The Dissertation Committee for Allison Joan Lazard certifies that this is the approved version of the following dissertation:

Photo Manipulation: The Influence of Implicit Visual Arguments on Dual Processing

Committee:

Michael Mackert, Supervisor

Mary Bock

Brad Love

Lucy Atkinson

Anthony Dudo

Photo Manipulation: The Influence of Implicit Visual Arguments on Dual Processing

by

Allison Joan Lazard, B.S., M.S. Media Arts & Sci

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Dedication

I dedicate this dissertation, first and foremost, to Peggy Lazard – my best friend, mother, and perhaps the most wonderful person in the world. Mom, there are no words to adequately express how grateful I am for all that you have done for me. Simply put, there would be no dissertation without you. Thank you for listening, discussing, reading, and editing all the big ideas and little details in this dissertation.

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Photo Manipulation: The Influence of Implicit Visual Arguments on Dual Processing

Allison Joan Lazard, Ph.D.

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Supervisor: Michael Mackert

Individuals view an overwhelming number of mediated messages every day, even if most of these messages are merely glanced at or given minimal amounts of attention. It is not possible or advantageous for individuals to critically evaluate all messages they encounter. In that first glance or initial impression, however, our brains process the visual arguments designed by photo manipulation presented in messages. This happens instinctually, almost instantaneously, and most often underneath our radar of consciousness. Following, individuals decide to attend to the information (or not) though conscious processing. Regardless of decisions for elaborative processing, however, the initial visual processing of photo manipulated arguments influences how individuals think, feel, and behave – whether they are aware of it or not. This dissertation contributes to our understanding of the role of implied visual arguments for persuasive message processing in three ways. First, Experiment 1 identified and provided empirical evidence for effects of photo manipulation as a visual persuasion technique. This experiment was a necessary first step in exploring the cause-and-effect relationship of photo manipulation and attitudes to better understand influences on message perception. Second, Experiment 2 tested currently used dual processing approaches for persuasive messages to overcome the gaps that currently exist. Theoretical frameworks widely used in advertising and

communication research – ELM and HSM – largely overlook the influence of visual communication and visual processing. These models do not account for the current understand of the brain mechanisms and processes for message processing. Findings from Experiment 2 provide evidence for the need to refine these models to account for influential visual processing variables that are largely absent from the literature. Third, findings from both experiments contributed to the conceptual refinement of visual literacy with evidenced-based support for the boundaries of when this concept is (or is not) influential for assigning meaning to visual messages.

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Chapter 1: Introduction

Individuals view an overwhelming number of mediated messages every day, even if most of these messages are merely glanced at or given minimal amounts of attention (Petty, Briñol, & Priester, 2009). It is not possible or advantageous for individuals to critically evaluate all messages they encounter (Petty et al., 2009). In that first glance or initial impression, however, our brains process the visual arguments presented in messages. This happens instinctually, almost instantaneously, and most often underneath our radar of consciousness (Barry, 2002, 2005; Gazzaniga, 2011). Following, individuals decide to attend to the information (or not) though conscious processing. Regardless of decisions for elaborative processing, however, the initial visual processing influences how individuals think, feel, and behave – whether they are aware of it or not.

Visual information, in individuals without visual impairments, is processed prior to any text-based or verbal information (Barry, 1997, 2005; Gazzaniga, 1989; Williams, 2005). Initial impressions and emotional, instinctual processing occur prior to any critical evaluation of the message content (Barry, 1997). While many of the commonly used theories in strategic communication research downplay or ignore this type of processing, other disciplines, such as neuroscience and visual communication, highlight the powerful roles of visual processing for our feelings, thoughts, attitudes, and behaviors (Gazzaniga, 1989; LeDoux, 1994). Neuroscience studies have revealed that visual information is processed first directly, unconsciously through the amygdale, the emotional center of the brain (Barry, 2002). Following, on a slower path – on a brain processing timescale – this information is also processed indirectly through our conscious thought (Barry, 2002). It is because of these dual pathways that visual information is influential on both our thoughts and feelings. Yet, communication research continues to posit visual processing as a

sidecar or simple peripheral cue for information processing, largely ignoring the way the brain actually functions for message processing (Chaiken, 1987; Eagly & Chaiken, 1993; Petty & Cacioppo, 1986).

In my dissertation, I contribute to our understanding of the role of implied visual arguments for persuasive message processing in three ways. First, I identify and provide empirical evidence for effects of visual persuasion techniques, a necessary first step in exploring the cause-and-effect relationship of photograph manipulation to better understand how it influences message perception. Second, I tested currently used dual processing approaches for persuasive messages to overcome the gaps that currently exist. Theoretical frameworks widely used in advertising and communication research – ELM and HSM – largely overlook the influence of visual communication and visual processing. These models do not account for the current understanding of the brain mechanisms and processes for message processing. Findings from this research should be used to extend these models to account for influential visual processing variables that are largely absent from the literature. Third, I contributed to the conceptual refinement of visual literacy with evidenced-based support for the boundaries of when this concept is (or is not) influential for assigning meaning to visual messages.

To study the proposed arguments, this study utilized two complementary experiments; given that experiments are rigorous scientific tests that can be used creatively to understand a phenomenon and provide empirical evidence for existing causal relationships. There are many limitations in the study of a photo manipulation following standard social science protocol, as the typical methods of inquiry – that utilize verbal responses – may not be representative of the processing of visual information. Individuals are not always able to identify or express visceral, instinctual, or emotional responses. Thus, a variety of approaches are needed to better understand how individuals

conceptualize and react to photo manipulation in the creation, existence, or consumption of imagery.

Given this, it is unlikely that *one* ideal experimental protocol exists for social scientists exploring the role of photo manipulation. Rather, researchers must explore this phenomenon through a variety of approaches that dovetail from their limitations, each building on the other's weaknesses. It is through a stream of research that I might uncover valuable information about how visual design influences perceptions of strategic communication. In recognizing that any one method will not clarify the complex relationship between photo manipulation and persuasive message processing, two experiments were conducted. The two experimental designs that follow attempt not only to study this phenomenon from different perspectives, but also to complement each other and possibly compensate for the limitations that are inherent with each study.

Chapter 2: Literature Review

VISUAL COMMUNICATION

Vision and Visual Information

Vision is one of the senses most heavily relied upon by the majority of humans. Vision and visual processing, which includes both the sensory processing of visual stimuli and imaginative visual thought in the mind's eye, consumes the majority of an individual's neurological resources (Williams, 2005). Indeed, the predominate amount of daily information processed by an individual brain is visual in nature (Williams, 2005).

"Seeing" is often used synonymously with "knowing." In the US, the common phrase "I see" is often used to convey that "I know" or comprehend the meaning of something (Williams, 2005). Indeed, with the majority of our neurological resources dedicated to processing visual information, for most individuals without visual impairments, one's understanding of the world is primarily though perception (Williams, 2005). Furthermore, visual information is processed more quickly, through direct brain mechanisms, than verbal information, suggesting that visual communication is the primary system for meaning creation, attitude formation, and behavior (Barry, 1997, 2005; Gazzaniga, 1989; Moriarty, 1994).

Non-Verbal Information and Meaning

In social interaction, the majority of information – some scholars suggesting upwards of 90% – is learned from non-verbal communication (Barry, 1997; Bonoma & Felder, 1977; Mehrabian, 1972, 1981). This includes the "subtle aspects" of speech and interaction, such as "speech errors or pauses, rate, duration, volume, inflection, and pitch," along with non-verbal information gathered from behavior (e.g., gestures), personal style choices (e.g., hair styles, clothing or jewelry worn), body type, and other

environmental cues (e.g., olfactory and thermal cues) (Mehrabian, 1981, p. 2). Together these sources of information make up the 'implicit' information inherent in interpersonal or social interaction (Mehrabian, 1972, 1981). The syntactical rules of explicit verbal communication are not applicable to this implicit information, thus leaving non-verbal communication without a formal set of rules for the encoding or decoding of meaning. Although this implicit-explicit dichotomy presents challenges for scientific inquiry to understand the unique influences for communication, there is generally high consistency of non-verbal communication within a culture allowing this culturally constructed phenomenon to be an area of study for over three decades (Mehrabian, 1972, 1981).

In strategic printed or electronic messages, where there is no other human in the communication process, the "subtle aspects" or non-verbal information in the communication process must be garnered from different sources. This alternate source is the visual presentation and respective visual design of the message that complements (or sometimes contradicts) the verbal message (Griffin, 2008; Messaris, 1994). While visual and verbal processing is largely interdependent, in mediated messages, this implicit, non-verbal information is achieved through the visual communication or perceptions of the message's visual design (Moriarty, 1994).

Visual Communication in Message Processing

Visual communication encompasses the communication of ideas and information through any visual based stimuli that relies on light and visionary processes. Visual communication is a process that relies on the eyes to retrieve and a brain to interpret sensory information (Lester, 2011). Visual communication includes visual-verbal presentations, in print or electronic media. Although visual messages can take on a plethora of forms, common visual communication studies focus on message properties

such as graphics, illustrations, photos, and any other mediated visual design. Specifically, visual design encompasses the intentional construction of specific design elements (e.g., graphics, fonts), visual imagery (e.g., photos, illustrations), or organization (e.g., layout) for a holistic display that allows viewers to assign meaning to the information (Cyr, Head, & Ivanov, 2006). Indeed, it is the assigned meaning through the sensory mode of interpretation that unifies visual communication. The meaning of these objects is brought to life by light and perception (Lester, 2011). Notably, even though the influential nature of non-verbal information on an individual's interaction is widely accepted, communication scholars largely overlook how the visual information provides this same context for communication materials.

Unlike language, visual communication has syntactical indeterminacy (Messaris, 1997). There is no explicit way to demonstrate relationships (a is like b), causation (a caused b), differentiation (a is not b), or absence (only b is left) (Messaris, 1997; Messaris & Moriarty, 2005). Thus, "the meanings of visual arguments are always implied" (Messaris & Moriarty, 2005, p. 498) Even more importantly, visual information can override verbal information for meaning formation (Barry, 1997; Griffin, 2008), such as when the pharmaceutical warnings are paired with happy imagery in direct to consumer advertising to distract the consumer from the negative side effects.

Visual-Verbal Divide

There is a well-established historical trend to downgrade the value of visual processing, its impact on message perception, and the role of visuals in communication more broadly (Barry, 1997; Moriarty & Barbatsis, 2005). What is processed intuitively, instinctually, and rather felt than thought, has often been demoted as less important than rational, cognitive thought, which is paradoxical since "perception is our chief means of

knowing and understanding the world" (Barry, 1997, p. 90). Regardless, a bias toward rational thought, often exhibited in text-based or verbal arguments, is deeply rooted in our educational system and culture (Williams, 2005). Ironically, although many do not consider mathematics or linguistics to be "visual" content, in their written form, they are most certainly visually communicated (Williams, 2005). Even so, visual information, which is often processed non-rationally, emotionally, or unconsciously, seems to have slipped from the very consciousness of academia.

For this discussion, the most important (and detrimental) outcome of this visual-verbal divide is a proliferation of tunnel-vision scholarly research and professional practice in disciplines most concerned with mass communication. Authoritatively stated by Paul Martin Lester (2011, p. ix), "visual communication *is* the history of mass communication. Every student in a mass communications program should know of the field's importance in telling stories with words and pictures that educate and persuade" (emphasis in original). However, this is not the case in our current academic environment, which heavily favors the former to the almost exclusion of the latter.

PHOTO MANIPULATION

Objectivity and Photography

Photographs are often equated with evidence or truth (Newton, 2006). From its invention, photography has been relished (and hated) for the medium's ability to capture the fine, intricate details of life that are beyond the talents of most realism artists. However, giving this medium the power of being an exact replication of "reality" is misleading at best, outright deceiving at its worst.

