evident. A larger sample size might provide better effects, as the effect size was very low ($R^2=.049$). The power analysis also showed low values. H3 was not supported.
H3a (availability bias) was not supported at all with no main effects ( visuals: \( p = .216 \) and healthy choice: \( p = .133 \)) and no interaction effects. However, covariates “time was too short” and habitual choice influenced the effect size \( (R^2 = .173) \). A power analysis revealed a larger sample size might increase the significance of the main effect healthy choice. No support was found for H3a.

H3b (persuasiveness of vividness effect) showed main effects for visuals \( (p = .007) \) and healthy choices \( (p = .014) \), but no interaction effects were evidenced. There was no covariate with a significant effect on the variables. Partial support was determined for H3b.

**Full model ANOVA:** The full model showed main effects for both visuals \( (p = .003) \) and healthy choices \( (p = .014) \), but no interaction effect was evidenced. Habitual choices had a significant influence on the effect size \( (R^2 = .167) \).

In general, there seems to exist a familiarity bias, and a lurking variable (time of day) that had an effect on the results. There seems to be an improvement in selections of the potato chips between the static and video conditions, but this could be attributed to the difference in time of day, since the high score for potato chips in the video condition was around lunchtime. The potato chips static condition was completed in the morning. Just the opposite effect was encountered for the peanuts conditions, yet, the time of day indicates the same pattern as for the potato chips condition. Both potato chips and peanuts had higher selections closer to lunchtime, indicating this might be triggered by hunger. This leads this researcher to believe that time of day was an influencer for the study’s treatments, in general. Therefore, results are influenced by this variable.

Observed power for the various hypotheses groups were generally below the .8 threshold advocated by Hair et al. (2006). So, an increase in the number of subjects should show an improvement for the interaction effect.

**6.1.2 Vividness Construct**

A 17-item multi-dimensional vividness construct was derived consisting of three factors—attentional focus, salience, and attentional cognition. The goodness-of-fit indicators were found adequate for the construct. The construct’s reliability and construct validity (CR=.955; AVE=.558) were also good with an adequate model fit. Convergent and discriminant validity were proven for the construct. Factor loadings were all above .6, which is above the cut-off value of .5 (Hair et al., 2006).
6.2 Limitations

One of the limitations of this study was no dissemination of food items to increase involvement levels of the subjects. The subjects were too familiar with the food items. There was no control for hunger, other than time of day. The video ad showed only a zoom movement so the movement might attract the eye, but it lacked sufficient intensity, color, lifelikeness, etc. to engage and persuade the subjects to make a selection, based on the video ad. The sample size was also too small.

Individual factors such as social context, personality traits of individuals, as well technology adoption indicators, such as early or late technology adopters, were not assessed. These factors might be important, since different types of personalities and early technology adopters might be able to adopt several decision heuristics and process larger amounts of information.

For the vividness construct, Churchill (1979) advocates collecting a new data set between iterations and using inter-judge rating to reduce the number of items. This has not been achieved during this study. Also, some factors’ loadings were at .6. Although above the minimum cut-off of .5, it is below the ideal value of .7 (Hair et al., 2006).

6.3. Recommendations and Future Research

Recommendations for future research include the usage of either unfamiliar items or very intense video shots of familiar products. Subjects should be asked if they are hungry, if they have eaten beforehand, or all subjects should be fed before the study begins. A situation where the subject can consume the food and complete a post-hoc evaluation of video ad versus consumption will be ideal.

Future research is planned to include a quasi-field study in one of the cafés on campus, where a DDMB will be simulated and subjects asked to complete a survey after purchase and consumption. Furthermore, comparative sales data will be tracked for sales during periods when the DDMB is not operational vs. when it is being used. The use of eyetracking metrics will further enhance the research’s quality, as fixations and saccades can be tracked to where exactly subjects are focusing on DDMB and the resultant sales. Therefore, the vividness construct must be tested with new data.
CHAPTER 7. CONCLUSIONS

This research study was designed to answer three research questions. 1) How consumer-decision making processes are influenced by a video on DDMB. 2) Does a vividness effect exist for DDMB. 3) Are consumers influenced to make healthier food choices by viewing video ads on DDMB.

Although no interaction effect was determined for the hypotheses, the data looked promising. They show main effects for visuals and healthy choices. The measurement model for the vividness construct, as encountered in video ads on DDMB, also seemed very promising. The vividness construct combined with the research model can potentially provide proof of influence on consumer decision-making and healthy eating.

This research did not answer how consumer decision-making processes are influenced by the video on DDMB. However, there is at least marginal support for an influence of DDMB healthy eating. One of the issues highlighted in this research is the video ad has an effect on habitual consumers. But, the influence was not sufficient to persuade them to select the featured item. The second research question can be answered with a “yes.” A vividness effect does exist for DDMB.

