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PRODUCT DISPLAY VERSUS GRAPHICAL REPRESENTATION ON PACKAGING

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PRODUCT DISPLAY VERSUS GRAPHICAL REPRESENTATION ON PACKAGING

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ABSTRACT

Previous research conducted (Hurley, et al., 2012) concerning physical and graphical product visibility from the primary display panel (PDP) is limited to one product category. This research expands previous peer-reviewed research, which indicates that there is a significant difference between consumer preferences of graphical display vs. physical product display on packaging.

The shelf presence of packages showing actual product visibility versus packages showing only a graphical representation of the product was evaluated. Both shopping results and quantitative data using eye-tracking technology were collected and cross-referenced with a qualitative, post-experiment survey.

Specifically, variables of packaging within pasta, snacks, prepared frozen meals and refrigerated meats were analyzed in this research. The experimental design took the form of a 4 (products) x 4 (package styles) study. A total of 130 participants contributed to the study by shopping in a staged retail environment and then filling out a survey. There were three main goals for this study: determine if participants were more visually attentive to graphical representations of products or actual products being shown, determine if participants were more/less visually attentive to packages showing a higher/lower percentage of actual products, and lastly determine which packaging styles consumers preferred given the opportunity to choose between the styles.

Analysis of participant shopping selections revealed that packages displaying actual product through windows were selected significantly more than packages displaying only a graphical representation of the product. No significant purchase

differences were seen between higher/lower percentages of actual products being displayed. Eye-tracking data analysis generally showed no significant differences for window type or presence.

DEDICATION

This research is dedicated to my loving friends and family for both supporting and empowering me throughout this process.

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CHAPTER ONE

INTRODUCTION

This thesis is an extension of a study published in Packaging Technology and Science titled "The Effect of Modifying Structure to Display Product Versus Graphical Representation on Packaging" by Rupert Andrew Hurley, Josh Galvarino, Emily Thackston, Andrew Ouzts and Andy Pham.

Successful Packaging and Marketing

Packaging has been considered the "neglected Cinderella of design—the cosmetic afterthought of business" by many researchers (Holdway, Walker & Hilton, 2002). More companies are now realizing that successful packaging design can ultimately determine the lifespan of a new product. A package must not only protect and preserve its product, it should also provide essential product information to the consumer while differentiating itself on the shelf to promote a sale (Holdway, Walker and Hilton, 2002). Store shelves today are crowded with various styles of packages strategically positioned to grab attention and influence a consumer's purchase decision. It is currently estimated that there are over 38,000 different products within a single store (Hesterman, 2012). This vast array of different products has given companies reason to compete for consumers' attention in the market place by designing unique packaging as the number of new products is constantly increasing (Fischer et. al., 2012).

Fundamental marketing textbooks by Pickton and Broderick (Clement, 2005) and Kotler and Keller (Clement, 2006) consider packaging to be one of the "important

decision variables for the marketing executive but treat packaging in a very general way and understate the importance of the visual cues that packaging offers" (Clement, 2007). Usually, packaging is the last marketing communication that a company can use to influence a purchase decision. This fact alone shows the importance of packaging as a communication tool (Rundh, 2009).

Positioning

Maggard (1976) states that the origin of the term "positioning" comes from authors Al Ries and Jack Trout whom were published in the *Industrial Marketing* magazine in 1969. The term has its roots in product packaging and can be defined plainly as "the shape of the product, the size of the package and its price in comparison to the competition" available (Ampuero & Vila, 2006). These authors stated that a new era was emerging in the consumables market, "The age of positioning". This new age not only recognized the significance of product/company imagery but also the importance of positively positioning this imagery in the mind of consumers (Ampuero & Vila, 2006). Marketers strive to have their products linked to a consumer's evoked set. An evoked set is defined as a top-of-mind set of products particular to a certain consumer and product category (Babin and Harris, 2012). For example, what are the top brands that come to mind when thinking of cereal? Package shelf presence can help products stand out and increase the likelihood of consideration.

Shelf Presence

Consumer goods companies are constantly looking for ways to increase the shelf presence of their products. Package typography and graphics are no longer the only ways used to capture a consumer's attention. Unique packaging structures are now being used in retail environments to distinguish brands and increase attentive dwell time (Schoormans & Robben, 1997 Hurley, et al., 2012). Several factors are involved in the structural design process of a package. Some of these factors include pricing, sustainability, environmental aspects, product protection, and distribution (Underwood, Klein & Burke, 2001). Brand owners are also concerned with package features such as material, shape, and size. One of the biggest driving factors for package design in most consumer products companies is shelf presence (Lai, 1991). Eye tracking technology can be utilized to effectively collect quantitative data while surveys can be utilized to collect qualitative data to help analyze consumer buyer behavior and package shelf presence.

CHAPTER TWO

REVIEW OF LITERATURE

Importance of Packaging

Packaging is continuously being used daily around the world for multiple purposes. It lives in the homes of consumers becoming an intimate part of their lives. This "live experience" continues to deepen until the product/package is ultimately discarded or thrown away (Lindsay, 1997 Ampuero & Vila, 2006). Over 70% of consumers make their purchasing decisions in stores (POPAI, 1996), 85% make their decisions after picking up only one item, and 90% make their decisions after only examining the primary display panel (PDP) of a package (Clement, 2007). Holdway, Walker and Hilton (2002) describe packaging in terms of "Fitness for Purpose" in their article titled *Eco-design and Successful Packaging.* These writers discuss that "Fitness for Purpose" means packaging must be capable of:

1. Protecting, containing, and preserving the product while allowing efficient manufacturing, handling, and distribution
2. Providing commercial and consumer information
3. Presenting and marketing (differentiate) the product
4. Ensuring good ergonomics/customer acceptance
5. Being tamper-proof
6. Allowing ease of opening/closure, but be child proof
7. Conforming to safety standards
8. Conforming to legislation

However, packaging has also been deemed as one of the most important factors in positively influencing purchasing decisions at the point of sale (Prendergast and Pitt, 1996 Silayoi & Speece, 2004). Proper packaging design is thus crucial to draw attention of consumers and influence a sale. This is especially critical as self-service outlets are becoming more prominent in today's economy and because the packaging of a product is usually the last thing a consumer sees of that product before making a purchasing decision (McDaniel and Baker, 1977 Ampuero & Vila, 2006)

Holdway, Walker and Hilton (2002) state that packaging is used as a marketing vehicle aiding in communication and recognition of branding. Often coined as the "silent salesman" on the shelf, packaging informs consumers of product features and benefits that can be obtained if a certain product is to be consumed. (Rettie and Brewer, 2000 Silayoi & Speece, 2004 Ampuero & Vila, 2006). As product benefits are often contributed by packaging (for both hedonic and utilitarian purposes), packaging and product can be seen as one in the same (George, 2005 Rundh, 2009). Bahaeghel (1991) and Peters (1994) give reasoning for the idea that packaging could be the most imperative communication channel. These authors state:

- It touches almost all consumers in the category;
- It is present at the vital moment when a purchasing decision is to be made; and
- Consumers are actively involved with packaging as they assess it to obtain beneficial information (Ampuero & Vila, 2006)

Packaging uses persuasive sales tactics through usage of colors, shapes, typography, and graphics to evoke emotions and past memories in mental framework to ultimately create a consumer preference for one product to another (McNeal & Ji, 2003 Ampuero & Vila, 2006 Fishcer et. al., 2012).

Impulse shoppers make up a big part of the consumer subculture today. Nine out of ten consumers occasionally buy on impulse (Nancarrow et al., 1998 Welles, 1986). Also, 51 percent of in-store purchases are spontaneous and unplanned (Ampuero & Vila, 2006). Packaging is especially important in these types of purchases when there is generally not a brand preference. Drawing attention and communicating product benefits to the consumer is a must (Rundh, 2009).

Paperboard Packaging

Paperboard packaging is considered to be the largest segment of the packaging industry (Rundh, 2009). A Paperboard Packaging Alliance focus group conducted consumer research on paperboard packaging and determined that participants understood paperboard as a "comfort" packaging material. Some key conclusions from this research (Rundh, 2009 George, 2005) include:

1. The package helps create an overall product perception and promise
2. The package is the product until the product is consumed and the package is disposed of, reused, recycled
3. Older consumers see products packaged in paperboard as familiar and trusted. When properly executed, paperboard packaging strikes consumers –younger and older- as contemporary

Consumer Attention

Psychologist William James (1980), describes visual attention in his book *The Principles of Psychology:*

> Everyone knows what attention is. It is the taking possession by the mind, in clear and vivid form, of one out of what seems several simultaneously possible objects or trains of thought. Focalization, concentration, of consciousness are of its essence. It implies withdrawal from some things in order to deal effectively with others.

Simplified, attention is the purposeful attempt to understand a stimulus. It is an element of consumer perception. Consumers are exposed to several stimuli each and everyday. Exposure to a stimulus however does not always constitute attention. When shopping in a retail environment, consumers are exposed to several stimuli (packages) at one time and can often be overwhelmed (Babin and Harris, 2012). Attention criticality comes into play with a statement by MacInnis and Price (1987) saying, "The imaging of the individual brand leads to fewer brands being evaluated, improving the brand's likelihood of purchase." Many stimuli/objects are overlooked because the "visual attention mechanism has limited capacity" as it is difficult to fully concentrate on more than a few objects at one time. (Verghese & Pelli, 1992 Simons & Chabris, 1999 Simons, 2000 Clement, 2007).

Krugman (1994) states that attention is the first step to comprehension. Attitude and behavioral changes then follow comprehension. Therefore the first step in purchase persuasion of a product at the retail level is to gain the attention of the consumer to give

the product/package a chance to be selected. Gaining attention is a critical role of packaging in the retail environment as it can captivate new consumers to brands. Attractive packaging draws attention and can sell itself (Selame & Koukos 2002, Clement, 2007). Consumers examine stimuli with their eyes to gain knowledge and information, however their focus of concentration can be either intentional or unintentional (Duchowski, 2007). Ultimately, consumers choose the product they will buy with their eyes and visual stimuli will influence a purchasing decision at the point of purchase (Clement, 2007).

It can be difficult to distinguish between brands and determine product quality in a retail environment (Olsen, 1994). Consumers that experience this difficulty are more likely to choose products that can differentiate themselves by "break[ing] through the clutter of visual information" on the shelf and gaining attention (Pieters, Warlop and Wedel 2002). There are several ways to enhance attention in retail. "Packaging that contains distinct visual basic features such as shape, colour, orientation, contrast or size will attract consumers' visual attention and influence peoples' reaction and buying behavior regardless of their specific brand preferences" (Clement, 2007).

In advertising, research has shown that images draw more attention than verbal information (Bolen, 1984). Other research has shown that pictures on packaging can gain more attention for brands in stores (Underwood, Klein & Burke, 2001). Underwood, Klein and Burke (2001) found in their research that images on packaging primarily increased attention for low familiarity brands. These researchers determined that private

label brands that are not as well known as other brands might depend on extrinsic cues to captivate a consumer.

Eye tracking research by Pieters and Warlop (1999) studying attention to packaging showed a correspondence between gaze time and brand choice. Participants were found to gaze longer at preferred products. A factor of time pressure was also said to influence consumers' involvement by shifting their focus from visual elements to high information value elements (Clement, 2007).

Search

The search process generally begins with 'need recognition'. 'Need recognition' occurs when a consumer perceives a difference between an actual state and a desired state. For example, 'need recognition' can occur when a previously purchased product becomes diminished, such as milk. The consumer then recognizes a need to replenish this product and must go out to purchase another. The act of searching in a retail environment can be affected by multiple factors. Such factors can include product experience, involvement, perceived risk, value of search effort, time availability, attitudes toward shopping, personal factors, and situational influences. (Beatty & Smith, 1987 Babin & Harris, 2012).

Janiszewki (1998) states there are two types of visual search methods. These types are 'goal-directed' and 'exploratory' search. 'Goal-directed' search occurs when a consumer is familiar with the visual information to be displayed in the environment. Consumers using this type of search method access past search routines through mental

framework utilizing top down cognitive processing to articulate their search pattern. The 'goal-directed' search method is most frequently used out of the two methods and is associated with searching for a particular product. This type of search creates a visual search pattern for a certain brand, influencing attentive dwell or gaze time (Treisman & Gormican, 1988). 'Exploratory' search is associated with "browsing" in a retail environment creating a more random search pattern. This method of search is considered to occur through bottom up cognitive processing and generally takes a longer time to complete. (Janiszewski, 1998 Gomes, 2012).