It is important to dispel the myth of objectivity in photography before diving into the production processes. Photographs are often perceived to be objective, but do not

inherently possess objectivity; a critical distinction given that photography's visual appearance inherently conceals the creation process. As opposed to paintings and illustrations that have brushstrokes or pencil lines to provide evidence of the artists' touch, there is seldom a detectable or distinct mark of a photographer on a photograph. Indeed, photography was seen to be the great equalizer for the production of visual imagery (thus ending the "last bastion of exclusiveness of the artists") by eliminating the need for artistic talent to replicate an environment (Dondis, 1973, p. 6). However, all images are touched (or brought to life) by human influence. Photographers choose a lens, select the camera settings, and position the camera or other light-capturing device, which is generally beyond the conscious detection of all but the most critical consumers.

It was not the advent of digital photography that marked a period that recognizes that photography, although able to capture realism, is not reality. One of straight photography's well known advocates, Ansel Adams, proclaimed the absence of "visual reality" in images even before glass plates were replaced with the lightweight technology of flexible film (Adams, 1985, p. 62). Ansel Adams was well known for the photographic realism images that *he* was able to create, not images the *camera* recorded. Semantics in this case are rather critical.

Pre-digital masters of photography did not stop the photographic process after the shutter was closed. The printing of the negative was as much a part of the image making process as the decisions and actions that occurred before the time of capture. Ansel Adams is known for his mastery in the darkroom where he exhibited great control over how the negative would be interpreted for the print. Others, equally praised for their glorious prints, such as fashion photographer Richard Avedon, would meticulously instruct darkroom assistants for printing manipulations to ensure the print matched their visualization of the photograph.

If photo manipulation has always been intricately entwined with the photographic process, why is it getting renewed attention in the digital age? Likely because the transition from negatives and transparencies to digital files has allowed for even greater advances in photographers' and editors' abilities to seamlessly hide manipulations in the photographic process. While traditional photography practices kept the connection from moment of capture to image largely intact, the digitization of the process has greatly reduced the reliability associated with necessity or limitations that maintained this connection (Emme, 1989; Emme & Kirova, 2005). Technological innovations have transformed the photographic image into "billions of manageable, pixel-sized pieces," which can be easily adjusted, modified, or rearranged in holistic or localized ways that influence the meaning of the image (Emme & Kirova, 2005, p. 148). With the introduction of computer retouching capabilities, there has been a shift from physical limitation for image creation and manipulation to concerns regarding ethical limitations, especially in journalism (Harris, 1991). Efforts to investigate this phenomenon exist in other disciplines, such as journalism, public health, and forensics (Farid, 2009; Greer & Gosen, 2002), but photo manipulation research is largely absent in the advertising and marketing literature – arguably the disciplines that most heavily rely upon its persuasive power.

Defining Photo Manipulation

I am proposing the term "photo manipulation" to serve here as an umbrella term to broadly describe any action performed by a human that influences the final appearance of a still photograph. This term may serve as a catchall for the wide variety of academic concepts and colloquial terms. These include: retouching, airbrushing, image editing, image alteration, digital alteration (Greer & Gosen, 2002; Reaves, 1991), digital

manipulation (Barry, 1997; Emme & Kirova, 2005; Harris, 1991), image manipulation (Emme & Kirova, 2005), Photoshopping (Spalter & van Dam, 2009), photo fakery (Brugioni, 1999), and photo illustration (Reaves, 2005), as well as encompassing specific techniques of morphing (Messaris, 1997), compositing, montaging (Barry, 1997; Brugioni, 1999), color balancing, and a wide variety of image manipulation techniques developed in computer science disciplines. Additionally, any in-camera technique used to alter an image – such as choice of lens, framing decision, amount of light during exposure, and other camera settings – are actions that are considered photo manipulation (Greer & Gosen, 2002).

The choice to use the term photo manipulation, as opposed to one of the many others that are used as synonyms in the literature, is deliberate. Terms such as digital manipulation or image manipulation may seem more accurate or relevant when discussing the need to understand this phenomenon in the digital environment. However, I choose not to use either of these terms, as they have limiting or expanding connotations that do not capture and define the phenomenon as well as photo manipulation. "Digital" inadequately omits all pre-digital manipulations, as well as illogically differentiating the control of the photographer post capture from the first half of the creation process. "Digital" and "image" also can be inclusive of other media. "Digital" could include visual information that is solely construction in a virtual environment (e.g., 3D models, gaming environments) or designs that do not intend to capture impressions of life (e.g., web design, infographics). Similarly, an "image" can be used generally to refer to any visual media. While all photographs are images, it is important to clarify that not all images are photographs. Images – or more broadly imagery – can be created from a variety of media, including ones that do not rely on light capturing devices or the "lens media" of photography (Emme, 1989; Emme & Kirova, 2005). Additionally, I do not

suggest the use of the term “alteration,” as this is also misleading. Alteration implies that there was an original or pure state. However, the photographic creation process is never “pure” or absent from the consequences of human action. Lastly, photo manipulation, as a term, also functions to limit the objects of interest in this typology to still images only, as video manipulation or editing techniques generally have additional dimensions of manipulation associated with time that are not relevant for the still image.

Photo manipulation includes any human action during the production process, however, not all of these are included for this study. I have chosen to focus on the post-production aspects of photo manipulation, as this is the area that has received the least amount of attention in the literature. Many of the decisions and actions necessary of the photographer could fall into a first category of capture constraints, such as device and lens selection, composition, and camera settings; however, as they are decisions that a photographer must decide prior to the capture of an image they are not of specific interest in a post-production typology (Greer & Gosen, 2002). Decisions made prior to and during the capture of an image are known to largely influence image perception (Messaris, 1997; Messaris & Moriarty, 2005). For example, composing a shoot from a low angle, creating an image that looks up at a subject, can make the person appear to be more powerful (Messaris, 1997; Messaris & Moriarty, 2005). Similarly, the distance of the camera to the subject can influence the viewers’ perceived level of personal involvement or social distance with the person in the images (Bell & Milic, 2002; Messaris, 1997; Messaris & Moriarty, 2005). While these effects, and many others not detailed here, are influential on viewers, there has already been much attention and research on their effects. Therefore, this study includes any photo manipulation that is done to an image after capture that influences its final appearance.

The following outlines the two classifications of photo manipulation – form

constraints and form freedom – that are of specific interest for this study. Table 2.1 gives technical descriptions and situates the classifications in the broader context of photo manipulation. Form constraint is the classification of photo manipulation that does not alter the actual shape or form of an image's contents. Generally, the principles in this category are more accepted among journalistic practices, but not if applied liberally (Mäenpää & Seppänen, 2010). Form constraint manipulations include techniques of dodging, burning, and color balance. Dodging and burning are technical terms for the lightening or darkening of an image during photographic printing. Perhaps reverse from their intuitive interpretation, when a photographer is printing an image on white paper, dodging allows the photographer to dodge or avoid some of the light that would hit the paper thus leaving this area lighter than it would be if printing straight from the negative. The reverse is true for burning, as it is a technique to burn in more light to darken an area on the print. These terms, as well as representations of tools used in darkrooms, live on in the digital environments in programs such Adobe Photoshop. Color balance refers to the alteration of the hue (the color's color), saturation (intensity of color displayed), or value (brightness of color) of any pixels in an image. These changes can be made holistically to an entire image – applying a photo filter in Instagram – or locally to a specific area – changing a model's eye color.

Form freedom includes all manipulation techniques where the photographer or image editor decides to move, add, or delete pixels in any way. This encompasses three of the four types of photo fakery detailed by Brugioni (1999, p. 17), "removing details, inserting details, [and] photomontage," only leaving out the concept of moving pixels. While Brugioni's analysis of technique focuses on the deceitful aspects of photo manipulation, these manipulation tactics do not contain an inherent valence. "Freedom" in this classification of form freedom is rather telling of the wide range of techniques and

action within its boundaries. This could range from "omitting" to "morphing" to "photomontage," as well as any creative varieties of these terms that are constantly being explored and developed by photographers and retouchers (Brugioni, 1999; Messaris, 1997). Any technique that retains the elements of a captured image, but changes composition of objects relative to other image contents falls into the category of form freedom. For example, computer technology allows for "morphing," where two are more images are seamlessly transitioned together to make a hybrid of the respective parts (Brugioni, 1999; Messaris, 1997). When the morphing technique is applied there are psychological effects, as the viewer tries to sort out the unrealistic creation, resulting from the merged elements (Messaris, 1997). Additionally, although not new to the digital environment, photomontaging or compositing is a common technique of photo manipulation that falls in the form freedom category. Photomontages are photographs that result from the combination of two or more images. Originally practiced as a way to print beyond the limitations of film size in the 19th century, this technique can result in an image that is photorealistic or that only resembles a collage of images (Lester, 2011).

Photo manipulation by the definition presented excludes consideration of any manipulative styles, themes, or representations illustrated in the content of the photograph as it was captured. The subject matter of imagery is a vast area of study beyond the scope of this proposed investigation. Photo manipulation only involves content or the subject matter of the image to the degree that information is adjusted, moved, replaced, added, or omitted as detailed below. As described here, photo manipulation is not concerned with the *objects* shown in imagery, but instead the *techniques* applied to create photographs.

Table 2.1: Photo Manipulation Techniques

Technique	Area of Manipulation	Technical Description	Example of Effect
		Pre-production or In-camera	
Device selection	Holistic	Sensor size, type of sensor or capture mechanism	Determines range of colors and quality of the image
Lens selection	Holistic	Wide angle, Normal, Telephoto	Varying lens lengths will distort or enhance beyond the capabilities of the eye
Composition/ Framing	Holistic	Camera position, Camera distance	Determines what it is presented in relation to other objects in the image
Capture Setting	Holistic	Shutter speed, Aperture, ISO, Depth of Field, Focus, etc.	Determine the amount of sharpness and ability to freeze motion in a frame
		Capture Constraint	
Digital transfer	Holistic	Color profile applied	Determines the color range or interpretation of raw capture
Cropping	Holistic	Removing pixels from the edge of the image frame	Can change the shape or ratio of height and width
		Form Constraint	
Dodging and Burning	Localized	Altering the value of the color information	Lightening or darkening selected areas of the image
Color balance (adjustments)	Holistic or localized	Altering the hue, saturation, or value of the color	Applying photo filters to replicate different film types
		Form Freedom	
Omitting	Localized	Deleting or replacing pixels to alter the appearance of an image	Removal of specific objects or visual clutter
Morphing (warping)	Localized	Moving or adding pixels to create a new image	Transforming the shape of an object or creating new objects from merged shapes
Photomontage (compositing)	Localized	Adding pixels from two or more sources to create a new image	Resulting images can be seamless (hard to detect manipulation) or form a collage of imagery

VISUAL PROCESSING IN NEUROSCIENCE DUAL PROCESSING MODEL

Brain Mechanisms for Visual Processing

The dominance of processing resources for the interpretation of visual information is deeply rooted in biological processes of our brains. While many visual scholars make the argument that now, as we experience another visual turn, it is more important than ever to understand how individuals make sense of visual information, it is important to note there is no biological distinction between the processing of mediated visuals and visual information encountered in real life (Barry, 2005; Williams, 2005). Thus, even though digital technology has rapidly transformed our visual media message capabilities, there is no evidence that our brains are adapting to these changes with the same break-neck speed. Rather, our brains still adhere to the slow timeline of evolution, where "visual media is just as real to the emotional brain as any other visual experience" (Barry, 2005, p. 47)

Psychology, primarily neuropsychology or neuroscience, and visual communication are some of the few research disciplines that are not limited by the visual/verbal divide. Of these, neuroscience leads in revealing the mechanism of brain processes that can then be utilized by other fields. Roger Sperry revolutionized the field of visual-verbal processing with his experiments involving patient that had undergone split brain procedures in the 1960's (Barry, 2005; Sperry, 1961; Williams, 2005). The brain is organized in two hemispheres that are connected by the corpus callosum, a massive, single fiber neurological bridge between the two control centers. While, it was commonly assumed that verbal information was processed in the left hemisphere and visual information on the right, our understanding of the separate function was rudimentary at best, wrong at worst, until experiments were conducted on animals and individuals with a severed corpus callosum (Gazzaniga, 1989; Sperry, 1961) Individuals

with extremely debilitating seizures can benefit from these split brain procedures, as it greatly reduces the ability of destructive currents to travel the entirety of the brain, often resulting in a partial or complete reduction of seizures (Gazzaniga, 2011). This work, along with the introduction of technology – functional magnetic resonance imaging (fMRI), computerized tomography (CT), positron emission tomography (PET) – has revolutionized our understanding of how the brain processes visual information (Barry, 2005).