The implications from these results and future work, as outlined before, are that video ads can be effectively used to attract consumers’ attention by cutting through the clutter and engaging customers. Customers can be influenced to make healthier food options, which, in the long term, would circumvent negative associations with fast food outlets and obesity, and also attract customers from other market segments. Therefore, this research contributes to the academic literature on Digital Signage.


APPENDIX A. Survey Instrument

### Decision Block

What food item would you like to have?

- Peanuts
- Cookies
- Chips
- Raisins
- Almonds
- Trailmix
- Pretzels
- Donuts
- Protein Bar
- Popcorn
- Cheese Balls
- Dried Fruit

### Decision Making

Part I: Please rate the following questions: (video food ad refers to moving images in food selection)

<table>
<thead>
<tr>
<th>Question</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Somewhat Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The time was too short to make a selection.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2. There was too much information.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3. I noticed the video food ad immediately.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>4. I did not see the video food ad at all.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>5. The video food ad attracted my attention.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>6. It was easy to ignore the video food ad.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>7. When I looked at the video food ad, I wondered what would come next.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>8. I found the video food ad to be distracting.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>9. I could not help but look at the video food ad.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>10. The video food ad made it easy to compare choices.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>11. The video food ad made deciding what to eat easier.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>12. It was difficult to decide what to choose.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>13. I imagined what it would be like to eat the item shown in the video food ad.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>14. I found the video food ad very interesting.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>15. I compared the other items against the item in the video food ad.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Somewhat Disagree</td>
<td>Neither Agree nor Disagree</td>
<td>Somewhat Agree</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>----</td>
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<td>---------------------------</td>
<td>----------------</td>
<td>-------</td>
<td>----------------</td>
</tr>
<tr>
<td>16. I did not want to eat what was on the video food ad, so I looked at something else.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>17. I waited for the video food ad to finish to see what was next.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>18. I decided to choose the item featured in the video food ad.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>19. When I had to write down my choice, I knew what I wanted.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>20. When I had to write down my choice, I chose the item in the video food ad.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>21. I imagined what it would be like to eat the item shown in the video food ad.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>22. It seemed like a good idea to choose what was shown in the video food ad.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>23. I played around with several choices before settling on a final decision.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>24. My final selection was different from my first thoughts.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>25. The video food ad influenced my decision.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>26. I feel happy about my final selection.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>27. I selected a healthy food option.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>28. I usually choose something similar to what I chose today.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>29. I usually like eating the food item that I chose today.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

### Vividness Construct

**Part II: What are your thoughts about the video food ad:**

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Somewhat Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I cannot help but look at the video food ad.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2. I always look at the video food ad.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3. I was not aware of time while looking at the video food ad.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4. Time seemed to stand still when I was looking at the video food ad.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5. It made me wonder which video food ad would come next.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6. I cannot help but stare at the video food ad.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>21.</td>
<td>Sample Item</td>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Somewhat Disagree</td>
<td>Neither Agree nor Disagree</td>
<td>Somewhat Agree</td>
<td>Agree</td>
</tr>
<tr>
<td>-----</td>
<td>-------------</td>
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<td>----------</td>
<td>------------------</td>
<td>--------------------------</td>
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</tr>
<tr>
<td>22.</td>
<td>Sample Item</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>23.</td>
<td>Sample Item</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>24.</td>
<td>Sample Item</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>25.</td>
<td>Sample Item</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>26.</td>
<td>Sample Item</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>27.</td>
<td>Sample Item</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>28.</td>
<td>Sample Item</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>29.</td>
<td>Sample Item</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
### Telepresence Scale:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Somewhat Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Somewhat Agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Time appeared to go by very quickly when I was viewing the video food ad.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2. I lost track of time when I was viewing the video food ad.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3. Time flew by when I was viewing the video food ad.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>30. The video food ad was so detailed.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>31. The video food ad was very salient.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>32. The food in the video food ad looked so attractive.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>33. The video food ad seemed so lively.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>34. The video food ad seemed so vibrant.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>35. It was difficult to concentrate on the video food ad.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>36. I felt the video food ad looked so vivid.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>37. The video food ad aroused my appetite.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>38. I could imagine myself eating the food in the video food ad.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>39. I found the video food ad informative.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>40. I only focused on the video food ad and forgot to look at other choices.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>41. I was thinking about the video food ad afterwards.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>42. I still remember the video food ad.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>43. I was looking at the video food ad.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>44. I could not decide on anything else but those foods in the video food ad.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>45. The video food ad was very vivid.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>46. The video food ad was very appealing to the eye.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>47. The video food ad was very vivid.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>48. The video food ad was very appealing.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>49. The video food ad was very appealing.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>50. The video food ad was very vivid.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
4. When I was viewing the video food ad, I was able to block out other distractions. [Strongly Agree: 0, Agree: 0, Neither Agree nor Disagree: 0, Disagree: 0, Strongly Disagree: 0]