The visual attention aspect of *orientation* is a form of low-level parallel search (Posner, Snyder and Davidson 1980). Orientation happens when a consumer generally browses a shelf not focusing on anything in particular, but is able to minimally analyze multiple objects at a time. The orientation process then continues until the intended product/package or other attractive package gains consumer attention. When this *discovery* occurs, parallel search then shifts to serial search. Serial search is a much more involved search in which consumer focus is directed to specific packaging. While in serial search, consumers tend to perceive only one piece of information at a time (Clement, 2007 Gibson, 1941). Finally, the acts of *evaluation* and *verification* occur in which the consumer compares a few alternatives and makes a final decision (Russo & LeClerc, 1994).

Consumer Perceptions

Perception can be defined as a consumer's awareness and interpretation of reality (Babin & Harris, 2012). The process elements of consumer perception are exposure to a stimuli, attention to the stimuli, and comprehension of the stimuli. Perception can be influenced by information organization, atmospherics, and conditioning. Organizational processes are explained by how consumers label (organize) information. These processes can change consumers' expectations for a product and their perception of the benefits. Store atmosphere can also greatly affect perceptions. Atmospheric influences include music, lighting, color, type of sales person, and store layout. Conditioning is defined as a form of unintentional learning, which can enhance consumer comprehension of a stimulus and also encourage repeat behavior. The main types of conditioning are classical and instrumental. Classical conditioning is known as a change in behavior that occurs through associating one stimulus with another stimulus that naturally causes a reaction within the body. Instrumental conditioning is defined as behavior conditioned through reinforcement whether it is positive, negative, or punishment (Babin and Harris, 2012).

Past research has informed the packaging industry of consumer perceptions to packaging in general and certain packaging attributes. Consumers' attitudes toward hard-to-operate and wasteful packaging are continually growing negative. Consumers are now becoming more conscious of the negative side effects that un-ecofriendly packaging (plastics) have (Holdway, Walker & Hilton, 2002). Perception of packaging can also be influenced by design variations such as "type, number, size, combination of graphical

design shapes, variations in colour and colour combinations, and variations in container shape and size" (Westerman et. al., 2013).

Kalick and Cardello (1991) conducted research to discover the importance of package appearance on food quality. These researchers designed a study consisting of four different package stimuli including three packages that used vibrant colors and appealing design and one package that was a plain meal ready to eat (MRE) package. Participants were then asked to rate the packaging on multiple attribute scales. Overall, the appealing packages were preferred over the MRE package and were said to be of much higher quality (Kalick & Cardello, 1991 Gomes). In this example, it can be seen that attractive design changed the consumer perception of product quality. In another similar study conducted by Kramer et. al., (1989) a pudding was packaged in four different styles to be rated and consumed by participants. The packaging styles were one basic white package, two different military style packages, and one commercial style package. Results from this study showed that the commercial style package was rated significantly higher than the other packages on an acceptability scale. Also, the pudding inside of the commercial package was consumed more than the other packages showing that packaging altered consumer perception of acceptability (Kramer et al., 1989 Gomes 2012).

Sarah Nassauer's (2011) article titled "A Food Fight in the Product Aisle" discusses one interesting perception consumers have on packaging/products in supermarkets. Stores are finding out that consumers are considerering products placed near the produce section to be "fresher and [of] higher quality". Nassauer states that

"packaged-food manufacturers" who make products such as cheese and juices are trying to get these products physically displayed by the produce section in stores. Companies are now seeing a "halo effect" around the produce section in grocery stores. In other words, some products that are in close proximity of the produce section may be perceived as fresher products. Also, produce sections are now being placed closer to the front entrance of super markets. Many consumers say that the freshness of produce a grocery store has determines their loyalty to the store. Within Nassauer's article, Mike Siemienas says, "[fresh produce is] the first thing people see and really sets the tone for somebody's shopping experience. However, some companies are not happy about companies trying to push packaged products close to their produce sections saying that this new location will give the products 'freshness credibility'."

Yet another illustration of consumer perception of product deals with its weight perception. A study conducted by Raghubir and Krishna (1999) revealed that consumers' volume perceptions were correlated with their preferences. Specifically, the more voluminous a package appeared, the more that package was preferred. "This perceived heaviness, or visual weight, is likely to be a cue for product quality in some product categories (Deng, 2009)."

Decision Making Process

Consumer decision-making can be described as the process to which a consumer approaches a choice to purchase something, makes a choice, and then evaluates this result in terms of utilitarian and hedonic value (Lysonski et al., 1996 Babin & Harris, 2012). A

product that helps to solve a problem has utilitarian value. A product or product experience that causes immediate gratification in an emotional form has hedonic value (Babin & Harris, 2012). Five different phases structure the decision making process. These phases are:

1. Need recognition
2. Search for information
3. Evaluation of alternatives (price and quality)
4. Choice/Purchase
5. Post-purchase evaluation

Babin and Harris (2012) underline three different types of decision making approaches consumers use: habitual decision making, limited decision making, and extended decision making. These approaches depend on the involvement a consumer has towards the act of purchasing a product and the consumers' perceived risk of purchasing that product. Involvement is defined as the "degree of personal relevance that a consumer finds in pursuing value from a given act (Babin & Harris, 2012)". Perceived risk is defined as the perception of undesirable consequences that could happen due to a process and the available doubt determining which process is best. (Babin & Harris, 2012). Types of risk include financial, social, performance, physical, and time (Prasad, 1975 Babin & Harris, 2012). Involvement and risk are often correlated so that when there is low involvement, there is low risk and vice versa.

Habitual decision-making is a low risk, low involvement form of decision making. Choice in this case is based on habit/brand loyalty. The term coined "brand

inertia" relates to this form of decision-making. Unlike brand loyalty, brand inertia occurs when a product is bought repeatedly without attachment to a particular brand. Limited decision-making is a medium risk, medium involvement form of decision making. In this type, brand comparison is at a minimum and there is low search with the consumer often buying based on past experience. Extended decision-making is a high risk, high involvement situation. This process is generally lengthy in the forms of search and evaluation with high probability of cognitive dissonance, or buyer's regret (Babin & Harris, 2012).

During the decision making process, unique packaging can draw attention, communicate product benefits and ultimately give a product the chance of consideration (Silayoi & Speece, 2004). Silayoi and Speece (2004) state there are four main packaging elements that can affect a consumer's purchasing decision. These elements can be separated into two different categories: visuals and information. Visual elements include graphics and size/shape of a package. The visual elements are generally affective and can influence perceived hedonic value (Underwood et. al., 2001). Underwood et. al., (2001) states that graphics can conjure "imagery processing and anticipation of the sensory aspects of a product" influencing a consumer to focus on "that product's experiential benefits." Informational elements such as nutritional facts and statements relate to consumer cognitive processing when making a decision (Silayoi & Speece, 2004). However, visual processing is said to rule information processing (Posner, Nissen & Klein, 1976 Deng, 2009).

Package Structural Design

Packaging design is increasingly becoming more significant especially in relation to marketing and communication. (Rettie & Brewer, 2000). Managers are now realizing the potential that packaging has to differentiate similar products on retail shelves (Spethmann, 1994 Underwood, 1999). Choosing the proper material, shape, and sizing for a package can minimize logistical costs (Rundh, 2009). Past research "suggest[s] a growing role for product packaging as a brand communication vehicle for consumer products (Rundh, 2009 Underwood et al., 2001)." Packaging structures in particular have increased "influential power" of purchasing decisions in retail environments (Rundh, 2009).

When designing a package for a retail environment, it is critical to understand the power of visual attraction. Designers should strive to gain attention by designing packages that stand out on the shelf and positively reflect brand image (Rundh, 2009). However, packaging should not be designed with the idea of "being different just for the sake of being different". Packaging should be designed with a particular target audience in mind and should avoid coming across as gimmicky (Hill, 2011).

Howard and Ostlund (1973) discuss three main factors that both marketers and designers should address when going through the packaging design process. The factors in this model, called the "Howard-Ostlund Model", include "a consumer's past needs and wants; a design's ability to be noticed; and a design's ability to communicate effectively (Howard & Ostlund, 1973 Gomes, 2012)". Designers should also be mindful of target audience's culture, sustainability perception, and preferences (Rundh, 2009).

Graphic Design

Packaging graphic design components include (but are not limited to) colors, typography, graphical shapes and images (Rundh, 2009). Visual elements such as graphics and color can play major roles in influencing a consumer to make a purchasing decision (Silayoi & Speece, 2004). Rundh (2009) also states that consumer perception can be influenced by color selection, which can "reinforce the brand name or image of the product". However, consumer culture can influence color preference due to the fact that different cultures are exposed to different graphic design styles (Silayoi & Speece, 2004). Rundh (2009) continues in his article titled "Packaging design: creating competitive advantage with product packaging" stating that balanced graphics in combination with creative shape and color can evoke emotion. This evocation of emotion can promote product appeal and aid in persuasion of purchasing a product (Rundh, 2009).

Much graphic design in today's retail utilizes pictures on packaging. Attractive imaging on packaging can spark "lifestyle aspirations" a consumer may have, based on mental conditioning within the consumer's mental framework. Images such as calm beaches, smoky mountains, and other places of luxury (Rundh, 2009) can aid in determining the valence (positivity or negativity) a consumer gives to a package. In low involvement situations such as grocery shopping, "marketing and image building" play a large role in decision-making. "The evaluation of attributes is of less importance in low involvement decisions, so graphics and color become critical" (Silayoi & Speece, 2004 Grossman & Wisenblit, 1999). Underwood et. al., (2001) conducted research through virtual reality simulation to determine the effects of product imagery on attention to

brands. These researchers found that product pictures on packaging could improve attention, especially for low familiarity brands. This result suggests that product pictures play a very important role in gaining consideration for a product or brand (Underwood et. al., 2001). They also state that the vividness of a product picture could be a "very diagnostic piece of information in some product purchase situations" because it can "evoke imagery processing of product consumption."

Actual Product vs. Graphical Representation of Product

Past research has shown the significance of product imagery on packaging as it relates to consumer perception (Underwood et. al., 2001 Silayoi & Speece, 2004 Grossman & Wisenblit, 1999). The question now arises; what is a more effective way of displaying a product to consumers, graphically or by actually displaying the product itself through structural packaging design?

Toni Gomes (2012), a now graduated Master's student at Clemson University, conducted consumer research to determine consumer preference to beverages with full body labels versus partial body labels on clear bottles. Partial labeled bottles allowed for actual product to be seen through packaging. She found through this research that consumers significantly preferred partial body labels on packaging rather than full body labels from consumer choice recorded on shopping lists. Testing was conducted in a retail environment in which consumers were fitted with eye tracking glasses, were given a shopping list, and then asked to shop in the environment as they normally would. Participants were asked to write the preferred products on their shopping list to be

analyzed later. Eye tracking data showed that partial labeled packages were fixated on (fixation count) more than full body labeled packages**.**

The paper to which this study is an extension to (Hurley, R. A. et. al., 2012) provides insight to research possibilities pertaining to actual product display versus graphical representation on packaging. The past study analyzed consumer behavior and preference to grilling tools packaging in a retail environment. Three grilling products including tongs, forks, and spatulas were used as test products. Each of these three products was packaged in four different carton style containers varying in the amount actual product exposed. The four packaging styles displayed actual products visually by percentages of 100, 90, 40, and 0 through a die-cut window on the primary display panel. Participants were fitted with eye tracking glasses, given a shopping list, and asked to shop the environment as they normally would. Participants were asked to write down their product of choice for each category on the provided shopping list. Statistical analysis of actual product selection from the shopping list and eye tracking data were analyzed once the study was completed. Shopping list results showed that a significant number of participants chose the 100% visible package style over all other packaging styles. Eye tracking metrics including total fixation duration, average fixation count, and time to first fixation were statistically analyzed for significance. Participants showed a significant difference in total fixation duration and average fixation count for the 0% visible package style. This package style received significantly less fixations and less total fixation duration compared to other package styles.

In the previous experiment, the stimuli were displayed in a 3 x 4 pattern with one product type per row and on package style per column. During this experiment the 3 x 4 grid was permuted every two hours by removing the bottom row (tongs for example), shifting the other two rows down one row, and replacing the top row with the previously removed product. Because of this permutation style, package styles stayed in the same column throughout the entirety of the experiment. Columns from left to right by package style visibility were 100%, 90%, 40%, and 0%. The Gutenberg Diagram (Lidwell, et al., 2010) states that when viewing a display, generally people tend to start their visual analysis at the top left of a display and gradually move to the bottom right. Lidwell (2010) also describes the F-pattern. The F-pattern suggests that the left side of a display (generally in web design) is a very strong visual area compared to the right side. Leaving the 100% visible package style on the left of the visual display could have contributed to an increase of consumer visual attention. Eye tracking results also showed that the 90% visible package style had a significantly faster time to first fixation. Time to first fixation for this experiment was defined as the amount of time in seconds it took a person to fixate on a particular packaging style. However, in this experiment the 90% visible package style showed a white background to the product, compared to blue coloring of all other packages, that could have initially grabbed the consumers' attention leading to a faster time to first fixation.