Visual information is routed through two different pathways in the brain (Barry, 2002). Entering through the ocular system, visual information is directed to the thalamus where it is then split into two processing routes, all before conscious recognition of the information (Barry, 2005). In the quicker of these pathways – the thalamo-amygdala pathway – visual information is routed through the thalamus, amygdale, and then the cortex (Barry, 1997, 2005). This route is often referred to as the "quick and dirty" pathway, as it is much faster on a brain processing time scale, with the process complete well before an individual has a conscious thought about the stimuli (LeDoux, 1994). Furthermore, as this is the emotional processing part of the brain often in charge of survival, this process can trigger action before someone is even aware of the stimuli. A commonly used example of this type of dual processing is one's reaction to the presence of a snake. Visual or auditory stimuli that even resemble a snake will cause someone to instinctively jump or react before a conscious decision to so. We often compensate and say, "oh, I thought I saw a snake," however, if one had to wait till the stimuli entered conscious thought, decided to react, and then initiated action, they would like already have been bitten if it were an actual snake (Gazzaniga, 2011). The longer processing route – the cortical pathway – is the one that we perceive and gives us the sense of control over our responses (Barry, 2005). This compensating, after the fact story creation

is a function of the left-hemisphere and cortical pathway processing called "the interpreter," housed in the left hemisphere, which often hides the influence of visual information on behavior from our own thoughts (Gazzaniga, 1989).

The power of this immediate processing – prior to conscious thought – of visual information and its subsequent influence on "rational" thought has been demonstrated in experiments on split-brain individuals. One illustrative example is from the work of Gazzaniga (1989, 2011) where a device was used so that different visual stimuli was shown only to the right or left hemisphere of the brain. In one instance, a chicken claw picture was shown to the left hemisphere (the one known to house our interpreter abilities) and a snow scene was shown to the right hemisphere. Following, an array of pictures were shown to the subject, and the respective hand-hemisphere connection selected a picture of a chicken and one of a shovel. While this was predicted, what followed was not. When asked to explain his image selection, he responded, "Oh that's simple. The chicken claws goes with the chicken, and you need a shovel to clean out the chicken shed" (Gazzaniga, 1989, p. 951). The subject responded with a plausible story, one his conscious mind could make sense of even though it was 'confabulated' or made up (Gazzaniga, 2011). The shovel was actually selected because of its association with the snowy scene, but the patient was not able to pull that information from his unconscious processing. From this example, and others like it, Gazzinga (1989) discovered our rational selves are incapable of linking an action to unconscious processing, let alone acknowledge that we might not know why we performed an action. Rather, humans are inclined to compensate and 'confabulate' a believable story that their conscious brain will accept to explain away any influence beyond awareness (Gazzaniga, 1989, 2011).

The effects of visual information being processing via these different pathways

and the resulting conflict are also evident in visual illusions. Roger Shepard's illusionary tables where it is hard for viewers to detect they are the same size illustrates the conflict between one's unconscious processing, which is fast and rule-driven, and conscious processing which takes requires large amounts of mental effort (Gazzaniga, 2011). Even though the tabletops of these two tables are the exact same dimension, people just can't 'see' it. Indeed, "your brain is computing and adding corrections, adjusting to the visual cues of the orientation of the tables – and you cannot stop it" (Gazzaniga, 2011, p. 79). This simple illustration demonstrates that our "quick and dirty" visual processing can overpower our conscious abilities, even against our will. How these dual processes are influential in media messages, however, is yet to be explored.

VISUAL PROCESSING IN COMMUNICATION DUAL PROCESSING MODEL

Visual-Verbal Divide in Commonly Used Theories

Given all that we know about the brain, it may be surprising that we still find the visual-verbal division in theoretical frameworks that guide much of communication research. While this is a byproduct of the past, emerging research and technological innovations of the last five decades no longer limit us to understanding linguistic processing only. However, as other disciplines have moved beyond this limiting bifurcation, communication research lags behind with its continued reliance on dual processing models that focus on cognition – a little thinking versus a lot of thinking – such as the Elaboration Likelihood Model (ELM) or Heuristic Systemic Model (HSM). A discussion of these models, their theoretical backgrounds, and application is warranted here to aid further discussion of how communication research could potentially move forward to more inclusive investigations that are reflective of biological mechanisms for message processing of visual *and* verbal information.

Before detailing the two most commonly used dual processing models, it is important to note that dual processing models are a bit of misnomer by anyone's standards. The dual in these models comes from the either/or treatment that we use to simplify and understand the complex message processing phenomenon, which is largely recognized to exist on a continuum or as parallel mechanisms in a monistic process, as shown in Table 2.2 (Eagly & Chaiken, 1993; Petty & Cacioppo, 1986; Sperry, 1980). Regardless of this simplification of the multiple pathways that are active in the brain, dual processing theories and models provide advertising and communication scholars with theoretical frameworks that can be tested for message effectiveness.

Elaboration Likelihood Model (ELM)

The ELM was originally introduced, in its full version, by Petty and Cacioppo (1986). Based on a series of previous studies by the author and colleagues, the ELM was presented as a model to understand how individuals process persuasive messages for attitude change. The ELM posits information processing as an antecedent to attitude change, which occurs via one of two routes divided by the level of elaboration or active thought regarding the issue relevant arguments in the message. While the authors acknowledge that level of engagement in information processing likely exists on a continuum, the model divides processing into low levels of elaboration – peripheral processing – and high levels of elaboration – central processing (Petty et al., 2009; Petty & Cacioppo, 1986).

Born out of a tradition of dissecting communication effects by looking at "who (source) says what (message) though which channel (media) to whom (audience)" (Lasswell, 1948, p. 216), the ELM is a response hierarchy model that investigates the communicative process from unawareness to attitude change, which then leads to

behavior. The resulting attitudes from persuasive message processing in the ELM are defined as the "general evaluations people hold in regard to themselves, other people, objects, and issues" (Petty & Cacioppo, 1986, p. 127). The critical point of persuasion, which determines which processing route will be taken, begins in the ELM with the actual persuasive communication and two individual factors – motivation and ability to process (Petty & Cacioppo, 1986).

After exposure to the message, an individual follows the model's central route if they possess both the motivation and ability to process the message information (Petty & Cacioppo, 1986). Motivation can be influenced by the perceived personal relevance of the message, their general need for cognition, or personal responsibility on the issue (Petty & Cacioppo, 1986). When these factors are high, there is an increased likelihood that an individual will engage in more effortful thought about the message. Similarly, if also one possesses the ability to process, which can be determined by freedom from distraction, message repetition, prior knowledge, and the comprehensibility of the message, among other things, there is a greater likelihood for central processing (Petty & Cacioppo, 1986). Possessing motivation and ability will allow an individual to scrutinize the message and relate it to prior knowledge and experience that will likely result in " an attitude [that] is relatively enduring, resistant, and predictive of behavior" (Petty & Cacioppo, 1986, p. 126)

The alternate processing path – the peripheral route – occurs when individuals do not possess the motivation or ability to engage in effortful thought about the message. Although much of the literature treats this as a lesser processing route, likely because it leads to attitude changes that are temporary and susceptible to new counter-arguments, this route is no less powerful in many situations. Petty and colleagues have acknowledged that it is not advantageous or possible to centrally process all messages encountered on a

daily basis (Petty et al., 2009).

The ELM perpetuates the illogical dichotomy of visual and verbal information – disregarding the interdependence of these systems so that visual information gets left in the dust – from the initial point in the model's framework. The persuasive communication itself is most often defined by argument/message quality and textual content. Any visual information is generally regarded as peripheral cues or simple cues that affect attitude, if it is even considered at all. For instance, in the lengthy, detailed report of the constructs and relationship proposed in the ELM, visual information is largely absent from the discussion. Indeed, visual information of any form is not mentioned until the thirty-third page, where it is merely a reference to the absence/presence of a product image in the experimental stimuli (Petty & Cacioppo, 1986). Subsequent applications of the ELM have not fared much better for any advancement in the role of visual information for message processing. Discussion or testing of visuals, visual design, imagery or other visual communication elements or techniques with the ELM are rare. Those that do exist often only focus on source attractiveness, hardly a representation of all the visual persuasion strategies that are at play in advertising and communication.

In recent years, Petty and other scholars have defended the ELM's treatment of visuals and other contested variables by reiterating that variables can take on multiple roles within this framework (Booth-Butterfield & Welbourne, 2002; Petty et al., 2009), but a gap remains for scholars to investigate the role of visuals at the critical point of persuasion. In its current form, the ELM not only overlooks neuroscience research which indicates that visual information is processed prior to the cognitive activities detailed in the ELM's critical point of persuasion, but also ignores much of the evidence that pictorial information can lead to more elaborative thinking and is distinctively encoded

for improved recall (Childers, Heckler, & Houston, 1986; Paivio, 1990; Paivio & Csapo, 1973).

Heuristic-Systematic Model (HSM)

The HSM is a theoretical framework that proposes two types of information processing that occur before and subsequently influence attitude formation (Eagly & Chaiken, 1993). This dual process approach was first used to examine how involvement may influence processing routes for persuasive messages, specifically for "validity seeking" situations (Chaiken, 1980). In a validity-seeking situation, there is an assumption that the viewer is trying to determine the accuracy of the message. While Chaiken and colleagues have proposed extended models for defense-motivation and impression-motivation processing, researchers should still use caution with applications of the HSM – and ELM – that go beyond a viewer's intentions to hold correct attitudes (Eagly & Chaiken, 1993).

There are many similarities between the ELM and HSM, especially in their treatment of systematic or central processing and its role in persuasive message processing as an antecedent to attitude formation. In the HSM, systematic processing is conceptualized as the analytical thought that involves scrutiny of information presented against other accessible information to determine its relevance and validity of the argumentation (Chaiken, 1980). The HSM also "assumes that capacity and motivation are important determinants of systematic processing" or elaboration that mediates the persuasive effects of the argument (Eagly & Chaiken, 1993, p. 327).

Where these models differ, however, is in their treatment of heuristic or peripheral processing routes, as alternate routes. Building off research on decision making by Tversky and Kahneman (1974) – the paper that would later largely contribute to

Kahneman's winning of a Nobel Prize – the heuristic processing route was conceptualized as a processing mechanism that demanded less cognitive resources and effort from the viewer. However, unlike the peripheral route in the ELM, the heuristic processing in the HSM was proposed as a parallel route to systematic processing, one where a viewer uses the available information and a set of simple decision rules to formulate their judgment (Chaiken, 1987; Eagly & Chaiken, 1993). Kahneman (2003, 2011) later refers to this processing mechanism as System 1 after the labels of System 1 and System 2 were coined by Stanovich and West (2000). Notably, System 2 is more akin to the brain processing mechanisms that are explored with most information processing theories and models and the systematic route or central route of the HSM and ELM respectively.