5. When I was viewing the video food ad, I was absorbed in what I was doing. [Strongly Agree: 0, Agree: 0, Neither Agree nor Disagree: 0, Disagree: 0, Strongly Disagree: 0]

6. When I was viewing the video food ad, I was immersed in the task I was performing. [Strongly Agree: 0, Agree: 0, Neither Agree nor Disagree: 0, Disagree: 0, Strongly Disagree: 0]

7. When I was viewing the video food ad, I got distracted by other attentions very easily. [Strongly Agree: 0, Agree: 0, Neither Agree nor Disagree: 0, Disagree: 0, Strongly Disagree: 0]

8. When I was viewing the video food ad, my attention did not get diverted very easily. [Strongly Agree: 0, Agree: 0, Neither Agree nor Disagree: 0, Disagree: 0, Strongly Disagree: 0]

9. I had fun watching the video food ad. [Strongly Agree: 0, Agree: 0, Neither Agree nor Disagree: 0, Disagree: 0, Strongly Disagree: 0]

10. Watching the video food ad provided me with a lot of enjoyment. [Strongly Agree: 0, Agree: 0, Neither Agree nor Disagree: 0, Disagree: 0, Strongly Disagree: 0]

11. I enjoyed watching the video food ad. [Strongly Agree: 0, Agree: 0, Neither Agree nor Disagree: 0, Disagree: 0, Strongly Disagree: 0]

12. Watching the video food ad bored me. [Strongly Agree: 0, Agree: 0, Neither Agree nor Disagree: 0, Disagree: 0, Strongly Disagree: 0]

13. When watching the video food ad, I felt in control. [Strongly Agree: 0, Agree: 0, Neither Agree nor Disagree: 0, Disagree: 0, Strongly Disagree: 0]

14. I felt that I had no control over viewing the video ad. [Strongly Agree: 0, Agree: 0, Neither Agree nor Disagree: 0, Disagree: 0, Strongly Disagree: 0]

15. Watching the video food ad excited my curiosity. [Strongly Agree: 0, Agree: 0, Neither Agree nor Disagree: 0, Disagree: 0, Strongly Disagree: 0]

16. Watching the video food ad made me curious. [Strongly Agree: 0, Agree: 0, Neither Agree nor Disagree: 0, Disagree: 0, Strongly Disagree: 0]

17. Watching the video food ad aroused my imagination. [Strongly Agree: 0, Agree: 0, Neither Agree nor Disagree: 0, Disagree: 0, Strongly Disagree: 0]

Social Desirability Scale

Please select the statement which best reflects you by selecting True or False for each of the statements.

<table>
<thead>
<tr>
<th>Statement</th>
<th>True</th>
<th>False</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I sometimes feel resentful when I don’t get my way.</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2. I am always careful about my manner of dress.</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3. My table manners at home are as good as when I eat out in a restaurant.</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4. There have been times when I felt like rebelling against people in authority even though I knew they were right.</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5. I’m always willing to admit it when I’ve made a mistake.</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6. I sometimes try to get even rather than forgive and</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Reference price

Please indicate how much you would be willing to pay for the following items (all bags are 4 ounces):

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Bag of Potato Chips</td>
<td>$0</td>
</tr>
<tr>
<td>2. Bag of Almonds</td>
<td>$0</td>
</tr>
<tr>
<td>3. Bag of Raisins</td>
<td>$0</td>
</tr>
<tr>
<td>4. Bag of Trail Mix</td>
<td>$0</td>
</tr>
<tr>
<td>5. Bag of Chocolate Chip Cookies</td>
<td>$0</td>
</tr>
<tr>
<td>6. Bag of Popcorn</td>
<td>$0</td>
</tr>
<tr>
<td>7. Bag of Dried Fruit</td>
<td>$0</td>
</tr>
<tr>
<td>8. Bag of Pretzels</td>
<td>$0</td>
</tr>
<tr>
<td>9. Bag of Cheese Balls</td>
<td>$0</td>
</tr>
<tr>
<td>10. Bag of Peanuts</td>
<td>$0</td>
</tr>
<tr>
<td>11. 1 x Donut</td>
<td>$0</td>
</tr>
<tr>
<td>12. Protein Bar</td>
<td>$0</td>
</tr>
</tbody>
</table>

Healthy Food Perception:

How healthy do you consider the items below to be?