A new display system was created from the past research conducted on grilling tools to minimize color and location variable influence. The display system is explained in the '*Experimental Design'* section of Chapter 3 in this paper.

Eye Tracking Methods

An ‘eye tracker’ is the shared name used for a measurement device that tracks and measures eye movements (Duchowski, 2007). Data from eye tracking can offer various metrics to which a researcher can diagnose attentive behavior. Two forms of basic eye movements are used to create data for analysis. These basic movements are called ‘fixations’ and ‘saccades’. Fixations are made of rapid eye movements called microsaccades and are described as stabilizations of the retina on a motionless article of interest (Duchowski, 2007). Saccades are defined as rapid eye movements or jolts of the eye that occur when focusing on new targets within a visual scene. These rapid eye movements are used to reposition the fovea within the visual scene.

Two main eye-monitoring techniques are used in eye tracking. One measures eye movements in relation to the head while the other measures eye movements in relation to space or the “point of regard (POR)” (Young & Sheena, 1975). The technique that measures eye movements in relation to point of regard is frequently used when the experimental concern is to identify objects in a visual scene. There are generally four main methods for measuring eye movements. These methods include scleral contact lens/search coil, Electro-OculoGraphy (EOG), Photo-OculoGraphy (POG) or Video-OculoGraphy (VOG), and video-based combined pupil and corneal reflection (Duchowski, 2007).

The most common type of eye tracking that utilizes point of regard measurement is the video-based corneal reflection eye tracker, which can be table-mounted or mounted to the head. To record eye movement measurements this way, “either the head must be

fixed so that the eye's position relative to the head and point of regard coincide, or multiple ocular features must be measured in order to disambiguate head movement from eye rotation (Duchowski, 2007)." Ocular features used to disambiguate head movement from eye rotation include corneal reflection and pupil center. Small cameras and image processing hardware are used to calculate the point of regard live. X- and Y- coordinates are then outputted relative to the visual scene. The video-based corneal reflection eye tracker is most practical for interactive uses because it is moderately accurate and relatively unobtrusive. This form of eye tracking also has the advantage of easy graphics system integration compared to most other types (Duchowski, 2007). Mobile eye trackers using this method allow subjects to freely move around an environment (retail) while continuously tracking eye movement.

CHAPTER THREE

MATERIALS AND METHODS

Objectives

The purpose of this research was to determine if there was a significant difference in preference (visually and by choice) for packages with graphical representations of products versus packages with windows that show the actual products. Another purpose for research was to determine if an increase of actual product exposure (by package window size) could influence a consumer's attention for packaging, leading to an increase in probability of the product actually being purchased.

Participants

The study had a total of 130 participants. All participants in the study were registered attendees at Pack Expo 2012. The convention was held at the McCormick Place Convention Center in Chicago, Illinois. Multiple advertisements by way of magazine, newspaper, and television were used to promote interest and draw participants to the study. Instead of recording participant names, an identification number used for reference purposes was given to each individual. There was no incentive to participate in the study. Participants were also informed that they did not have to participate in the study and they could end the study at any point in time.

Apparatus and Eye Tracking

Tobii eye tracking glasses were utilized to record eye movements throughout the study. These video-based combined pupil and corneal reflection eye tracking glasses are monocular, sampling only from the right eye and have a sampling rate of 30 Hz with a 56° x 40° recording visual angle. The glasses must be plugged into a Tobii Recording Assistant with a small cord, which aids in calibration of the glasses and data gathering (Figure 1).

Figure 1. Tobii eye tracking glasses with Recording Assistant courtesy of Tobii Technology.

This small Recording Assistant (11.938 x 7.874 x 2.794) recorded eye tracking data as well as a video of the participant's visual field during the study. All of this data was stored onto a standard digital card for extraction into Tobii Studio software. Tobii Studio was used to analyze and aggregate particular eye tracking metrics including time to first

fixation, total fixation duration, and total fixation count which are further defined later in the paper. Infrared (IR) markers (Figure 5) were used in combination with the glasses and Recording Assistant to define an area of analysis (AOA). An AOA is defined as a 2D plane determined by placement of four or more IR markers. This AOA is similar to the idea of an area/region of interest (A/ROI) that is frequently used in eye tracking research to define sections of a stimulus to filter eye movements. AOA's are hardware implemented and are required to collect data when the glasses are being used. AOI's were created in Tobii Studio software and used to help analyze more specific items such as packaging type. Figures 2, 3 and 4 show AOI's for scenarios tested not including mirrored scenarios. IR markers help delineate this AOA only when they are set into an IR marker holder. Otherwise, they are used for calibration of the glasses, emitting a green light to communicate this mode they are in.

Figure 2. AOI examples for pasta packages.

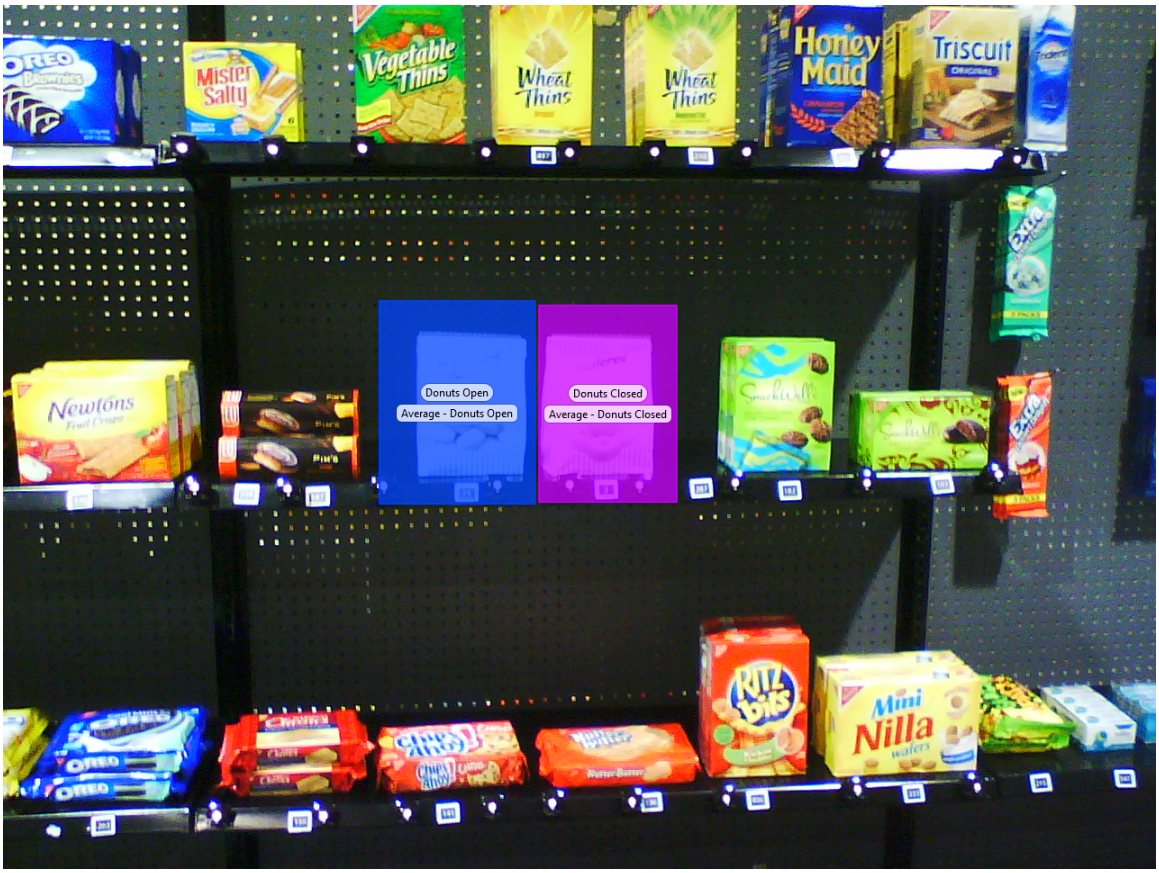

Figure 3. AOI examples for donut packages.

Figure 4. AOI examples for bacon and pizza packages.

Figure 5. IR marker representation courtesy of Tobii Technology.

Calibration

Calibrations utilized Tobii eye tracking glasses, Recording Assistant, and an IR marker. Participants were asked to position the glasses on their face and were told to look straight at a wall approximately one meter away to allow the instrument to find the location of their pupil. The Recording Assistant then displayed a 3 x 3 point grid for the experimenter to reference. The experimenter then informed the participant to follow the IR marker with their eyes and keep their head as still as possible. The experimenter then placed the IR marker on the wall moving it to each reference point according to the Recording Assistant. Once the Recording Assistant had successfully found the participant's pupil at each of the nine points, it gave a calibration score and prompted the user to continue. The "Record" button on the side of the Recording Assistant was then pressed to begin the recording/data gathering.

Retail Audit

Online research was conducted utilizing Mintel's Global New Products Database to determine most frequently used package and window dimensions (modes) for pasta, powdered donuts, bacon, and pizza packages. All research samples are/have been sold in the USA. Researched pasta, bacon, and donut packages primarily used a rectangular window shape. A variety of different window shapes were seen while researching pizza packages. These shapes included rectangles, triangles, and circles. The modal shape used was a circle. Therefore, the radius mode of all researched pizza packages was selected for

100% window use on pizza stimuli (Table 1). Mintel research data can be seen in Appendices A-D.

Table 1. Mintel modal research for pasta, donuts, bacon, and pizza packages from the USA.

Modal Package and Window Dimensions		
	Package L x W x H (mm)	Window L x H or circle size, radius (mm)
Pasta	130 x 60 x 185	75 x 40
Donuts	150 x 70 x 250	100 x 40
Bacon	265 x 18 x 150	130 x 45
Pizza	305 x 35 x 305	2/5, 116

Stimulus Package Design

A total of four different products were utilized in the study and each of these products was packaged in four different structures. The products included pasta, powdered donuts, pizza, and bacon. All products were found to have packages with and without windows across multiple brands (Mintel). The fabricated four different packaging styles included a carton with a graphical representation of the product (no window), a carton with a modal size window (100% of the determined modal dimensions), a carton with a above modal size window (125% of the determined modal dimensions), and a carton with a below modal size window (75% of the determined modal dimensions). The package style with the graphical representation of the product only was considered to be the control for the experiment and was visible during the each

shelf scenario. Throughout the continuation of this paper, these stimuli packages are respectively referred to as: 75% window, 100% window, 125% window and graphic packages. A generic graphic design was imposed on all stimuli packages based on product category to avoid brand recognition and loyalty.

Coated Kraft paperboard was used to create all of the said packages. A Roland VersaUV LEJ-640 was used to print all packages and an Esko Kongsberg iXL44 was used to cut/score all packages. Packages were then assembled and placed in their respective sections of the retail environment. Figures 7, 8, 9, 10, and 11 show shelf scenarios of all package types. Number tags were created and placed on the shelving below each product for participants to delineate which products they preferred. Shopping lists were utilized for participants to write down their preferred products. Three random shopping lists were created consisting of six products including bowtie pasta sauce, coffee, pasta, powdered donuts, pepperoni pizza, and bacon. Coffee and pasta sauce were used as filler products to distract consumers from the research objective. These shopping lists can be seen in Figure 6. Pricing was removed from the study to reduce variables and solely concentrate participants on packaging styles.