The two systems in the HSM are assumed to be concurrent processes. Furthermore, each processing route "can exert both independent (i.e., additive) and interdependent (i.e., interactive) effects on judgment" (Eagly & Chaiken, 1993, p. 328). With both systems at work, the HSM acknowledges that prior knowledge utilized in heuristic processing may bias systemic processing, especially when heuristic information is available, accessible, and perceived to be reliable (Eagly & Chaiken, 1993). Given that individuals generally like to exert as little effort as possible, the processing modes in the HSM work on a sufficiency threshold principle where an individual will utilize both modes to "strike a balance between satisfying motivational concerns and minimizing their processing efforts" (Eagly & Chaiken, 1993, p. 330). Thus, these two systems will be utilized only to a point where an individual has reached a desired level of confidence about a given judgment (Chaiken, 1987).

The HSM attempts to fill the theoretical gaps left by the ELM, specifically in its treatment of peripheral route and mechanisms for processing peripheral cues. While the

ELM identifies many individual factors that predict the processing route – and has gathered support in a wide variety of studies – it does not provide any information about *how* and *why* peripheral cues are processed as such. Conversely, the HSM sheds some light on why "heuristic or peripheral cues often fail to exert a detectable persuasive impact…by illuminating the underlying psychological mechanisms" (Eagly & Chaiken, 1993, p. 345).

Although the HSM is used to investigate the persuasive effects of advertisements and other strategic messages, very little attention is given to the visual elements of these messages. A limited number of studies have shown that attractiveness, through color manipulations and physical features of the message source, increases the likelihood that individuals will rely on heuristic processing more than systematic evaluation of the argument quality, especially when there is low motivation or involvement (Brownlow, 1992; DeBono & Harnish, 1988; Meyers-Levy & Peracchio, 1995; Pallak, 1983; Peace, Miles, & Johnston, 2006). Aside from vividness – overall color representation – and source attractiveness, research that investigates the effects of visual message elements is largely missing. Even of these studies, most only use the HSM to inform the study and are not actual tests of the theory. This is problematic for a variety of reasons. First, there are many more elements that are influential for the visual persuasion of an advertisement than vividness and source features. Secondly, by only investigating these few isolated elements, researchers are missing a huge area of visual persuasion – syntactical indeterminacy – that allows advertising messages to communicate visceral, instinctual meaning that resonates with consumers (Messaris, 1997).

Lastly, referring back to the evidence from neuroscience, we begin to see that neither model truly accounts for the influential nature of visual information that is processing via the automatic, nonconscious route – the thalamo-amygdala pathway.

When we 'see,' visual information is not differentiated as real or mediated. It is all interpreted through the nonconscious processing mechanism – thalamus to amygdale to cortex – as real (Barry, 1997, 2002, 2005). This distinction is important because it highlights the fact that initial processing of visual information is not separated into real, which can be taken for granted as accurate and believable, and mediated, which can be questioned for its validity or accuracy. Following this logic, before we are even aware of it, we have "bought in" to the visual information or argument presented before a conscious thought has even occurred (Barry, 1997).

While many communication scholars view the ELM and HSM as competing models, Eagly & Chaiken suggest they are complementary (Eagly & Chaiken, 1993). It is this complementary view that may allow the strengths of both models to live on in future iterations that incorporate a larger emphasis and understanding of visual processing and how the brain works.

Visually Inclusive Processing Theories

In communication, it is the visual communication scholars that have side stepped the commonly used frameworks and attempted to incorporate neuroscience findings into theoretical frameworks that can be applied to message processing, such as Perception Theory (Barry, 2005) and omniphasism – an inclusive, cognitive balance theory (Williams, 2005). While these attempts have not been widely applied in communication research, there are many aspects of these theories that may benefit and improve research on persuasive communication effects.

Ann Marie Barry introduced perception theory as a general term "for describing the application of neurological research and accepted psychological principles to the study of visual communication" (Barry, 2005, p. 45) Highlighting the influential role of

mediated images in today's society, Barry posits that perception theory incorporates two fundamental assumptions suggested from the work by neuroscientists. First, individuals process and react to visual stimuli before they have a conscious experience of it (Barry, 2002, 2005). Second, an individual's brain is unable to differentiate between a mediated image and visual information from real life (Barry, 2005). While this theory has yet to be tested, the conceptual arguments are valuable for directing future research, as it allows us to recognize that "our sense of ourselves as beings with a rational integrative mind in control is just an illusion" (Barry, 2005, p. 52). This theoretical approach allows scholars to focus on the influence of visual stimuli and mental imagery, which drive our emotions and intellect, and is heavily utilized in persuasive tactics in advertising.

Integrating research from cognitive scientists and visual scholars, Rick Williams developed a theory of omniphasism, which means "all in balance" (Williams, 1999, p. 159) Proposing a theory that combines the rational and intuitive intelligences of the mind, Williams highlights how these intelligences differ in interpretation and application in academia (Williams, 1999). Science often focuses on rational processing, almost to the exclusion of intuitive intelligence. This bias is especially problematic for the interpretation of visual information or visual intelligence, which is predominately an intuitive intelligence, and thus results in an educational system that leaves students with underdeveloped skills (Williams, 2005). Focusing specifically on how a omniphasism-based approach can benefit our educational system, Williams encourages that academia spend more time and attention on visual literacy and the development of one's intuitive intelligence (Williams, 1999, 2005).

Although these visual communication scholars are making great efforts to update our theoretical frameworks to incorporate what we know about how the brain works, their theories are in need of evidence to support (or falsify) their claims. Applying their

theoretical perspectives to evidence-based research is a necessary next step to understand how these approaches will benefit future theory building for persuasive message processing, provide implications for practical application, and influence our educational system.

Table 2.2: Dual Processing Theories and Models

Authors (Year; Theory)	Discipline	Primary Processing System	Secondary Processing System	Relationship Between Systems
Gazzaniga (1989, 2011)	Cognitive Neuroscience	Sensory – both hemispheres have capabilities for processing; visual/spatial processing generally in the right hemisphere	Interpreter – abilities for causal inferences housed in the left hemisphere	The interpreter will confabulate a plausible story if motivated by sensory data that is processed unconsciously
Petty and Cacioppo (1986; ELM)	Psychology (commonly used in Advertising)	Peripheral – less effortful thought that is guided by simple cues	Central – effortful thinking that uses prior knowledge for critical evaluation	Critical point of persuasion determines if an individual will process via the central *or* peripheral route
Eagly and Chaiken (1993; HSM)	Psychology (commonly used in Advertising)	Heuristic – limited, relying on simple rules	Systematic – comprehensive, analytical	Processes are concurrent – additive (independent) or interactive (interdependent)
Stanovich and West (2000)	Psychology	System 1 – automatic, fast, implicit, effortless, and not available to introspection	System 2 – consciously monitored, slow, effortful and deliberately controlled	System 1 is always in action, but can be overridden by System 2 if resources are available
Williams (1999; Omni-phasism)	Visual Com-munication	Intuitive – understand directly without rational thought	Rational – ability to understand though reason-based approaches	Intelligences work in tandem for whole-mind knowledge
Barry (2005; Perception Theory)	Visual Com-munication	Thalamo-amygdale pathway – quick, unconscious, emotional processing	Cortical pathway – slow, conscious processing for emotional coloring	Visual messages are processed unconsciously and consciously

VISUAL LITERACY

What is Visual Literacy?

There is no unanimous agreement for a definition of visual literacy, let alone consensus regarding how this concept is relevant for individual processes, research, and educational goals (Avgerinou & Pettersson, 2011; Fahmy, Bock, & Wanta, 2014). This lack of consensus has been attributed to the unique properties of visual communication and visual literacy research, which allow researchers to easily pull "theoretical pieces" for unique application to a variety of context and disciplines (Avgerinou & Pettersson, 2011). Indeed, it is the multidisciplinary nature of visual communication and visual literacy research that simultaneously presents opportunities and challenges for understanding its role for individual message processing. Given the relative ease with which visual communication principles and visual literacy theory can be applied to various research areas, there is little effort to form a conceptual definition that may restrict the use of the concept that is most applicable to one's discipline or align most closely with their interests (Brill, Kim, & Branch, 2007).

In light of this, and with the hopes that I do not contribute to the follies of visual literacy research, I am proposing a definition of visual literacy that contains the essential and (somewhat) agreed upon competencies that are relevant to the interpretation of and consumption of photographs in the mass media, as well as one's ability to create and contribute imagery to our connected digital environment (Messaris & Moriarty, 2005). Thus, visual literacy is defined here as the perceived ability to interpret (read) visual information for meaning and create (write) images to communicate meaning. This definition contains the two core competencies that are included in a variety of published definitions for visual literacy (see Table 3 for a list of definitions). The definition proposed here reflects that there is at least some consensus that "images communicate

meaning, and literacy means being able to read and compose" (Brill et al., 2007, p. 48). Interpreting (reading) visual information can include perceived ability or actual ability to make sense of visual information and/or symbols (Brill et al., 2007). Creating (writing) is defined as the ability to juxtapose visual information in a way that communicates a message (Brill et al., 2007).

Notably, and of particular importance here, very few of the publications that define, study, or apply visual literacy address the specific relationship of this concept to the creation or perception of photo manipulation. The notable exceptions to this, interestingly, provide arguments and evidence for the visual literacy that counter common claims (Brumberger, 2011; Messaris, 1994; Messaris & Moriarty, 2005). In a study of digital natives, only 80% incorrectly identified an image as having been manipulated and only two-thirds of the participants correctly identified an image that had been not manipulated – not encouraging findings for an audience (college students) that were assumed to have high literacy (Brumberger, 2011). Another notable commonality of the publications highlighted in the table is the lack of empirical evidence, suggesting the need for future research to shed light on how visual literacy influences actual interpreting and creating of photographs, and images more broadly.

Visual Literacy and Photo Manipulation

To begin, it is necessary to demarcate when and how visual literacy matters for photo manipulation. Visual literacy does not likely have any role for "detection" of photo manipulation when it is intended to be concealed, but can be influential for interpretation of some messages with or without overt manipulation. Additionally, a few divides are recurring in the literature and warrant noting. There are divergent arguments whether visual literacy is concerned with the sensory modality (Debes, 1969) or symbolic

modality of visual information (Brill et al., 2007; Levie, 1978). In the latter, visual literacy is not concerned with the visual objects one is able to "see" from a sensory perspective, rather, it is the visual information of pictures that communicate meaning that is the stimuli of interest (Levie, 1978). In the words of Levie (1978) it "is not because pictures are visual (can be seen) but because pictures are symbols and, more specifically, symbols that are neither words nor some other kind of digital symbol," that they are of interest to visual literacy scholars. This distinction illuminates an important divide for the mental processes of photographs. Those interested in sensory perception are looking at different neurological pathways than others that highlight the mental process involved with interpretation of symbolic meaning.

Indeed, this divide between sensory and symbolic interpretation nicely maps out how and when visual literacy may be influential for photo manipulation. While there are "fundamental relationships between external (perceptual) images and their corresponding internal (mental) representations" (Levie, 1978), visual literacy does not likely influence the former end of this relationship for perceptions of photo manipulation.

Only two studies, to my knowledge, have ever investigated the effects of visual literacy for visual manipulation detection through experimental designs (Kelly & Nace, 1994; Noggle & Kaid, 2000). Of these, only one actually used the term visual literacy (Noggle & Kaid, 2000). While they differ on stimuli media – photographs (Kelly & Nace, 1994) and video (Noggle & Kaid, 2000) – neither study found an interaction with visual literacy for the interpretation of the imagery. Thus, even with expertise in photo manipulation or a high level of awareness of industry practices, a question still remains if one is truly able to "detect" photo manipulation with initial impressions – the ones most crucial for our emotional reactions. Secondly, even if these individuals with a high level of expertise do in fact have the ability to detect photo manipulation, this is likely a

cognitive, and perhaps highly taxing, demand (Barry, 2005). It is unlikely that these experts would be willing to engage in critical evaluation of all images they encounter, leaving a need to better understand what factors may motivate an individual to attempt or engage in photo manipulation detection behaviors.