<table>
<thead>
<tr>
<th>Item</th>
<th>Very Unhealthy</th>
<th>Unhealthy</th>
<th>Somewhat Unhealthy</th>
<th>Neither Healthy nor Unhealthy</th>
<th>Somewhat Healthy</th>
<th>Healthy</th>
<th>Very Healthy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potato Chips</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Almonds</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Raisins</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Peanuts</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cookies</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Trail Mix</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dried Fruit</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Popcorn</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Protein Bar</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cheese Balls</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pretzels</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Donuts</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Demographics

What is your age:
Are you Male/Female?
- Male
- Female

Where do you permanently reside (e.g. city name):

Have you seen a digital menu board with video ads before?
- Yes
- No

Do you consider yourself as a health conscious person?
- Definitely yes
- Probably yes
- Maybe
- Probably not
- Definitely not
APPENDIX B. Item Generation

Vividness Questions
For Question 3, which tested the vividness construct, 50 items were developed and some were derived from these scales:

- **Bone and Ellen (1992) vividness scale:** The items below were included from the original vividness scale (the items were also included in the vividness scale of Miller and Marks (1992):
  - Q24- clear
  - Q45-vivid
  - Q26-intense
  - Q17-lifelike
  - Q47-sharp
  - Q50-well-defined (original wording: defined the images).

- **Babin and Burns (1998) vividness scale:** Items included from their scale:
  - Q24-clear
  - Q30-detailed
  - Q45-vivid
  - Q46-fuzzy(r)
  - Q47-sharp
  - Q48-vague (r)
  - Q49-weak (r)
  - Q50-well-defined
  - Q41-I imagined to use (eat) the product
  - Q14-I imagined to taste the product.

- **Ha (1996) Ad message involvement:** 3 items were derived from scale items:
  - I paid attention to the content of the ad.
  - I carefully read the content of the ad.
  - When I saw the ad, I concentrated on its contents.
  - I expended effort looking at the content of this ad.
  - The derived items were:
    - Q8: I was curious about the content of the video food ad.
    - Q27: The content of the video food ad attracted my attention.
    - Q39: I found the video food ad was informative.

Telepresence Questions
Question 4 contained 17 items from the 5 dimensional Agarwal and Karahanna’s original Cognitive Absorption Scale (2000), which measured flow was included to measure discriminant validity.

- **Original items of the scale were:**
  - **Temporal Dissociation**
    - TD1. Time appears to go by very quickly when I am using the Web.
    - TD2. Sometimes I lose track of time when I am using the Web.
    - TD3. Time flies when I am using the Web.
    - TD4. Most times when I get on to the Web, I end up spending more time that I had planned.
TD5. I often spend more time on the Web than I had intended.

*Focused Immersion*

FI1. While using the Web I am able to block out most other distractions.
FI2. While using the Web, I am absorbed in what I am doing.
FI3. While on the Web, I am immersed in the task I am performing.
FI4. When on the Web, I get distracted by other attentions very easily.
FI5. While on the Web, my attention does not get diverted very easily.

*Heightened Enjoyment*

HE1. I have fun interacting with the Web.
HE2. Using the Web provides me with a lot of enjoyment.
HE3. I enjoy using the Web.
HE4. Using the Web bores me.

*Control*

CO1. When using the Web I feel in control.
CO2. I feel that I have no control over my interaction with the Web.
CO3. The Web allows me to control my computer interaction.

*Curiosity*

CU1. Using the Web excites my curiosity.
CU2. Interacting with the Web makes me curious.
CU3. Using the Web arouses my imagination.

Items TD4 (Most times when I get on to the Web, I end up spending more time that I had planned) and TD5 (I often spend more time on the Web than I had intended) from the temporal dissociation were not included in the measurement. Note: Two items were also included under Question 2, which was used for hypothesis testing purposes.

**Social Desirability Scale**

A 10-item Social Desirability scale from Crowne and Marlowe (1960) was also included in the study. Items were rated on a true/false basis. Items used were:

1. I sometimes feel resentful when I don’t get my way.
2. I am always careful about my manner of dress.
3. My table manners at home are as good as when I eat out in a restaurant.
4. There have been times when I felt like rebelling against people in authority eventhough I knew they were right.
5. I’m always willing to admit it when I’ve made a mistake.
6. I sometimes try to get even rather than forgive and forget.
7. I am always courteous, even to people who are disagreeable.
8. I have never been irked when people expressed ideas very different from my own.
9. I am sometimes irritated by people who ask favors of me.
10. I have never deliberately said something to hurt someone’s feelings.