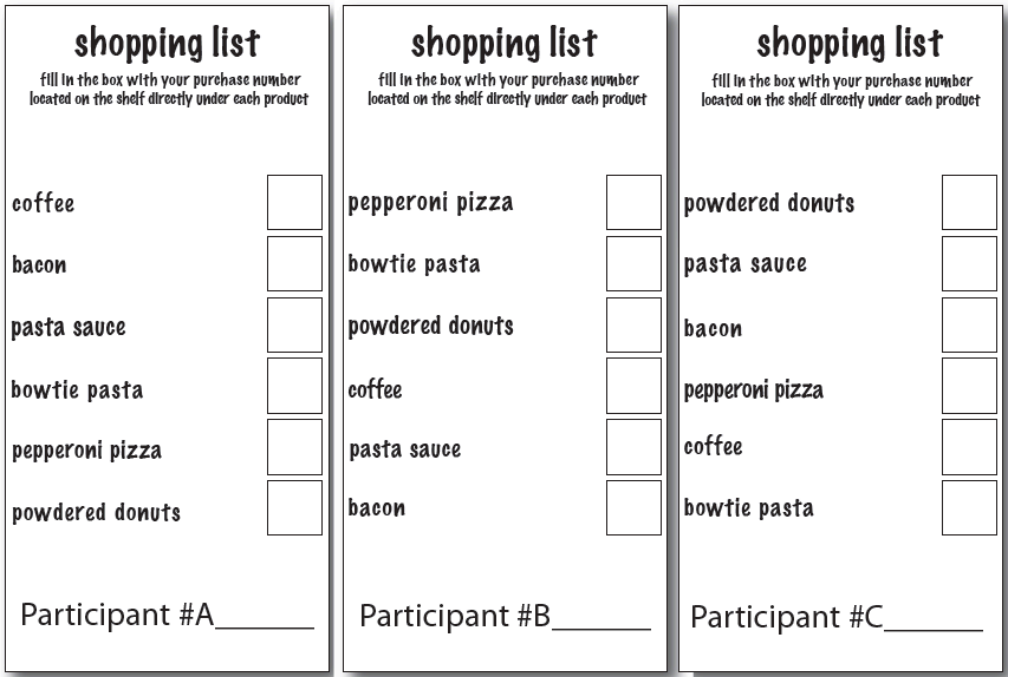

Figure 6. Shopping lists were given to participants in alternation.

Experimental Design

The experiment took place at Pack Expo 2012 Chicago, Illinois in a realistic shopping atmosphere called CUshop™, which was shipped from its origin of Clemson, South Carolina. The shopping environment measured approximately 8.25489 m X 6.04418 m and was composed of appropriate gondola display shelving, refrigerator and signage to promote a more realistic shopping atmosphere.

The study had a 4 (products) x 4 (package types) experimental design. To minimize variables seen in the grilling tool study previously discussed, only two package types per product were displayed at any given time; the control package (graphical representation of product without window) and one variable package (no graphical

representation of product with window). This was also done to prevent the participants from being overwhelmed by a majority of windowed packages. These scenarios were then mirrored for each product tested product every 10 participants by swapping the control package with the respective variable package to help counterbalance the scenario. Windowed stimuli packages were fabricated so that only product could be seen through windows (no visible background). The study lasted a total of three days. Day 1 was for testing the control packages vs. 75% window packages, Day 2 for testing the control packages vs. 100% window packages, and Day 3 for testing the control packages vs. 125% window packages. Products were placed in their respective product categories throughout the store. All stimulus packages were placed side by side (except pizza packages) at eye level for the consumer to achieve maximum eye tracking accuracy and promote consistency. Pizza packages were placed vertically on two shelves due to refrigerator size constraints.

Window Size: 75% Mode

Window Size: 100% Mode

Window Size: 125% Mode

Figure 7. Shelf scenarios of bowtie pasta (mirrored scenarios not shown).

Window Size: 75% Mode

Window Size: 100% Mode

Window Size: 125% Mode

Figure 8. Shelf scenarios of powdered donuts (mirrored scenarios not shown).

Window Size: 75% Mode

Window Size: 100% Mode

Window Size: 125% Mode

Figure 9. Shelf scenarios of bacon (mirrored scenarios not shown).

Window Size: 75%
Mode

Window Size: 100%
Mode

Figure 10. Shelf scenarios of pepperoni pizza for 75% and 100% window packages (mirrored scenarios not shown).

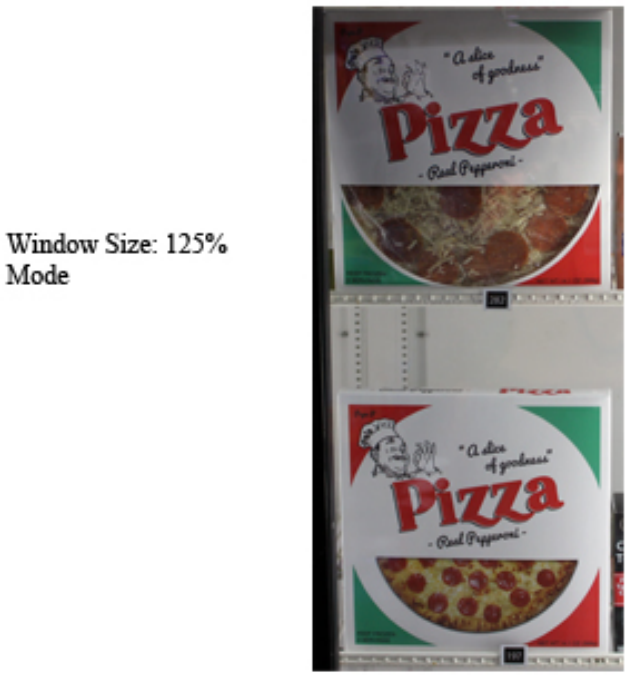

Figure 11. Shelf scenario of pepperoni pizza for 125% window package (mirrored scenario not shown).

Procedure

Each participant who willingly volunteered to participate in this study was informed that it would take approximately 5-10 minutes and that they could end the study and leave at any time. Once a participant consented, a researcher then escorted him/her to the calibration platform (seen in Figure 12) to be properly calibrated before entering the shopping environment.

Figure 12. Researcher calibrates a subject before entering the shopping environment.

Once calibration was completed, the researcher escorted the participant to the entrance of CUshop™. The participant was then handed one of three predetermined shopping lists and instructed to shop for each item on the list as they would normally. When the participant made a selective decision, they were instructed to write the corresponding product purchasing number (located on the shelf below each product) in the related white box on the shopping list. Participants were also asked not to touch any products as this could disrupt some of the eye tracking data recording.

When a participant finished shopping, they were then asked to complete a short survey consisting of demographic questions as well as a revised Witmer-Singer Presence

Questionnaire 2.0. This questionnaire helped measure a person's sense of being fully present and involved in their task. The Witmer-Singer Presence Questionnaire was used to determine a participant's 'presence' by dividing questions into subscales of immersion, involvement, sensory fidelity and interface quality. It has been found through multiple eye tracking experiments in CUshop™ that even though the Witmer-Singer questionnaire is designed for virtual reality experiments, it is still a useful tool for determining the immersion of participants in CUshop™ (Tonkin et. al., 2011). The scale also aided in determining the invasiveness of the eye tracking glasses. Modifications of the questionnaire included deletion of irrelevant questions and emphasizing of the immersion subscale. While a participant was taking their survey, recorded data from the Recording Assistant's standard digital card was loaded onto a computer for further analysis with Tobii Studio software.

Eye Tracking Metrics

Three eye tracking metrics were studied to determine which packages participants visually preferred. The metrics collected were time to first fixation (TTFF), total fixation duration (TFD) and fixation count (FC). 'TTFF' was defined as the time in seconds it took a participant to first fixate on an AOI after they had entered the range of the AOA (approximately 2.5 m). 'TFD' was defined as the total time in seconds a participant fixated on a particular AOI. 'FC' was defined as the number of fixations on a particular AOI. This last metric was measured with a velocity filter with a 30°/s point-to-point velocity threshold.

Statistical Analysis

For eye tracking data analysis, a two-factor analysis of variance (ANOVA) test was performed between window type packages and product types to determine significant association. This ANOVA test was conducted for each of the eye tracking metrics being inquired (FC, TFD and TTFF). An ANOVA test was used for data analysis here because of eye tracking data being numerical.

For shopping list data, a chi square test of independence was performed over all stimuli to determine significant association between graphic and window type packages. This type of test was applied because shopping list results were categorical rather than numerical for the populations. Another chi square test was performed between window type packages (75%, 100% and 125%) to determine significant association.

CHAPTER FOUR

RESULTS AND DISCUSSION

Although a total of 130 subjects participated in the study, 19 of those subjects had invalid eye tracking data due to weak calibration and were removed from analysis leaving 111. However, for analysis of variance purposes (ANOVA), the first 35 subjects per day were analyzed to keep sample numbers consistent. This was due to slightly uneven numbers of participants for each scenario type. Shopping list data was analyzed for all 130 participants.

Recorded eye movement data was exported from Tobii Studio and statistically analyzed in Microsoft Excel. A modified version of the Witmer-Singer Presence Questionaire 2.0 was used to gather qualitative data (see *Survey Results and Statistics* section). A 95% confidence interval was used for all applicable statistical analyses.

Eye Tracking Results and Statistics

A two-factor (window type and product type) repeated measures analysis of variance (ANOVA) on fixation count (FC) revealed no significant differences among window type packages [$F(2,11)=0.21$, $p > 0.05$] (Table 2). Strong significance was seen between product types [$F(3,11)=23.5$, $p < 0.05$]. This could be due to different stimuli package' shapes, sizes and color schemes used between product categories. For example, the pizza package's primary display panel was about twice the size of all other stimuli primary display panels.

Pairwise *t*-tests were performed between window and graphic packages showing no significant differences ($p > 0.05$ for each pair). These results can be seen in Table 3. Overall, window size and presence did not have a significant effect on participants' fixation counts. Heat maps of aggregate fixation counts for all participants can be seen in Figures 13-24. Due to limitations in the software, mirrored scenario participant data was not included in the displayed heat maps. Figures 13, 14 and 15 chart FC information for each scenario relating to package and product type. A sample participant scan path based on the two basic eye movements, fixations and saccades, can be seen in Figure 25.

Table 2. FC ANOVA table between window packages (columns) and products (sample).

ANOVA
FC

Source of Variation	SS	df	MS	F	P-value	F crit
Sample	3192.0625	3	1064.02083	23.4995376	4.4415E-14	2.62614691
Columns	18.9212963	2	9.46064814	0.20894408	0.81152490	3.01720189
Interaction	157.930555	6	26.3217592	0.58133182	0.74528763	2.12016610
Within	19016.9166	420	45.2783730			
Total	22385.8310	431				

Table 3. FC *t*-test table of p-values between graphic and window packages.

FC *t*-test P-values

Pasta			
	75% Window Package	100% Window Package	125% Window Package
Graphic Package	0.735005	0.856008	0.101293
Donuts			
	75% Window Package	100% Window Package	125% Window Package
Graphic Package	0.334054	0.120055	0.749785
Bacon			
	75% Window Package	100% Window Package	125% Window Package
Graphic Package	0.088615	0.245159	0.394241
Pizza			
	75% Window Package	100% Window Package	125% Window Package
Graphic Package	0.221208	0.096943	0.322874

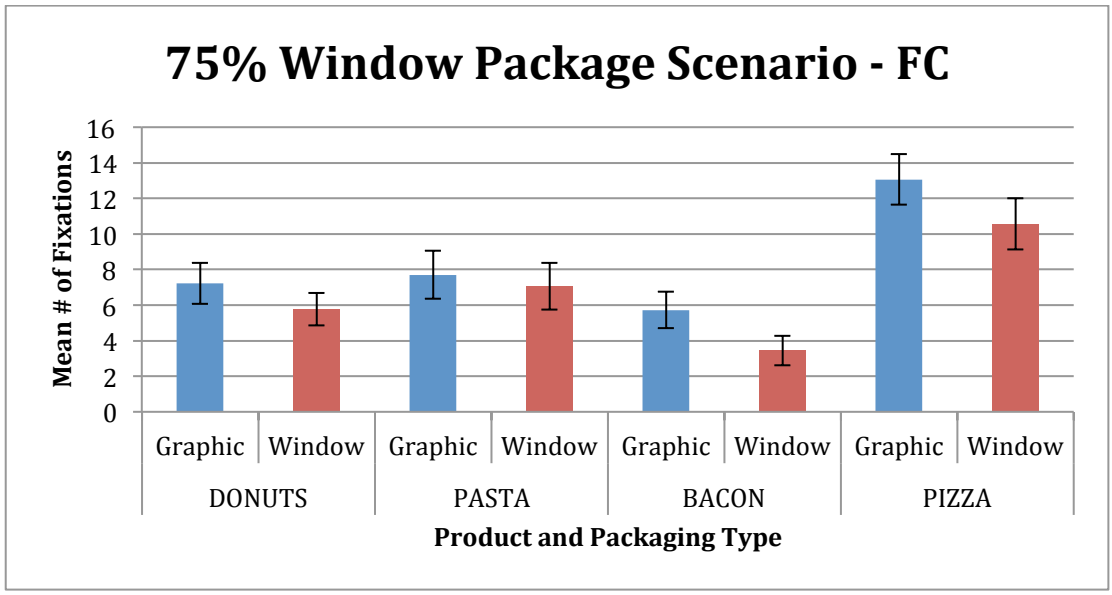

Figure 13. Fixation count averages between product and package types for 75% window packages.