The goal, rather, would be to teach visual literacy techniques for deep inspection and critical evaluation of manipulation, even though it is unlikely that visual literacy education efforts will be enough to offset our pre-programmed neurological reactions to images. By increasing one's visual literacy, it is possible for them to become a critical viewer of images, specially photographs, to be able to see the rhetorical aims and intended influence of an images, as well as detecting some level of manipulation. These efforts are critical as visual literacy educators and scholars are faced with a multitude of issues and questions with the increasing popularity of digital photography in regards to photo manipulation and beyond, such as how photo manipulation influences our ability to "read" images (Emme & Kirova, 2005).

Reading photographic images provides unique challenges (or capabilities) for interpreting realism that highlights the necessary understanding of context for interpretation. For example, a journalistic or documentary image is "read as a naturalistic document, [where] manipulation of the image is seen to undermine its reliability" (Emme & Kirova, 2005). Indeed, many viewers of mainstream media believe that image reporting is largely held under the contract of "straight news" where there is no allowance for manipulation (Messaris & Moriarty, 2005). Conversely, images that convey an ideal – commonplace in science or health communication – are often manipulated to reduce information, to remove unnecessary clutter or visual features that distract from the intended message (Emme & Kirova, 2005; Messaris & Moriarty, 2005). Similarly, advertising photographs are often manipulated to achieve the same goal of idealized

image, for better or worse. These varying expectations or levels of acceptance for photo manipulation add to the fluidity of the implicit rules that govern photographers' and editors' judgments and actions (Messaris & Moriarty, 2005).

There are two divergent stances for how digital photography and photo manipulation are influencing the relationship of objectivity and photography (Messaris, 1994; Messaris & Moriarty, 2005). On the one hand, they are viewed as tools that can seriously threaten the field, as it allows photographers, editors, and publishers to make questionable judgments for the edits and transmission of photographic images. Conversely, other scholars argue that digital photography may simply be a tool that can enlighten audiences that manipulation has always been inherent in the photographic process and is no less so in the digital environment (Newton, 2006). Regardless of one's position, visual literacy allows one to help discern either *when* or *that* an image represents a lie (or a subjective view) (Messaris & Moriarty, 2005).

When investigating photo manipulation, visual literacy is important for higher goals that propose an increased understanding of the photographic process (and other visual media creation processes) will lead to a greater conscious awareness of manipulation tactics and aesthetics. I mention aesthetics because it is important to acknowledge that increasing visual literacy has broader aims than simply reducing the evils of manipulation. Indeed, photo manipulation techniques open up a plethora of opportunities for more intricate message design and communicative meaning in visual messages. Photo manipulation can be appreciated, and enjoyed, given an individual's ability to recognize the intended meaning. For example, a visual metaphor derived from the morphing of two images together or the creation of a photomontage can stimulate thought about latent or implied meanings in such a way that is enjoyed by the audience (Delbaere, McQuarrie, & Phillips, 2011; Gkiouzepas & Hogg, 2011; McQuarrie & Mick,

2003). Thus, the ability to read and write visuals associated with visual literacy leads to the primary benefits of viewing photo manipulation (and visual messages more broadly) with enhanced proactive "cognitive enrichment" and reactive "critical viewing" (Messaris & Moriarty, 2005, pp. 482-483).

Visual Literacy and Message Processing

Ranging from the "decidedly theoretical to the solidly pragmatic," visual literacy has been interpreted and applied as a productive construct to understanding how individuals make sense of visual information (Brumberger, 2011, p. 21). Notably, however, most of the theoretical, conceptual, and operational debates over the boundaries of visual literacy do not include evidence-based research for influential factors for persuasive message effects.

To understand the concept visual literacy and specifically where and how it may play a role in message processing, it is perhaps advantageous to start with where it does not. Following the logic proposed by Ferdinand de Suassaure and other semioticians, individuals are often more inclined to understand a sign – or concept in this case – in opposition or delineating what it is not (Berger, 2010). This can be especially helpful when the object being conceptualized falls on a continuum of meaning. In this way, visual literacy is not influential in immediate processing of visual information. It is unlikely that visual literacy has any influence on one's initial processing, unconscious processing that occurs via the thalamus-amygdale pathway. This "quick and dirty" pathway is the likely byproduct of a long evolutionary adaptive mechanism for survival, found in a variety of species (LeDoux, 1994), and is not likely to be malleable by educational manipulations.

However, even though visual literacy may not be able to re-wire our deep-rooted

biological programming, it is important that we consider how this process influences our conscious interpretations. As illustrated by Gazzangia's research on split brain patients, our behavior and conscious attitudes are largely affected by this unconscious processing. This initial processing doesn't differentiate between mediated and real experiences. We may think that what we experience on screen-based media is processed differently, however when watching television "we stare at a shimmering piece of glass, but our surface-perception module tells the rest of our brain that we are seeing real people and places… we cannot erase the assumption. Even in a life-long couch potato, the visual system never 'learns' that television is a pane of glowing phosphor dots, and the person never loses the illusion that there is a world behind the pane" (LeDoux, 1998, p. 29) Our brains believe the reality of visual imagery, in a way that we must then use our cognitive resources to "unbelieve" or interpret for the truth in what we see (Barry, 1997).

Although we might not be able to alter our biological driven, immediate processing of visual information, visual literacy may play a role in the heuristic processing of System 1 – information processing that is less demanding and follows a simple set of rules for judgment and evaluation. Indeed, one of the unique contributions of the HSM is that the "simple decision rules" of heuristic processing are a "learned knowledge structures" that mediate attitude formation (Eagly & Chaiken, 1993, p. 342) While there is limited evidence about what can be taught, differing responses of those with high visual literacy and average consumers to some visual illusions may be a clue to how the brain can be trained to see the differences in the real world and the mediated world with heuristic, peripheral, or System 1 processing. "Only visual artists and experienced photographers have developed the skill of seeing the drawing as an object on the page" and are able to correctly identity the two characters as the same size on first impression (Kahneman, 2011, p. 101) Here visual illusions, such as this one created by

Roger Shepard, illustrate potential tools and a useful demonstration for why – in our mediated message filled society – we need to question our first impressions of the world (Marschall, 1991).

"Child development scholars would agree that visual communication skills are not secondary, derivative, impure or peripheral and, in fact, develop earlier than verbal skills in children" (Moriarty, 1994, p. 15). Given this, it is quite unreasonable that we abandon these abilities as students' progress in our educational system and completely disregard them in our advertising and communication research and practice in higher education. It is imperative that one is able to understand and interpret visual information to then be able to critically analyze the implicit arguments made with non-text depictions. Indeed, the true contribution of visual literacy may be understanding how the ability to identify, evaluate, and craft visual arguments influences our reactions to persuasive messages, where visual literacy would include the ability to analyze a variety of different forms, graphical representations, such as charts for example.

With charts, the 'reading' and 'writing' abilities of visual literacy directly relate to the ability to decipher the presence of 'chart junk' or misleading clutter on quantified depictions, as well as the ability to create visual representations that use the fewest marks to convey the most meaning, without distorting the truth. On the other hand, one can go too far with the reduction of information. Idealized figures, such as curves of "typical or representative" findings, which are simply "pretty", have no meaning or value for scientific purposes (Shepard, 1983). Evidence-based research that identifies the role and influence of visual literacy in the deciphering of persuasive messages will help refine conceptualization of this term, as well as provide evidence for implementation in educational practices.

In a participatory image creation environment, which we are increasingly moving toward, visual literacy also has a role for the education of individuals who will create photographs. As Messaris and Moriarty (2005) succinctly stated, “understanding how images work feeds into the process of creating them.” If individuals are visually literate for critical viewing and consumption of images, they are more likely able to foresee the audience’s perspective for the images that they create.” Thus, visual literacy can bee viewed as an essential set of skills for both image creators and consumers.

Chapter 3: Experiment 1

EXPERIMENT 1 METHODS

Study Design

This study used a mixed-design approach with a with-in subject factor implicit association test containing 1 target category (food) x 2 target attributes (pleasant versus unpleasant) and one between-subjects factor (post-production photo manipulation versus capture). Using methods to indirectly test automatic evaluations, and compare these to explicit responses, allowed for an investigation of the cause-and-effect relationship between photo manipulation and non-rational and rational responses to the implicit arguments made in persuasive images.

Hypotheses and Research Questions

H1: Individuals will have significantly more positive implicit attitudes toward food advertising images with manipulated visual arguments than toward capture food advertising images.

H2: Individuals will have significantly more positive explicit attitudes toward food advertising images with manipulated visual arguments than toward capture food advertising images.

H3: Photo manipulation will have a stronger effect on implicit attitudes than explicit attitudes.

RQ1: Does visual literacy moderate the influence of photo manipulation for implicit attitudes or explicit attitudes?

Explicit and Implicit Attitudes

Attitudes are the internal states that influence behavior by directing responses to objects and situations. Attitudes were consistently positioned as a central, critical concept for the study of behavior throughout the twentieth century (Allport, 1935; Clark, 1911; Fishbein & Ajzen, 1975; McGuire, 1969). Attitudes, although generally studied as conscious states, are not by definition limited to thoughts or feelings available through introspection (Allport, 1935). Attitudes consistently measured as explicit, consciously available evaluations, however dominated the first sixty years that they were of academic interest. Yet, despite replication and evidence for the attitude-behavior relationship, explicit attitudes have continuously disappointing explanatory power for actual behavior. In an attempt to provide boundaries and hopefully increase the predictive nature of attitudes, Myers (1987) proposed parameters to be used as underlying assumptions for any working attitude-behavior relationship. One of these assumptions was that attitudes are predictive of behavior *only* if they are brought to an individual's conscious attention (Myers, 1987).

Fortunately, ground breaking theorizing, which directly challenged the assumptions of conscious control of attitudes, has opened ways of investigating how non-conscious processing influences what we think, feel, and do (Bargh & Chartrand, 1999; Gazzaniga, 1989; Greenwald & Banaji, 1995; Tversky & Kahneman, 1974). With innovations in theory and measurement, it has been suggested that implicit cognition, not explicit that is available for introspection, may be more influential for behavior in a variety of situations (Greenwald & Banaji, 1995; Nosek, Greenwald, & Banaji, 2007). Implicit attitudes are unconscious, automatic evaluations often based on past experiences that elude conscious control and introspection (Greenwald & Banaji, 1995). The idea that implicit attitudes may be more predictive of behavior disrupted the entire field of

psychology by overturning the assumption that attitudes are by definition consciously available. To test these game-changing ideas, Greenwald and colleagues undertook the arduous task of constructing methodologically valid and reliable ways to measure implicit associations, those beyond the conscious research of individuals that are less influenced by social desirability or confabulation (Greenwald, McGhee, & Schwartz, 1998).

The Implicit Association Test (IAT) is a sorting task that generates detectable differences in association strength among concepts (Greenwald et al., 1998). Individuals taking a standard IAT will sort two target concepts (*men* and *women*) with two response options or target attributes (*good* and *bad*) in a sequence of seven blocks or timed trials (Nosek et al., 2007). IAT blocks include practice or orientation rounds in addition to the critical trials of interest. In the critical blocks used to investigate implicit associations, the target concepts are counterbalanced among the blocks so concepts are paired congruently and incongruently an equal number of times – two blocks where the concepts *men* and *bad* are paired and two where *men* and *good* are paired. The IAT conceptually works on the assumption that when two concepts are strongly associated, the sorting task will be easier and response times faster than when there is a weak or negative relationship; thus, individual's implicit associations reveal perceived congruency and strength. The different sorting response times – minus error – are a measure of association strength with two target categories (Greenwald et al., 1998). If individuals have faster times sorting *men* and *bad* than they do with *men* and *good*, this would indicate they have a negative implicit association toward men.

These association strengths are also an indirect measure of implicit attitudes and have been used in a variety of marketing contexts to better understand how they drive consumer behavior (Maison, Greenwald, & Bruin, 2001, 2004). Implicit attitudes provide

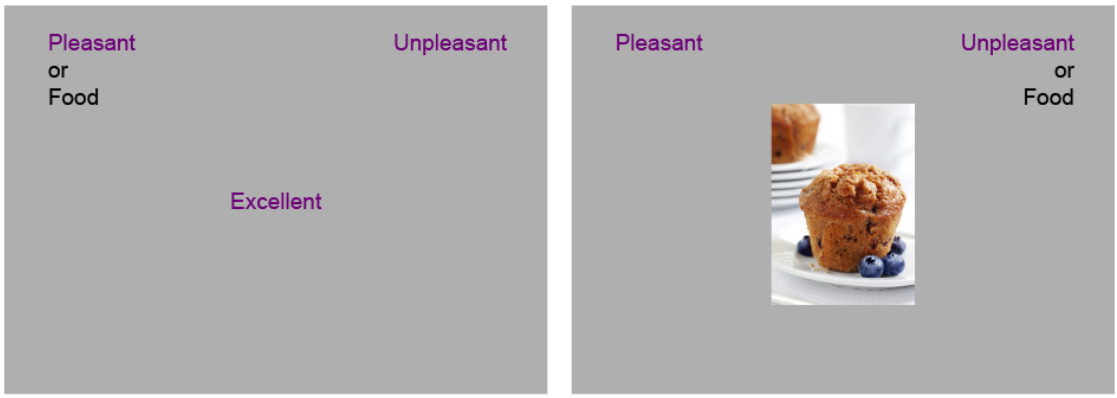
unique contributions, in addition to explicit attitudes, for brand preference and predicting behavior (Friese, Wänke, & Plessner, 2006; Maison et al., 2004). Specifically, implicit attitudes are found to be better predictors of consumption when processing resources are low or the behavior is spontaneous, such as quickly choosing a snack or between comparable products (Beattie & Sale, 2011; Friese, Hofmann, & Wänke, 2008; Perugini, 2005).

The standard procedure of the IAT described above has been validated, widely used with high reliability, produced high test-retest correlations shown to be resilient to personal factors and slight procedural changes (See methodological and conceptual review by Nosek et al., 2007). However, for the topic of interest here – photo manipulation – the IAT poses constraints that make it an unsuitable fit. The standard IAT is not applicable for investigations of associations toward a single target (e.g., men alone). Fortunately, alternative measures of implicit associations have been developed for single category assessment, such as the Single Category Implicit Association Test (SC-IAT) (Karpinski & Steinman, 2006). The SC-IAT is a validated test that is closely related to the IAT, but has the ability to measure implicit social cognition without a directly contrasting or complementary category (Karpinski & Steinman, 2006). There is no clear comparison concept in this experiment, as it is designed to test differing responses to a visual design technique (photo manipulation) that is likely beyond one's detection. Thus, the SC-IAT is the best-suited method.

The SC-IAT has a similar block design approach to the IAT. The SC-IAT is a modification of the IAT that requires only two stages of critical blocks – half as many as needed for the standard IAT (Greenwald et al., 1998; Karpinski & Steinman, 2006). The SC-IAT shares many procedural properties of the IAT, which also allows it to be easily implemented and interpreted. In each block of the SC-IAT participants are given stimuli

associated with a target category ("food") or target attribute ("pleasant" or "unpleasant") to rapidly sort by pressing a left hand key or a right hand key based on the labels displayed left and right, respectively. The labels in each block include a target attribute that is either paired with the target concept or shown alone, as shown in Figure 3.1.

Figure 3.1: SC-IAT Displays



Compatible Block with Target Attribute | Incompatible Block with Target Concept

Stimuli Conceptualization and Operationalization

Messages communicate explicit and implicit arguments. However, strategic communication research often only investigates the explicit elements of communication design. This general lack of attention means that little is known about how implicit arguments influence persuasive message processes. For this experimental design, which intends to begin to fill this void, it is critical that stimuli development take a more predominate role in the process, even if it is eventually relegated to a couple paragraphs in a methods section.

There is no systematic set of rules that guide the formulation of visual arguments. Rather, it is the syntactical indeterminacy in visual messages that often gives them their

power and elusiveness from regulation, study, and scientific interpretation (Messaris, 1997). Thus, in designing visual arguments, one must thoroughly understand commonly held meanings and inherent interpretations to be able to develop and design stimuli that will likely elicit shared meaning.

Food advertising is one area of strategic communication that conveys powerful implicit claims along with explicit information in photographic ad designs. Not only are our brains programmed to process visual information first, instinctively, and emotionally, the intensity of this processing is likely amplified when looking at images of food, sex, movement, or danger (Weinschenk, 2011). Specifically, food advertising that highlights the product or food as appetizing or healthy to the consumer must consider the message it is sending in the visuals. While this is used for a variety of food categories, it is often seen in breakfast food advertising, thus, breakfast food advertising images will serve as the operationalized target concept in my study.

Initial processing of imagery is influenced by the way our synapses are formed and connected – genetically and through experiences. This is not likely a nature versus nurture debate, but rather a combined influence of hard-wired reactions we inherit and how we have rewired (or additionally wired) as we learn from our experiences (LeDoux, 2002). Thus, food advertising often uses biologically programmed and socially constructed cues for meaning that individuals will process first and foremost. For example, in the US there is a commonly shared conceptualization about color and taste (Garber & Hyatt, 2003; Garber, Hyatt, & Starr, 2000), which can be (and often is) implied in food advertisements.

Images used in breakfast food advertising are designed – through photo manipulation – to be appetizing, and seen as potentially healthy, to consumers, regardless

of actual nutritional information. Color characteristics – hue, saturation, and brightness – often frame our expectations for taste by signaling a variety of food attributes. For example, more saturated colors communicate more intense flavors (Garber & Hyatt, 2003; Pangborn, 1960; Zellner & Durlach, 2003).

Stimuli Construction

All images were created in a process that mimics traditional advertising production. A studio set was constructed for full control and all pre-production was stylized and propped. Images of muffins, oatmeal, granola bars, waffles, yogurt, and cereal were stylized to serve as the stimuli in this study. Images were shot on an EOS Canon Mark II with a fixed 100mm macro lens. The set was illuminated with Profoto strobe lights and light modifiers in a standard food advertising light configuration. All images were first captured with an aperture setting that gave the image an ideal bell curve – no spikes of highlight or shadow data. Following, a variety of additional shots were captured with a range of exposures and light modifications to be used for compositing in the post-production photo manipulation condition.

Following capture, images in the capture condition were processed from their raw format to a compressed jpeg format with a standard color space for web (sRGB ICE61966-2.1). No other post-production techniques were performed on these images. These same images served as the base image of the photo manipulation condition. After processing from a raw format to the standard web color space, the images in the treatment condition were then retouched with a variety of form constraints and form freedom manipulations tactics often commonly used in persuasive visual appeals. First, ideal image elements were pulled from a variety of images and composited onto the base images. Following, holistic and localized adjustments were made to the hue, saturation,

and brightness of all image content.

Pretest 1

While it is not assumed that individuals will be able to detect photo manipulation, a pretest is needed to ensure there are differences in evaluative explicit attitudes to avoid ceiling effects of all images being perceived as pleasant and determine if there are enough differences to detect effects for implicit attitudes. Thus, all breakfast food images shot were pretested for perceived healthfulness and explicit attitudes, which served as a good test as these are likely weaker evaluative measure than implicit attitudes. Participants (n = 56) ages 19 to 65 (M = 35.57, SD = 11.85) were recruited from Amazon's Mechanical Turk (MTurk). Participants were paid 60 cents – a pay rate of 10 cents per minute. Over half (68%) of participants were male and the remainder female.

After consent, participants were randomly assigned to view photo manipulated images or captured images and rate their agreement with items for perceived healthfulness and attitude toward the product on a seven-point scale. Perceived healthfulness items assessed whether the food shown "would keep me healthy," "is nutritious," and "is good for my body" (Fotopoulos, Krystallis, Vassallo, & Pagiaslis, 2009). Attitude was gauged by the following items: "appealing," "good," "pleasant," "likable," and "favorable" (Spears & Singh, 2004). While no significant differences were found between the manipulated and captured images in this pretest, significant findings were unlikely due to small sample size and low statistical power. Therefore, results of this pretest were interpreted through the effect sizes (Table 3.1). Due to technical difficulties only one granola bar image displayed during the pretest, thus, these effect sizes are not reported. Only the muffin and oatmeal images had effect sizes that were above the threshold for a small effect, therefore further manipulations were applied to the

treatment group before another pretest.

Table 3.1: Pretest 1 Effect Sizes for Perceived Healthfulness and Attitude Toward Food Images

	Muffin	Oatmeal	Granola Bar	Waffles	Yogurt	Cereal
Perceived Healthfulness (η_p^2)	.019	.025	n/a	.000	.006	.007
Attitude Toward the Product (η_p^2)	.026	.024	n/a	.017	.001	.021

Pretest 2

Participants (n = 58) were recruited from MTurk for a second pretest to see if further manipulations in the treatment condition increased the potential for an effect to be found with the stimuli for waffles, yogurt, and cereal. All recruited participants were paid 60 cents for the completion of a 6-minute questionnaire. Participants were 21 to 64 years old (M = 34.78, SD = 11.35) and mostly (59%) male. Following consent, participants were again randomly assigned to the see the photo manipulated images or capture images and responded to the same items in pretest 1. Again, no significant differences were found in this pretest, however, the effects sizes shown in Table 3.2 indicate there are five images that were very close or above the cutoff for a small effect (.01) on attitude toward the product and significance given enough statistical power. Therefore, images of the muffin, oatmeal, granola bar, yogurt, and cereal were selected for use in SC-IAT portion of this study. Given the likelihood of survey fatigue, only two images were used in the self-report portion of the questionnaire – oatmeal and cereal. Images used for stimuli are shown in Figure 3.2.

Table 3.2: Pretest 2 Effect Sizes for Perceived Healthfulness and Attitude Toward Food Images

	Muffin	Oatmeal	Granola Bar	Waffles	Yogurt	Cereal
Perceived Healthfulness (η_p^2)	.005	.008	.001	.009	.031	.012
Attitude Toward the Product (η_p^2)	.009	.031	.021	.000	.016	.073

Figure 3.2: Stimuli Images

Capture Condition

Photo Manipulation Condition

Target Category

The target category used for the SC-IAT is *food*. A total of 10 breakfast food images were used as the stimuli of the target concept, which included five images without

post-production photo manipulation (capture condition) and the same five images with photo manipulation (photo manipulation condition).

Target Attributes

The target attributes were *pleasant* and unpleasant as general affective evaluations (Spence & Townsend, 2006). Pleasant stimuli were the following words: excellent, good, happy, likeable, and wonderful. Unpleasant stimuli included the words: bad, horrible, nasty, dislike, and terrible.