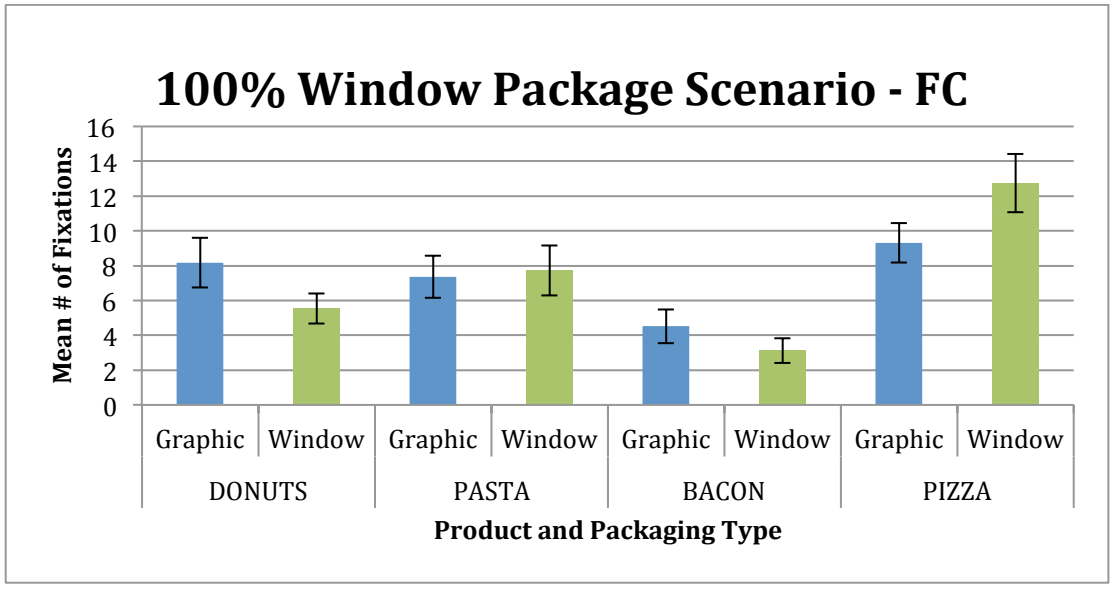

Figure 14. Fixation count averages between product and package types for 100% window packages.

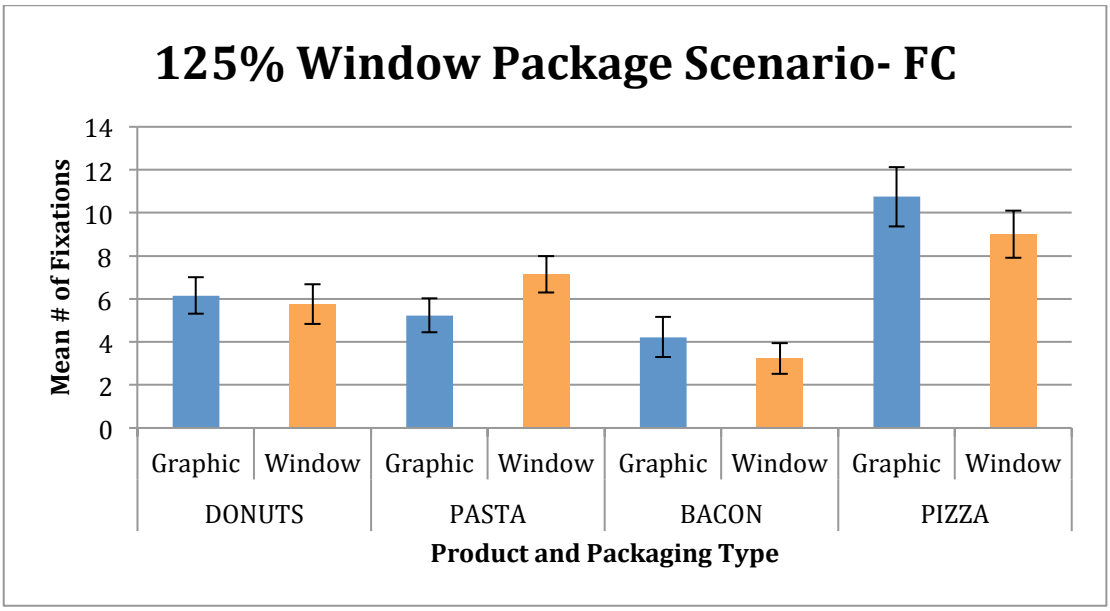

Figure 15. Fixation count averages between product and package types for 125% window packages.

Figure 16. Aggregate heat map of all participants' fixations for 75% window pasta package scenario. Window package is on the left and graphic package is on the right.

Figure 17. Aggregate heat map of all participants' fixations for 100% window pasta package scenario. Window package is on the left and graphic package is on the right.

Figure 18. Aggregate heat map of all participants' fixations for 125% window pasta package scenario. Window package is on the left and graphic package is on the right.

Figure 19. Aggregate heat map of all participants' fixations for 75% window donuts package scenario. Window package is on the left and graphic package is on the right.

Figure 20. Aggregate heat map of all participants' fixations for 100% window donuts package scenario. Window package is on the left and graphic package is on the right.

Figure 21. Aggregate heat map of all participants' fixations for 125% window donuts package scenario. Window package is on the left and graphic package is on the right.

Figure 22. Aggregate heat map of all participants' fixations for 75% window bacon and pizza package scenarios. Window package is on the left and graphic package is on the right for bacon while window package is on the top for pizza and graphic package is on the bottom.

Figure 23. Aggregate heat map of all participants' fixations for 100% window bacon and pizza package scenarios. Window package is on the left and graphic package is on the right for bacon while window package is on the top for pizza and graphic package is on the bottom.

Figure 24. Aggregate heat map of all participants' fixations for 125% window bacon and pizza package scenarios. Window package is on the left and graphic package is on the right for bacon while window package is on the top for pizza and graphic package is on the bottom.

Figure 25. Example scan path of random participant for 100% window package pasta scenario. Orange dots represent fixations while orange lines represent saccades. In this case, it appears that the participant had more fixations on the graphic package (right).

A two-factor (window type and product type) repeated-measures ANOVA on total fixation duration (TFD) revealed no significant differences among window type packages [$F(2,11)=1.84$, $p > 0.05$] (Table 4). Strong significance was seen between product types [$F(3,11)=40.6$, $p < 0.05$]. This could be due to different stimuli package' shapes, sizes and color schemes used between product categories.

Pairwise *t*-tests were performed between window and graphic packages (Table 5). The package type with the 75% window had a significantly lower duration time (p value = 0.03, $p < 0.05$) than the graphic package for the bacon product. Bacon was presented in its unprepared form through windowed packaging. Bacon graphics showcased prepared form of the product. One reason the graphic bacon package had longer fixation duration could be that consumers were more interested in seeing how the product looked prepared rather than unprepared. Significant differences were not seen among other types. Overall, window type did not have a significant effect of participants' fixation duration. However, product graphic presence in the case of the 75% window package did have a significant effect on participants' fixation duration. Significance seen here may not be meaningful as time deviations are in milliseconds. Figures 26, 27 and 28 chart TFD information for each scenario relating to package and product type.

Table 4. TFD ANOVA table between window packages (columns) and products (sample).

ANOVA
TFD

Source of Variation	SS	df	MS	F	P-value	F crit
Sample	61.4196990	3	20.47323302	40.62012099	4.5691E-23	2.6261469
Columns	1.85850555	2	0.929252778	1.843693188	0.15951028	3.0172018
Interaction	5.85423148	6	0.975705247	1.93585767	0.07378962	2.1201661
Within	211.687155	420	0.504017037			
Total	280.819591	431				

Table 5. TFD *t*-test table of p-values between graphic and window packages.

TFD *t*-test P values

Pasta			
	75% Window Package	100% Window Package	125% Window Package
Graphic Package	0.777285	0.552231	0.120996
Donuts			
	75% Window Package	100% Window Package	125% Window Package
Graphic Package	0.325599	0.155794	0.852403
Bacon			
	75% Window Package	100% Window Package	125% Window Package
Graphic Package	0.030073	0.100565	0.104719
Pizza			
	75% Window Package	100% Window Package	125% Window Package
Graphic Package	0.370222	0.205919	0.293599

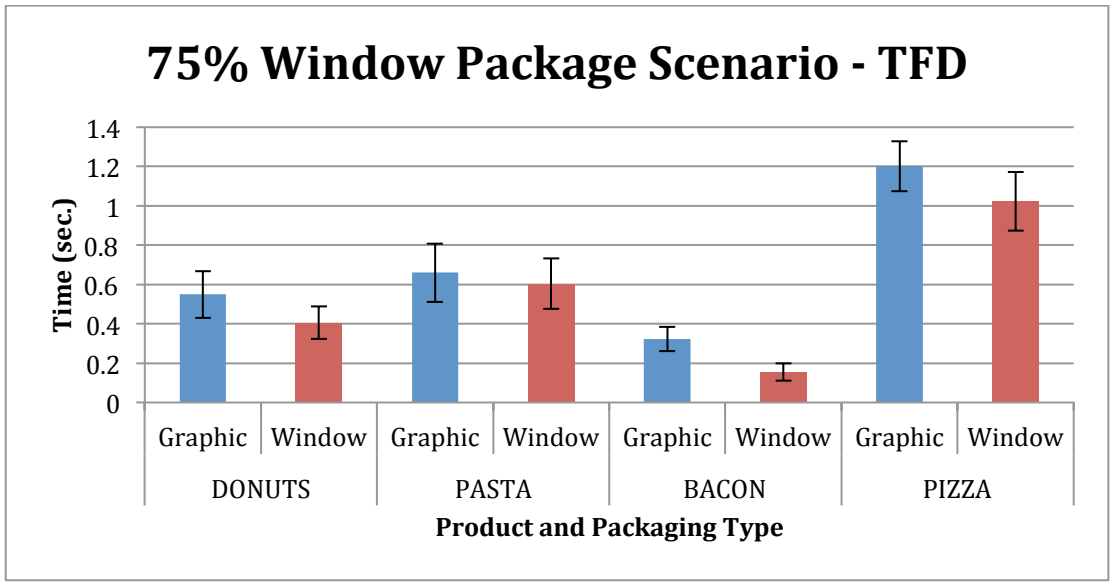

Figure 26. Total fixation duration time averages between product and package types for 75% window package scenarios.

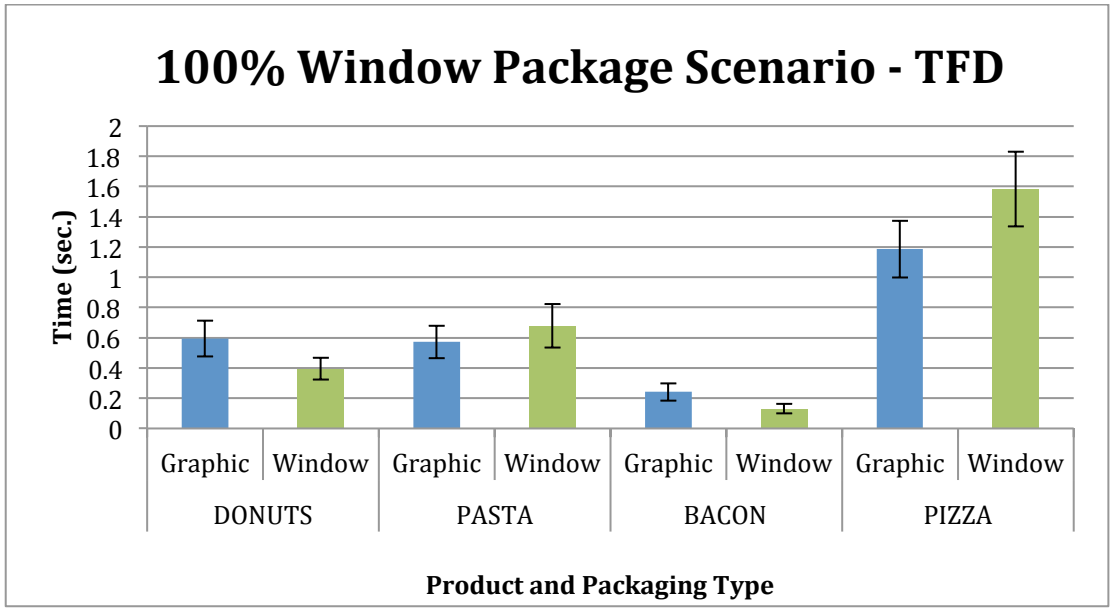

Figure 27. Total fixation duration time averages between product and package types for 100% window scenarios.