Participants

Participants were recruited through Amazon's Mechanical Turk (MTurk). Mturk is a crowd sourcing marketplace that allows for a heterogeneous sample of participants to be recruited for online activities (Ross, Irani, Silberman, Zaldivar, & Tomlinson, 2010). Matching current suggestions for pay rates of 10 cents per minute, participants were offered $1.10 for the completion of an eleven-minute questionnaire (Crump, McDonnell, & Gureckis, 2013; Mason & Suri, 2012; Sun, Wang, & Peng, 2011). To be eligible for this study, participants were required to be in the United States, have an acceptance rate of 85% or better from previous HITs on MTurk, and be at least 18 years old. Additionally, instructional manipulation checks – items with explicit instructions for what answer to select – were used to ensure that participants were not satisficing or skimming questions, which can increase error and decrease validity (Oppenheimer, Meyvis, & Davidenko, 2009).

After participants were eliminated for missed screener question or missing data, the final sample included 143 participants. Participants ranged in age from 18 to 65 years old (M = 35.16, SD = 11.08). Just over half (55%) were male and the remainder female. Participants self reported as white (83%), African American (6%), Asian (6%), Hispanic

(3%), American Indian (1%), or biracial (1%). Education levels included those with high school diplomas (11%), some college or technical training (32%), associate degrees (10%), bachelor's degrees (38%), master's degrees (8%), and professional or doctorate degrees (1%). There were no significant differences ($p > .05$) for any demographic variables – age, gender, race, or education – between the two experimental conditions.

Procedure

Participants were able to access the study as a Human Intelligence Task (HIT) on the MTurk marketplace. After accepting the HIT, participants began by clicking on the link to the online questionnaire and reading a consent form. The decision to continue the questionnaire served as consent in this study. Following, participants were randomly assigned to one of two between subject conditions in the experiment. Participants were assigned to either the post-production photo manipulation condition with images manipulated to advertising standards or the capture condition with images that had not been altered after the image was captured.

After random assignment, participants completed a Single Category Implicit Association Test (SC-IAT), where participants were asked to sort images representing the target concept of *food* and words for the target attributes of *pleasant* and *unpleasant*. The basic procedure of the SC-IAT is similar to the IAT (Karpinski & Steinman, 2006). Participants were asked to rapidly sort stimuli with a left hand key (e) or a right hand key (i) based on target words shown at the top left or right side of the screen. An SC-IAT contains four blocks, which include two trial blocks and two critical test blocks to measure implicit attitudes toward the food images, as shown in Table 3.3. Instructions for the sorting task were displayed before each block. Trial blocks had 24 rapid response sorting tasks to acquaint participations with the procedure and familiarize them with

current labels for sorting categories. Following, the critical testing blocks randomly selected stimuli from all target concept and attribute groups and presented them in a 7:7:10 ratio for the 72 trials to ensure 58% of the correct answers will be with the left key and 42% with the right key and vice versa for the second critical block. Participants were shown the stimuli and given an allotted window time of 1500 milliseconds to react for each trial. The block order was counterbalanced – half of the participants in each condition completed the incompatible blocks first.

Table 3.3: Single Category IAT (SC-IAT) Procedure

Block	Trials	Function	Type	Left-key response (e)	Right-key response (i)
1	24	Practice	Compatible	Pleasant + food	Unpleasant
2	72	Test	Compatible	Pleasant + food	Unpleasant
3	24	Practice	Incompatible	Pleasant	Unpleasant + food
4	72	Test	Incompatible	Pleasant	Unpleasant + food

With a medium gray background, the target attributes (*pleasant* and *unpleasant*) were shown in purple on the upper corners of the screen to indicate which hand would be used to sort these categories (Figure 3.1). The target concept (*food*) was shown in black with either attribute for half of the sorting tasks. Stimuli for rapid sorting were shown in the middle of the screen. Target attribute words were shown in purple and target concepts were images (in one condition or the other). Participants sorted the images and words by pressing a corresponding key with the left (e) or right (i) hand that matched the location of the target concept and attribute labels on the screen. For example, if the word "excellent" was displayed, participants would hit the "e" key if the label *pleasant* was on the left for a correct response. If sorted correctly, the next image or word would appear

after a 250ms interstimulus interval. If sorted incorrectly, a red *X* would appear at the bottom of the screen for 150ms before the interstimulus interval. If no action was taken in the allotted 1500ms, a reminder to "Please respond more quickly" was shown in yellow for 500ms before the interstimulus interval to deter participants from engaging in central processing. After completion of the SC-IAT, individuals completed items to assess one's perceived level of visual literacy, including perceived prevalence of photo manipulation in the media, and demographic items.

Dependent Variable Measures

Implicit Attitude Toward the Product

Difference scores or D-scores (M= .02, SD = .40) are a composite score that accounts for response latencies and error rates differences – critical measures used in all IAT methods – between compatible and incompatible blocks. D-scores serve as the primary dependent variable to evaluate non-rational responses and association strength of implicit attitudes toward the food products in this study. As participants were rapidly sorting the stimuli, faster reaction times or response latencies represent stronger implicit associations in the paired target concept and target attribute. A D-score is a difference score that is calculated by comparing the summary reaction times (response latencies) between contrasting blocks, while accounting for error rates. In this study, the D-score was the difference in the summary data of the compatible block (i.e., food + pleasant) minus the incompatible block (i.e., food + unpleasant), where negative scores represent positive implicit attitudes toward the food images. For ease of interpretation in the analysis, D-scores have been reversed so positive numbers represent positive implicit attitudes.

Explicit Attitude Toward the Product

Explicit attitudes toward the product were measured with five Likert-type items adapted from Spears and Singh (2004). After being shown the food images, participants rated their level of agreement that the oatmeal (α = .970, M = 4.98, SD = 1.49) and cereal (α = .949, M = 5.38, SD = 1.23) was "appealing," "good," "pleasant," "favorable," and "likable." Reponses ranged from strongly disagree (1) to strongly agree (7). Responses were combined for the analysis to represent average ratings of explicit attitude toward the product for the category of breakfast food (M = 5.18, SD = 1.19).

Visual Literacy Independent Variable Measures

Perceived Visual Literacy: Interpret

Perceived ability to "read" visuals or interpret meaning from visuals was assessed with ten Likert-type items (α = .920, M = 5.06, SD = .90) developed from extant literature (Avgerinou, 2007; Messaris, 1997). Reponses ranged from strongly disagree (1) to strongly agree (7). Following the stem "When I look at photographs in advertisements…", participants rated their agreement for the following interpretive abilities: "it is easy for me to critically evaluate the visuals for meaning," "I usually understand the photographer's communication intentions," and "it is easy for me to detect digital manipulation." Following a similar stem for non-photographic visuals, participant reported agreement with the following phrases: "It is easy for my to identify the purpose of the image," "I usually understand the artist or designer's communication intentions," and "It is easy for me to determine how the visual was created." The last four items assessed agreement with the following phrases for any visual: "It is easy for me to determine what the creator wants me to think," "I usually understand the symbols or

graphics used in the visual," "I can easily tell if visuals have multiple meanings," and "I critically evaluate the visuals for their meaning."

Perceived Visual Literacy: Create

One's perceived ability to "write" or create visuals was measured with seven Likert-type items (α = .879, M = 2.50, SD = 1.01) adapted from Brumberger (2011). Participants reported how skilled they considered themselves with "drawing," "painting," "photography," "presentation creation (e.g., MS PowerPoint®)," "image manipulation (e.g., Adobe Photoshop®)," "digital illustration (e.g., Adobe Illustrator)," and "website design (e.g., Adobe Dreamweaver®)."

Awareness of Photo Manipulation

Six Likert-type items (α = .916, M = 5.69, SD = .97) measured one's perceived level of awareness of photo manipulation (Messaris, 1997). Items assessed knowledge about and ability to detect photo manipulation. Participants rated their level of agreement, ranging from strongly disagree (1) to strongly agree (7), that "I know that some [photographs, video, advertising] has been digitally altered" and "I have noticed the use of computer alteration when looking at a(n) [photograph, video, advertisement]."

Photo Manipulation Experience

Experience with specific photo manipulation techniques – used in Photoshop or other photo manipulation software – was measured in addition to the operationalizations of visual literacy above to investigate whether regular use of these techniques – and not simply skill or knowledge that they exist – had a unique moderating effect. Six Likert-type items (α = .923, M = 2.70, SD = .95) were used to measure participants' level of experience with photo editing techniques. Participants rated how often, ranging from never (1) to all the time (5), they perform the following techniques: "resize images,"

"crop images," "work with image layers," "change the brightness/contrast of images," "selectively correct with masks," "retouch blemishes or unwanted objects," and "add, change, or remove color."

EXPERIMENT 1 RESULTS

H1-H3: Effects of Photo Manipulation

A multivariate analysis of variance (MANOVA) was used to analyze H1 and H2, investigating the main effects of photo manipulation for implicit and explicit attitudes. Effect size information from this analysis was coupled with a simple regression for each dependent variable to investigate whether photo manipulation has a stronger effect for implicit or explicit attitudes.

To investigate the influence of photo manipulation on implicit attitudes, D-scores from the SC-IAT were computed with the following steps using the recommended scoring algorithm (Greenwald, Nosek, & Banaji, 2003; Lane, Banaji, Nosek, & Greenwald, 2007). First, all trials with latencies above 10,000ms and all subjects with 10% or more trial latency under 300ms were excluded. Second, the sum of squared latencies for correct responses was calculated and divided by the number of correct trials in that block. Third, a standard deviation of correct response latencies from the block was calculated. Fourth, the overall standard deviation of all trials was calculated for each participant. Fifth, the mean of correct responses from the incompatible block was subtracted from the correct responses in the compatible block and this difference was divided by the overall standard deviation. Lastly, the resulting D-scores were reverse coded so positive numbers represented a positive implicit attitude

H1 stated that photo manipulation would have a significant main effect on implicit attitudes, where the presence of photo manipulation would lead to more positive

attitudes. This hypothesis was supported. Using D-scores, there was a significant main effect [$F(1,137) = 33.87$, $p < .001$, $\eta^2 = .20$] of photo manipulation on implicit attitudes toward food in the SC-IAT. Individuals in the post-production photo manipulation condition ($M = .21$, $SD = .36$) had significantly more positive implicit attitudes than those in the capture condition ($M = -.14$, $SD = .36$), which did not have any manipulation applied after the image was taken. The eta squared value of .20 is well above the cutoff for a medium effect (.10), thus indicating there is evidence of a moderate to strong relationship between the presence of photo manipulation and positive automatic, internal evaluations (Keith, 2006).

This main effect can be further illustrated by the shift in strength of the implicit attitudes. D-score effect sizes can be interpreted similarly to Cohen's *d* (1977), with cutoffs for effect sizes ranging from small (.2) to medium (.5) to large (.8). With this interpretation, participants can be categorized by the strength of their implicit attitudes toward the food images in the SC-IAT (Beattie & Sale, 2011; Greenwald et al., 2003). For example, D-scores of .8 or above would suggest the person has a strong preference for the food shown in the IAT, while a score from -.19 to .19 would indicate no preference or a neutral response. Table 3.4 shows D-scores categorized by the strength of the implicit association for each condition, as well as for participants overall. *N*'s over 15% are in bold for easy detection. The notable shift in preference direction between the two conditions further illustrated the effect of photo manipulation on implicit attitude. Participants exposed to images with post-production manipulation applied had generally neutral to moderately positive automatic evaluations. On the other hand, participants viewing the capture images, which were not retouched, had more negative non-rational responses that range from neutral to moderately aversive attitudes.