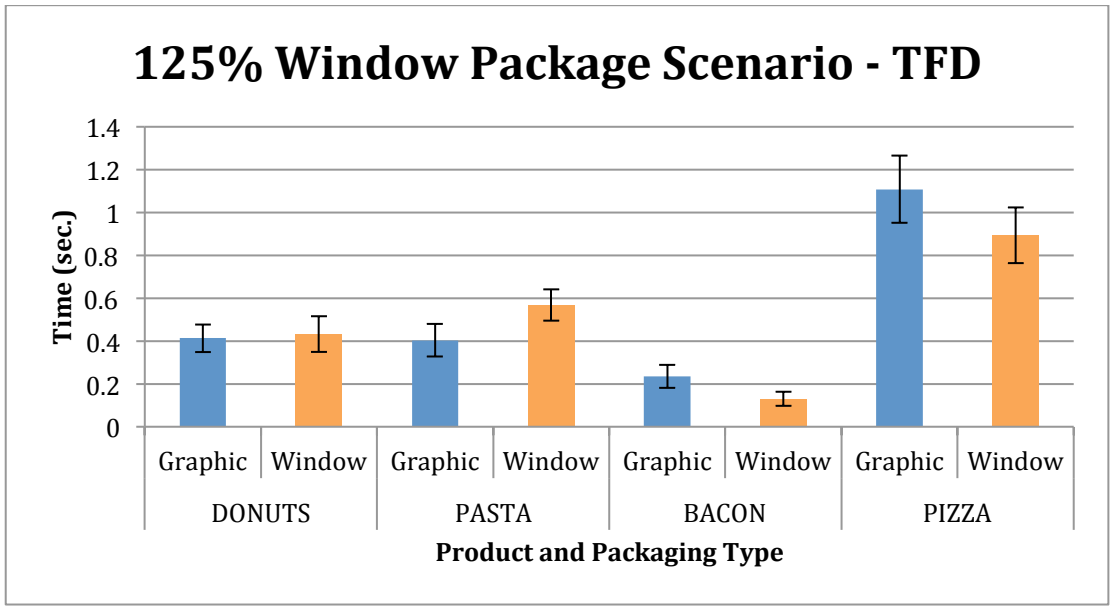

Figure 28. Total fixation duration time averages between product and package types for 125% window screnarios.

A two-factor (window type and product type) repeated-measures ANOVA on time to first fixation (TTFF) revealed no significant differences among window type packages [$F(2,11)=0.14$, $p > 0.05$] (Table 6). Strong significance was seen between product types [$F(3,11)=12.8$, $p < 0.05$]. This could be due to different stimuli package' shapes, sizes and color schemes used between product categories.

Pairwise *t*-tests were performed between window and graphic packages for each product showing no significant differences ($p > 0.05$). These results can be seen in Table 7. Overall, window size and presence did not have a significant effect on participants' TTFF. Figures 29, 30 and 31 chart TTFF information for each scenario relating to package and product type.

Table 6. TTFF ANOVA table between window packages (columns) and products (sample).

ANOVA
TTFF

Source of Variation	SS	df	MS	F	P-value	F crit
Sample	928.6420488	3	309.5473496	12.8121650	5.0191E-08	2.62614691
Columns	6.654889352	2	3.327444676	0.13772293	0.87137940	3.01720189
Interaction	90.00251991	6	15.00041998	0.62086739	0.71364430	2.12016610
Within	10147.37841	420	24.16042478			
Total	11172.67787	431				

Table 7. TTFF *t*-test table of p-values between graphic and window packages.

TTFF *t*-test P-values

Pasta			
	75% Window Package	100% Window Package	125% Window Package
Graphic Package	0.756491	0.190258	0.290907
Donuts			
	75% Window Package	100% Window Package	125% Window Package
Graphic Package	0.099811	0.987844	0.945284
Bacon			
	75% Window Package	100% Window Package	125% Window Package
Graphic Package	0.08569	0.630471	0.236016
Pizza			
	75% Window Package	100% Window Package	125% Window Package
Graphic Package	0.991476	0.56485	0.602332

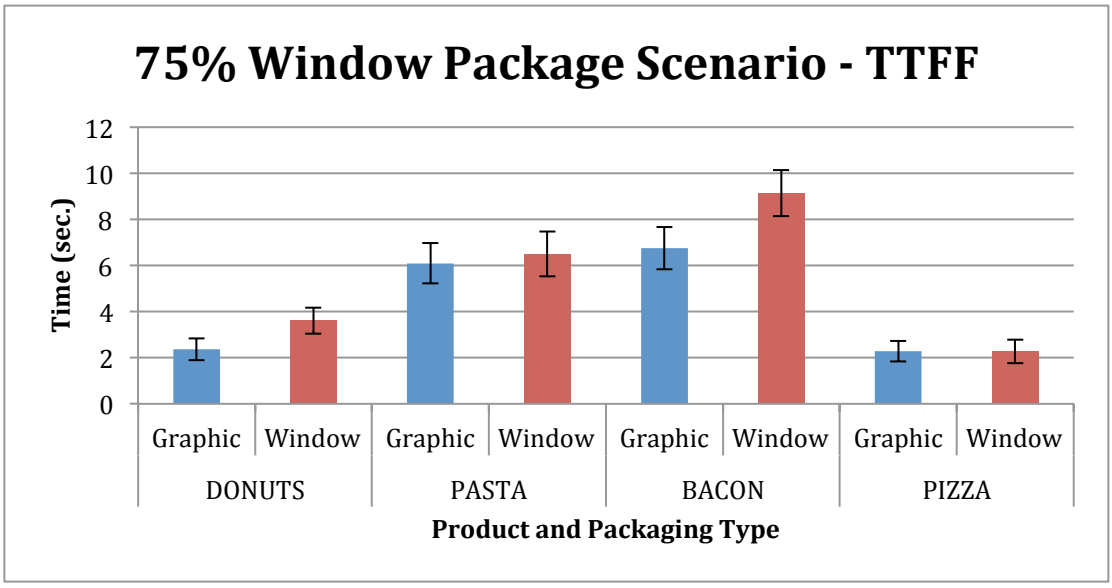

Figure 29. Time to first fixation averages between product and package types for 75% window package environment.

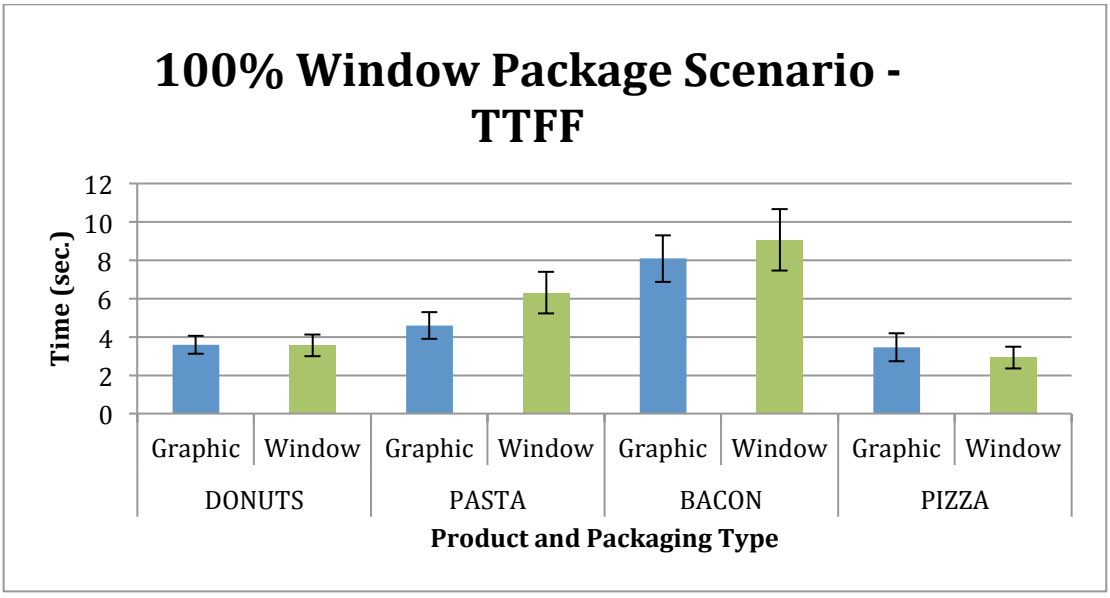

Figure 30. Time to first fixation averages between product and package types for 100% window package environment.

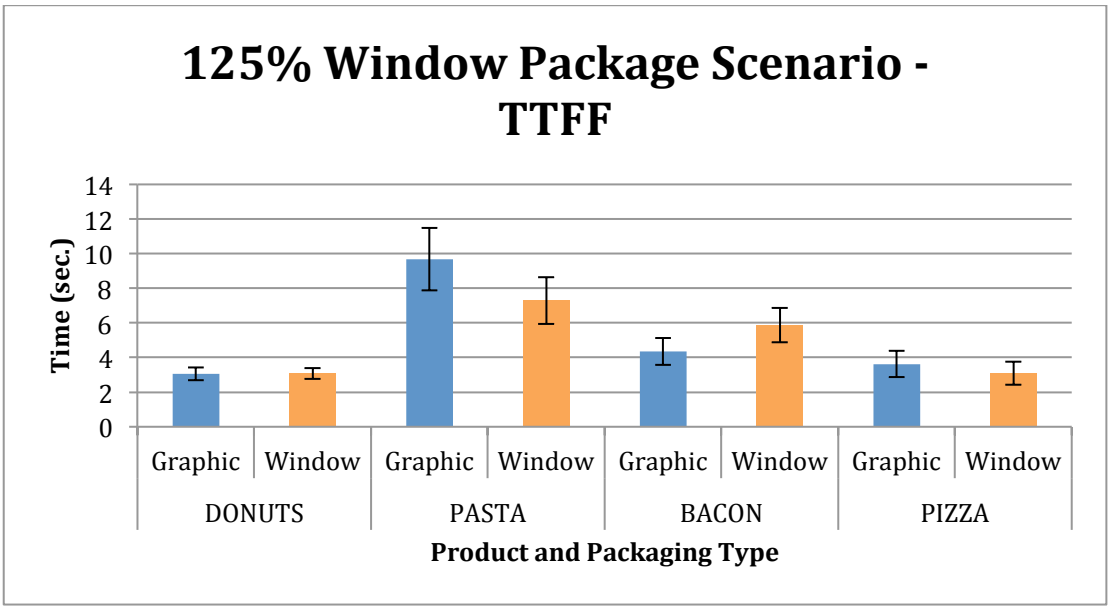

Figure 31. Time to first fixation averages between product and package types for 125% window package environment.

Shopping List Results and Statistics

Shopping lists were statistically analyzed and showed that window packages were selected significantly more than graphic packages. A chi square test for independence was performed between window and graphic packages yielding strong significance (p value = 0.002, $p < 0.05$). Supporting Excel data can be seen in Table 8. Figures 32 and 33 show charted shopping list selection data.

Table 8. Chi square test for independence table between window and graphic packages.

Package Type	Distribution	Product Type			
		Donuts	Pasta	Bacon	Pizza
Window	Observed	109	102	112	89
Graphic	Observed	21	28	18	41
Window	Expected	103	103	103	103
Graphic	Expected	27	27	27	27

p-value = 0.002113386

A chi square statistical analysis was performed between all window packages and products yielding no significant differences (p value = 0.99, $p > 0.05$). Supporting Excel data can be seen in Table 9. Overall, window packages were selected frequently more than graphic packages across all product categories and window scenarios.

Table 9. Chi square test for independence between window packages.

Window Type	Distribution	Product Type			
		Donuts	Pasta	Bacon	Pizza
100%	Observed	37	34	39	32
125%	Observed	33	36	37	29
75%	Observed	39	32	36	28
100%	Expected	37.5679611	35.1553398	38.6019417	30.6747572
125%	Expected	35.7160194	33.4223301	36.6990291	29.1626213
75%	Expected	35.7160194	33.4223301	36.6990291	29.1626213

p-value = 0.987827043

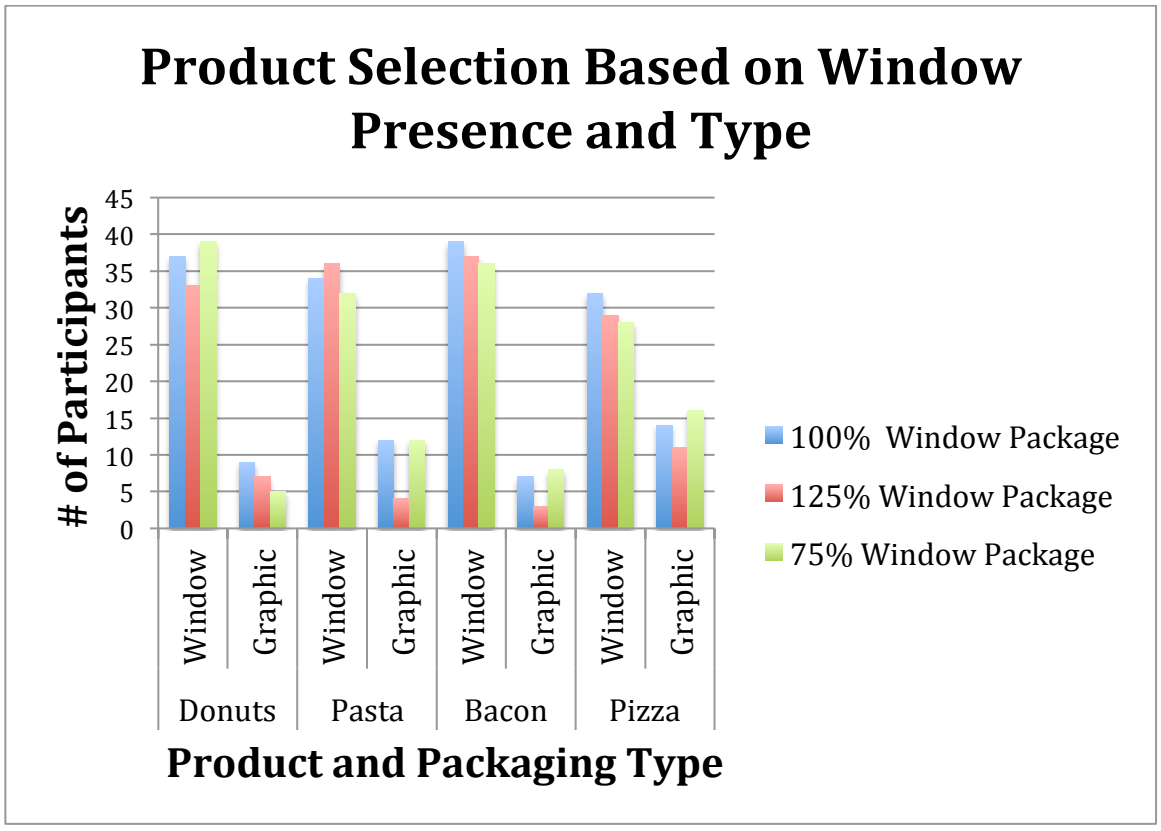

Figure 32. Shopping list selection results for product and package types.

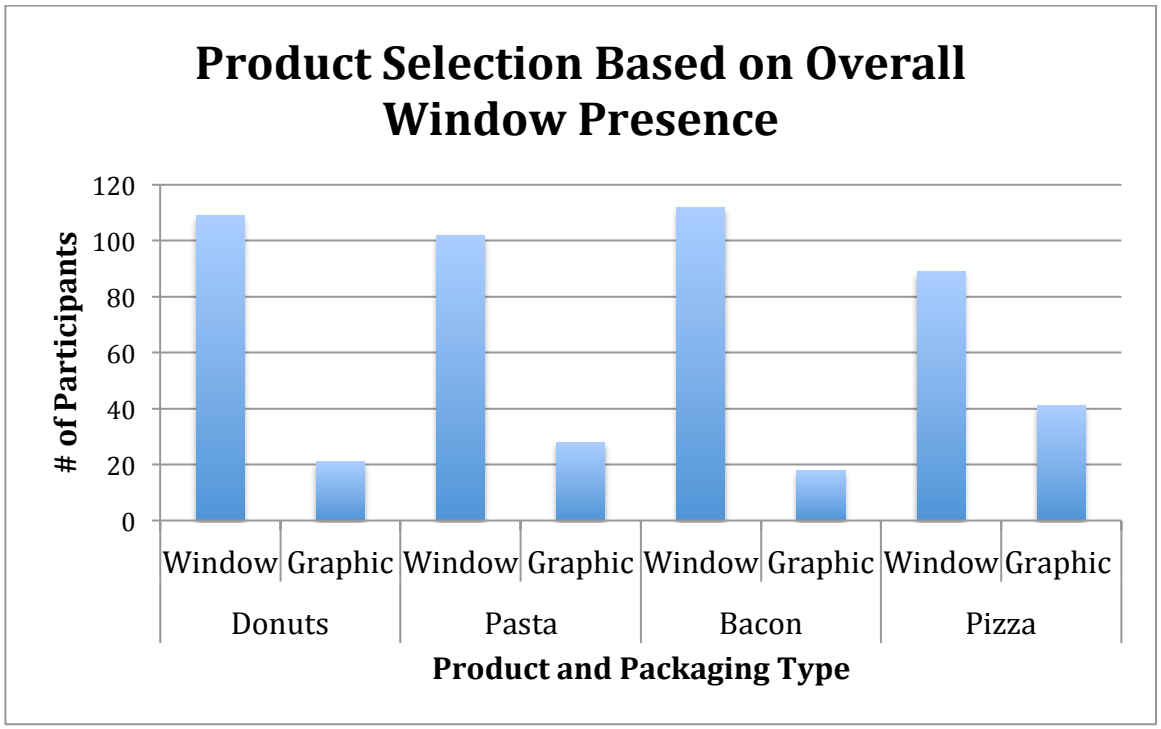

Figure 33. Shopping list selection results for product and package types between window and graphic packages.

Survey Results and Statistics

A short survey containing a modified Witmer-Singer Presence Questionaire 2.0 (Table 10), demographical and packaging preference questions was proctored to all subjects of the study. The average age range of participants was 25-34 with an estimated overall range of 18-74 (Figure 34). Survey results showed that 81 males and 49 females participated in the study. When asked which type of product representation participants preferred (graphic or actual product/window) on packaging, 91 participants stated actual product, 2 stated graphic, and 31 stated that it depended on the product (Figure 35).

Witmer-Singer Presence Questionaire results were analyzed by tailing the Madathil and Greenstein's analytical approach. Mean responses of question subscales were compared to find associative differences. Significant differences were not apparent across any window display scenarios (75%, 100% and 125%). A slight increasing trend in *Interface Quality* questions was seen across all scenarios. However, this trend may not be meaningful, as point deviations between scenarios did not exceed 0.1 of a point. Overall results showed that on average, participants ranked each subscale above neutral towards positive agreement. Modal participant responses showed that the eye tracking glasses did not hinder participants from performing their tasks, that the eye tracking glasses were comfortable, and that participants understood what they were expected to do during the experiment (Table 11).

Table 10. Mean responses to the modified Witmer-Singer Presence Questionaire 2.0, marked on a 5-point Likert scale with 1 indicating the most negative agreement and 5 indicating the most positive agreement to the given question when in the presence of 75% window package, 100% window package, or 125% window package environments.

#	Question	75% Window Package Environment	100% Window Package Environment	125% Window Package Environment
	Involvement			
1	My interactions with the grocery store felt natural.	3.8	3.8	3.6
7	From the entrance, I was able to visually survey and search the environment.	3.7	3.9	4
	group means (means of means)	3.75	3.85	3.8
	Immersion			
2	I felt immersed in the grocery store.	3.3	3.5	3.3
5	I felt like I was in an experiment.	2.9	3	3.1
10	It was easy to make a purchase selection from the store.	3.9	4	4
11	The store felt like a real grocery store.	3.3	3.4	3.2
	group means (means of means)	3.35	3.475	3.4
	Sensory Fidelity			
6	My experience shopping was consistent with my real-world experience.	3.6	3.7	3.5
8	I was able to examine objects closely.	4	4.1	4
9	I was able to examine objects from multiple viewpoints.	3.9	3.5	3.9
	group means (means of means)	3.8	3.8	3.8
	Interface Quality			
3	I was able to quickly locate the products I was interested in purchasing.	3.8	3.9	3.8
4	I was constantly aware of the eye-tracking device and the sensors.	3.2	3.3	3.6
	group means (means of means)	3.5	3.6	3.7

Table 11. Modal responses to subjective post-experiment questions, marked on a 5-point Likert scale with 1 indicating the most negative agreement and 5 indicating the most positive agreement.

#	Question	Mode
1	The glasses were comfortable	4
2	The glasses hindered by ability to perform tasks	4
3	I understood what was expected of me in the experiment	4

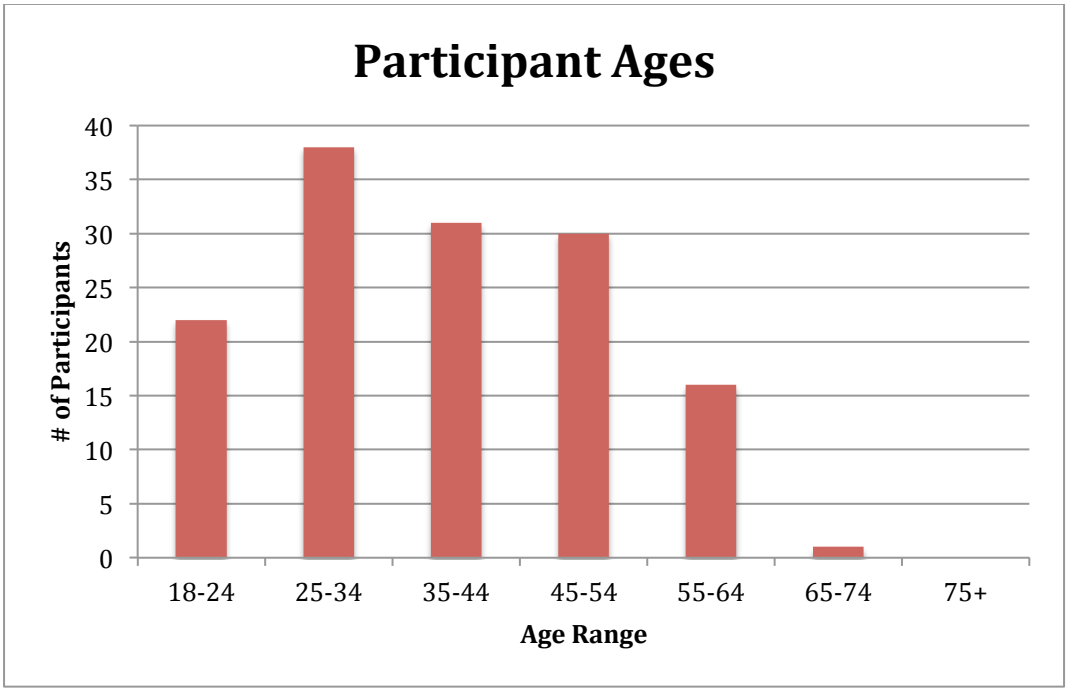

Figure 34. Age ranges of all participants.

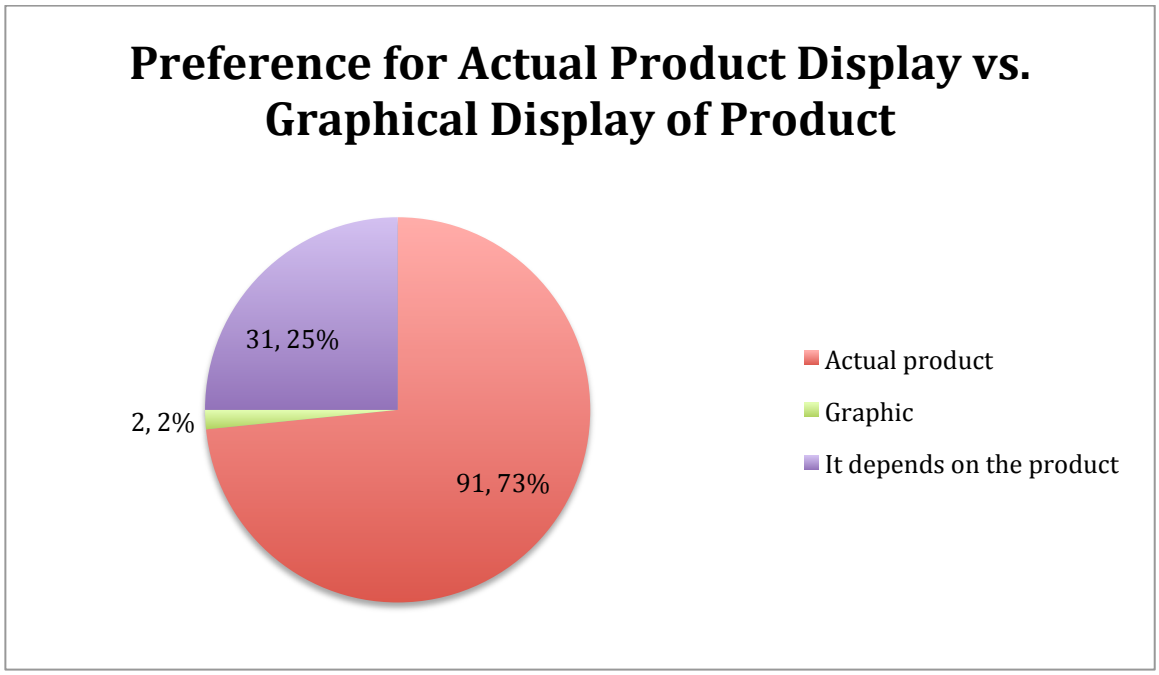

Figure 35. Participant preferences for type of product representation on packaging. This was a voluntary question that six participants opted out of answering.

CHAPTER FIVE

CONCLUSION

Research presented compared four products packaged in four unique structures varying by the amount of product visibility showing. The results indicate that subjects chose to select packages that showed at least some product significantly more than packages that displayed product through the usage of graphics. Significance in eye tracking data was only found for the 75% window package in TFD versus the graphic control package for bacon. While the 75% window package had lower fixation duration, it was still selected by participants more frequently than the graphic package. The significant difference found in TFD eye tracking data may not be meaningful because the fixation duration deviations were in milliseconds. Also, graphical display of prepared products may have influenced attention and evocation of emotional/sensory response, increasing dwell time. Package window size was not a significant influence in product selection or visual attention.

Eye tracking results did not correspond with shopping list and survey results. The eye tracking data did provide evidence that participants considered both styles of packaging, window and graphical product representation. Reasoning for insignificant differences in eye tracking data between package styles could be due to participants being asked not to touch the products during the experiments. Removing a product from its initial area of analysis would have disrupted eye tracking data recording. However, if a participant had picked a product off the shelf, their amount of attention given to the product could have changed.

Survey results showed that out of 130 participants, 73% of them preferred to see actual product when possible with 25% stating they preferred either windows or graphics depending on the product and 2% preferring only graphical representations of products. This could lead one to reason that unprepared products may not be as appealing as prepared products visibly showing through appropriate packaging.

Overall, these findings concur with previous grilling tool research (Hurley et. al., 2012) suggesting that windowed packages are preferred over packages with graphical representations. Even though most eye tracking analysis showed no significant differences for package or window type, participants were ultimately more inclined to choose window style packages when given the option between graphic and window packages.

CHAPTER SIX

RECOMMENDATIONS

It is recommended that this study be repeated for product categories other than the ones tested here. Comparison of equal products packaged in different materials may lead to interesting results. Testing attention to eco-friendly packages could be done. For example, plastic clamshell design versus recyclable paperboard carton design may yield interesting results. The usage of different materials may be found to influence visual attention in these cases.

Testing different demographics for particular products could also be done. Attentional analysis of windowed packaging directed towards a particular gender could produce beneficial gender specific results.

It is recommended that packaging designers design their packages to show product in pasta, snacks, prepared frozen meals and refrigerated meats categories when possible. Extended research could be done on each of these categories as only one product was tested per category.

APPENDICES

Appendix A

Mintel Global New Products Database Research for Pasta

Pasta	Package Length (mm)	Package Height (mm)	Package Width (mm)	
Barilla Tubini	123	186	49	
Barilla Farfalle	122	184	71	
Barilla Piccolini Mini Fusilli	121	185	71	
Grandessa Trucioli	143	274	64	
Reggano Farfalle	126	181	76	
Essential Everyday Farfalle	126	184	75	
Mantia's Italiano Rotini	130	185	64	
Mantia's Italiano Elbow Macaroni	129	185	46	
Paul Sorino foods Penne rigate	130	200	50	
Mueller's Penne	130	180	45	
Wegmans Italian Classics Orzo	105	180	43	
Bella Italia Orzo	100	145	45	
notta pasta Rice Linguine	125	175	50	
Ronzoni Trio Italiano	145	205	60	
Ronzoni Rotelle	145	205	60	
Ronzoni Elbows	120	175	60	
Weis Classic Pasta ditalini	130	185	65	
Bella Famiglia Penne Lisce	132	205	65	
Great Value Radiatore	128	185	62	
	130	185	60	**Modes**

Pasta	Window Length (mm)	Window Height (mm)	
Barilla Tubini	70	35	
Barilla Farfalle	40	25	
Barilla Piccolini Mini Fusilli	78	26	
Grandessa Trucioli	93	60	
Reggano Farfalle	80	35	
Essential Everyday Farfalle	90	28	
Mantia's Italiano Rotini	65	40	
Mantia's Italiano Elbow Macaroni	60	38	
Paul Sorino foods Penne rigate	75	40	
Mueller's Penne	75	25	
Wegmans Italian Classics Orzo	74	43	
Bella Italia Orzo	28	58	
notta pasta Rice Linguine	70	20	
Ronzoni Trio Italiano	75	55	
Ronzoni Rotelle	75	55	
Ronzoni Elbows	75	40	
Weis Classic Pasta ditalini	83	33	
Bella Famiglia Penne Lisce	50	85	
Great Value Radiatore	40	60	
	75	40	**Modes**

Appendix B

Mintel Global New Products Database Research for Donuts

Powdered Donuts	Package Length (mm)	Package Height (mm)	Package Width (mm)	
Entenmann's Powdered Donuts	150	205	70	
Hill Country Fare Powdered Sugar Donuts	150	220	65	
Bunny Mini Donuts	138	200	n/a	
Select 7 Powdered Mini Donuts	150	180	n/a	
Hostess Donettes Powdered Mini Donuts	150	205	70	
Blue Bird Powdered Donuts	151	185	n/a	
Krispy Kreme Krispy Juniors	152	215	n/a	
Mighty-O Donuts Cocoloco Minis	120	210	n/a	
Softees Frosted Donuts	151	260	n/a	
Dolly Donut Gems	148	223	n/a	
Mrs Bairds Grab N' Go Favorites Powdered Sugar Donuts	153	201	n/a	
	150	205	70	**Modes**

Powdered Donuts	Window Length (mm)	Window Height (mm)	
Entenmann's Powdered Donuts	75	42	
Hill Country Fare Powdered Sugar Donuts	100	72	
Bunny Mini Donuts	78	40	
Select 7 Powdered Mini Donuts	100	75	
Hostess Donettes Powdered Mini Donuts	80	45	
Blue Bird Powdered Donuts	100	72	
Krispy Kreme Krispy Juniors	95	85	
Mighty-O Donuts Cocoloco Minis	73	78	
Softees Frosted Donuts	75	70	
Dolly Donut Gems	65	40	
Mrs Bairds Grab N' Go Favorites Powdered Sugar Donuts	80	40	
	100	40	**Modes**

Appendix C

Mintel Global New Products Database Research for Bacon

Bacon	Package Length (mm)	Package Height (mm)	Package Width (mm)	
Coleman Natural Uncured Hickory Smoked Bacon	270	155	65	
Jamestown Brand Bacon	265	155	16	
DAK Premium Bacon	265	150	72	
Sugardale Deluxe Restaurant Hickory Smoked Bacon	425	270	70	
Ole Carolina Sliced Bacon	262	151	18	
Bar-S Thick Sliced Bacon	265	145	22	
Holmes Smokehouse Hickory Smoked Bacon	265	150	20	
Chuck Wagon Sliced Bacon	265	153	15	
Always Save Sliced Bacon	265	152	20	
Bryan Foods Sweet Hickory Smoked Bacon	263	151	15	
Oscar Mayer Turkey Bacon	265	165	70	
Branding Iron Hardwood Smoked Bacon	268	150	15	
Zeigler Premium Bacon	270	150	18	
Farmington Sliced Bacon	265	155	20	
Gwaltney Cured and Smoked Beef Bacon	267	153	16	
Cottage Brand Sliced Bacon	266	141	15	
Corn King Bacon	264	151	18	
Niman Ranch Uncured Maple Bacon	264	125	18	
Gwaltney Hardwood Smoked Premium Sliced Bacon	267	153	16	
	265	150	18	**Modes**

Bacon	Window Length (mm)	Window Height (mm)	
Coleman Natural Uncured Hickory Smoked Bacon	150	55	
Jamestown Brand Bacon	135	50	
DAK Premium Bacon	135	50	
Sugardale Deluxe Restaurant Hickory Smoked Bacon	310	155	
Ole Carolina Sliced Bacon	130	44	
Bar-S Thick Sliced Bacon	150	42	
Holmes Smokehouse Hickory Smoked Bacon	215	70	
Chuck Wagon Sliced Bacon	125	40	
Always Save Sliced Bacon	125	42	
Bryan Foods Sweet Hickory Smoked Bacon	185	45	
Oscar Mayer Turkey Bacon	210	65	
Branding Iron Hardwood Smoked Bacon	190	40	
Zeigler Premium Bacon	155	55	
Farmington Sliced Bacon	125	40	
Gwaltney Cured and Smoked Beef Bacon	130	45	
Cottage Brand Sliced Bacon	110	45	
Corn King Bacon	118	32	
Niman Ranch Uncured Maple Bacon	140	85	
Gwaltney Hardwood Smoked Premium Sliced Bacon	130	45	
	130	45	**Modes**

Appendix D

Mintel Global New Products Database Research for Pizza

Pizza	Package Length (mm)	Package Height (mm)	Package Width (mm)	
DiGiorno Supreme Pizza	305	305	35	
Freschetta Signature Peperroni Pizza	310	310	36	
Hannaford Deli Style Pepperoni	420	420	43	
Supervalu Take & Bake	368	360	34	
DiGiorno Italian Style Favorites Meetball Marinara	305	305	35	
Mama Cozzi's Pizza Ultimate Meat Pizza	320	320	43	
Marketside Pepperoni Pizza	320	320	43	
Artisan Fresh Take N' Bake Pepperoni Pizza	430	430	38	
Kroger Wholesome@Home Meals Italian Sausage and Peppers Flatbread	246	245	40	
Mama Cozzi's Pizza Kitchen Five Cheese Pizza	420	420	41	
QT Take and Bake Pepperoni Pizza	350	350	40	
Marketside Colossal Combo Pepperoni & Ultimate Meat Pizza	490	405	n/a	
Wholesome @ Home Meals in Minutes Half Cheese & Half Pepperoni Pizza	375	370	45	
DiGiorno Rising Crust Buffalo Style Chicken Pizza	305	305	35	
Against the Grain Gourmet Nut-Free Pesto Pizza	303	303	34	
	305	305	35	**Modes**

Pizza	Window Radius (mm)	Window Height (mm)	Window Length (mm)	Window Shape	
DiGiorno Supreme Pizza	n/a	60	45	triangle	
Freschetta Signature Peperroni Pizza	n/a	60	45	triangle	
Hannaford Deli Style Pepperoni	183	n/a	n/a	2/5 circle	
Supervalu Take & Bake	n/a	270	150	rectangle	
DiGiorno Italian Style Favorites Meetball Marinara	n/a	60	45	triangle	
Mama Cozzi's Pizza Ultimate Meat Pizza	116	n/a	n/a	2/5 circle	
Marketside Pepperoni Pizza	117.5	n/a	n/a	3/4 circle	
Artisan Fresh Take N' Bake Pepperoni Pizza	125	n/a	n/a	3/4 circle	
Kroger Wholesome@Home Meals Italian Sausage and Peppers Flatbread	67.5	n/a	n/a	1/4 circle	
Mama Cozzi's Pizza Kitchen Five Cheese Pizza	116	n/a	n/a	2/5 circle	
QT Take and Bake Pepperoni Pizza	n/a	225	180	rectangle	
Marketside Colossal Combo Pepperoni & Ultimate Meat Pizza	n/a	370	240	rectangle	
Wholesome @ Home Meals in Minutes Half Cheese & Half Pepperoni Pizza	146	n/a	n/a	7/12 circle	
DiGiorno Rising Crust Buffalo Style Chicken Pizza	n/a	60	45	triangle	
Against the Grain Gourmet Nut-Free Pesto Pizza	n/a	95	105	rectangle	
	116	n/a	n/a	2/5 Circle	**Modes**

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