Table 3.4: D-scores by Condition for SC-IAT

Strength of Implicit Attitude for Food	*D-score* cutoffs	% (*n*) Photo Manipulation (*n* = 64)	% (*n*) Capture (*n* = 79)	% (*n*) Both Conditions (*n* = 143)
Strong preference	+.8	3% (2)	0	1% (2)
Medium preference	+.5	**16% (10)**	5% (4)	10% (14)
Slight preference	+.2	**39% (25)**	13% (10)	**25% (35)**
No preference or neutral	0	**31% (20)**	**37% (29)**	**34% (49)**
Slight aversion	-.2	8% (5)	**28% (22)**	**19% (27)**
Medium aversion	-.5	2% (1)	**17% (13)**	10% (14)
Strong aversion	-.8	2% (1)	1% (1)	1% (2)

H2 stated that explicit attitudes toward the product would be significantly higher for participants exposed to the manipulated images. This hypothesis was supported. There was a significant main effect of photo manipulation for explicit attitudes [$F(1,137) = 6.57$, $p < .05$, $\eta^2 = .05$] where individual in the photo manipulation condition ($M = 5.46$, $SD = .93$) had more positive attitude that participants in the capture condition ($M = 4.95$, $SD = 1.34$) across both food images.

H3 predicted that the effects of photo manipulation would be greater for implicit attitudes than explicit attitudes. The effect sizes associated with the previous results indicate that photo manipulation had a stronger effect on implicit attitudes ($\eta^2 = .20$) than explicit attitudes ($\eta^2 = .05$), as predicted in H3. Further analysis of the variance explained and parameter estimates generated with a simple regressions run for implicit and explicit attitudes were also used to better understand this difference with a standardized comparison. The regressions were significant for both dependent variables, however, the photo manipulation explained 20% of the variance in implicit attitudes [$R^2 = .198$, $F(1,141)$, $p < .001$] but only 5% of the variance in explicit attitudes [$R^2 = .046$, $F(1,137)$, $p < .05$]. Additionally, the regression coefficients indicate that photo manipulation has more than twice as strong of an effect for implicit attitudes ($\beta = .445$, $p < .001$) than

explicit attitudes (β = .214, $p < .05$). Thus, through these comparisons H3 is supported; photo manipulation is more influential on implicit attitudes.

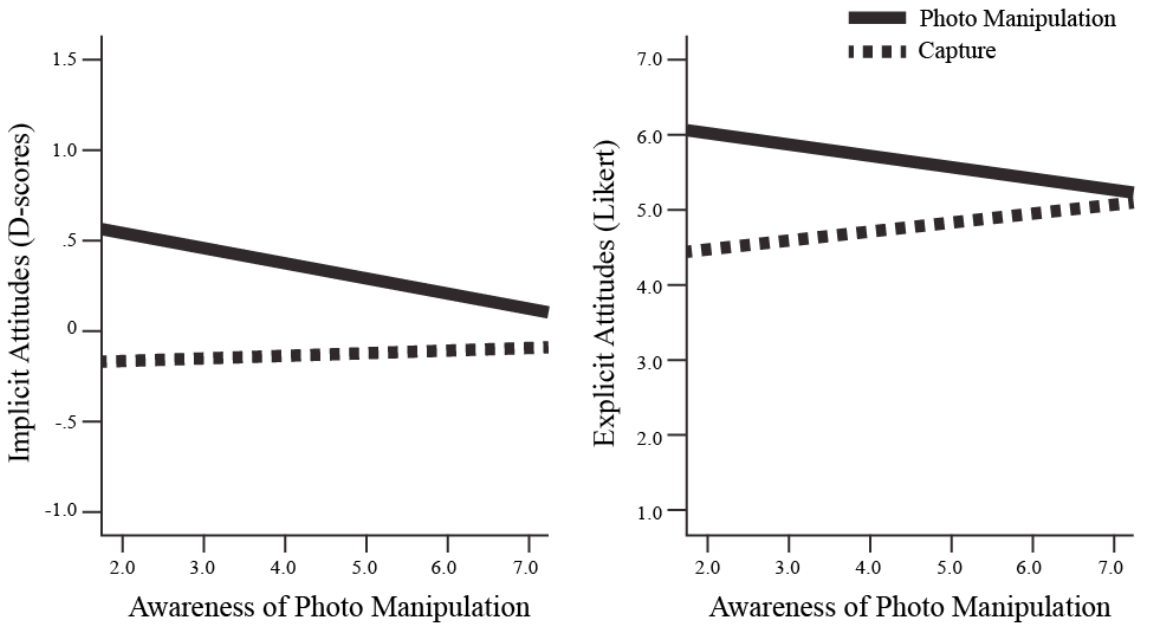
RQ1: Moderating Effects of Visual Literacy

A hierarchical multiple regression was run to determine whether visual literacy constructs of interpreting and creating visuals, awareness of photo manipulation, or photo manipulation experience moderated the relationship between photo manipulation and implicit attitudes for food images, given that MR subsumes analysis of variance tests and is a more robust test for analysis of experimental design data when independent variables are continuous. A dummy variable for the experimental conditions (photo manipulation vs. capture) was entered along with all potential moderating visual literacy independent variables, which were centered prior to use in the regression to avoid multicollinearity with conceptually similar constructs. Following, cross products of ability to interpret visuals, create visuals, awareness of photo manipulation, and photo manipulation experience were tested for significance. Due to the exploratory nature of this research question, interactions were graphed regardless of statistical significance to aid in the interpretation of any moderation.

Neither multiple regression for implicit attitudes nor explicit attitudes had a significant interaction for photo manipulation and visual literacy; although a visual inspection of the interaction did reveal one consistent pattern for a moderating variable – awareness of photo manipulation. As shown in Figure 3.3, the graphs indicate that awareness of photo manipulation does not have an effect in the absence of photo manipulation, but has a negative effect on implicit attitudes and explicit attitudes in the presence of photo manipulation. However, regressions run to isolate these effects did not

reveal a significant moderating influence for implicit (b = -.078, β = -.207, p > .05) or explicit (b = -.20, β = -.193 p > .05) attitudes.

Figure 3.3: Interaction of Awareness of Photo Manipulation and Photo Manipulation on Attitudes



EXPERIMENT 1 DISCUSSION

Individuals do not have time (or energy) to critically consume the plethora of mediated messages they encounter daily (Petty et al., 2009). However, even messages that are not attended to with great care may influence our thoughts, feelings, and actions (Barry, 2005). In a fraction of a second, quick glance, the brain processes implied visual arguments in messages (Barry, 2005). This happens instinctually, whether one likes it or not, and the resulting implicit attitudes have the power to influence our behavior (Gazzaniga, 1989, 2011). The power of these automatic evaluations and the role that

visual design plays in their valence, has been largely ignored by persuasive message processing theory – until now.

The main goal of this study was to provide evidence of a cause-and-effect relationship between photo manipulation and implicit attitudes and explicit attitudes, and to begin to shed light on how individuals are affected by implied visual arguments. In our digital era, there is increasing buzz that photography's easily manipulated digital form is corroding its visual communication power (Malkewitz, Wright, & Friestad, 2003). However, the ability to influence implicit and explicit attitudes with photo manipulation demonstrates that technological advances have to usurp our natural inclinations to believe what we see.

Using a novel approach with the SC-IAT, I found that individuals had more positive implicit attitudes toward food in images when they had been retouched to be more appetizing. Our findings confirm that advertising photo manipulation techniques are persuasive tactics to elicit positive automatic evaluations of food photography. The implied visual arguments in the manipulated images had the ability to sway immediate reactions from aversive to preferential, in just a fraction of a second.

Implicit attitudes are instinctual, affective responses that are generated almost instantaneously in the reaction to stimuli. The rapid formation of implicit attitudes makes them unable to be mediated by conscious thought and often out of our ability for introspection (Greenwald & Banaji, 1995). For consumer behavior, implicit attitudes are often better predictors of unplanned decisions. For example, while well thought out behaviors – diets and meal plans – are often best explained by explicit attitudes, spontaneous behaviors – quick snacking and on-the-go food choices – are best predicted by implicit attitudes (Friese et al., 2008; Perugini, 2005; Spence & Townsend, 2006).

Photo manipulation was shown to also influence explicit attitudes. Mirroring the differences in implicit attitudes, participants exposed to messages retouched to be more appetizing had more positive explicit attitudes toward the food. Although accounting for much less variance in the explicit attitudes, the visually implied arguments none-the-less were shown to influence thoughts and feelings available for introspection.

Demonstrating that photo manipulation can sway our immediate, visceral responses through the processing of implied visual arguments – to a greater degree than conscious evaluations – provides evidence that initial reactions to visual design in persuasive messages should be added as consideration in dual process models and other theories of persuasive message processing. The visual arguments in messages likely influence day-to-day attitudes and subsequent decisions and behaviors. Visually implied arguments, created by photo manipulation in this study, may have the power to generate similar halo effects as explicit claims in food marketing widely used in the American food landscape (Chandon & Wansink, 2007; Lee, Shimizu, Kniffin, & Wansink, 2013).

Implicit attitudes have been conceptualized as existing attitudes that are projected in the reaction to stimuli, such as visual images. Following this line of thinking, our study indicates that the design of the visual images influences which existing attitude is automatically activated. When the retouched, more appetizing images were shown, positively valenced associations were activated. Participants looking at the retouched images were able to sort these images as pleasant more quickly than individuals with capture images. This indirect measure of implicit attitudes demonstrates that advertisers have a powerful persuasive tool at their fingertips.

However, all hope may not be lost; individuals may not be mindlessly at the mercy of photo manipulation. While my findings do not support that any consistent moderating effects of perceived ability or experience interpreting and creating visuals

will alter one's automatic visual interpretations, there is one visual literacy that holds promise to be able to temper implicit and explicit attitudes alike – awareness of photo manipulation. Individuals with higher levels of awareness of photo manipulation were not as influenced by the manipulated visual arguments when they were present. This finding opens possibilities that visual and media literacy efforts to educate consumers about advertising and marketing practices may temper the effects of photo manipulation. This finding may be particularly influential in media literacy education efforts for children and adolescents. Children and adolescents are more susceptible to visual arguments, as they rely predominately on emotional or instinctual processing until they develop the cognitive abilities for more systematic evaluation as young adults.

Additionally, while the IAT or SC-IAT is not a new method for investigating implicit, its application in this study for a between subjects experiment of an "undetected" visual technique is novel. The study provides researchers interested in persuasive message processing a method that overcomes two major shortcomings with self-report investigations of visual appeals - individuals do not often have the jargon necessary to articulate reactions to design nor are they able to identify or express visceral, instinctual, or emotional responses. This approach is especially important for visual communication research, as it gives researchers a method that subverts the verbal imperialism that is rampant in persuasion effects testing.

Limitations and Future Research

This study was designed to test not only the impact of photo manipulation on implicit and explicit attitudes, but also to determine if photo manipulation had a stronger effect on one or the other. While the multiple analyses support that photo manipulation is more influential on implicit attitudes, these findings may be influenced by the differences

in stimuli. The design of the SC-IAT requires a variety of images, thus five breakfast food images were used. However, only two images were evaluated with self-report items for explicit attitudes due to concerns of survey fatigue. Replication of these findings with even numbers of messages (and different message context) are needed to support the claim that photo manipulation influences implicit attitudes more than explicit attitudes broadly.

Additionally, the effects of photo manipulation on implicit attitudes should be explored in conjunction with behavioral measures to better understand how these initial affective reactions do (or do not) influence action. By looking at attitudes alone, this study does not provide evidence for how these reactions may or may not correlate with actual behavior. Future work that investigates the differences for how photo manipulations affects deliberate and spontaneous behavior will further illuminate how visual arguments might influence behavior in day-to-day decisions.

Chapter 4: Experiment 2

EXPERIMENT 2 METHODS

Study Design

This experiment used a 2 (photo manipulation: photo manipulation vs. capture) x 2 (rational counter-argument: poor nutrition label vs. control) between subjects design to investigate the role of photo manipulation and visual literacy in persuasive message processing. This study was designed to demonstrate that a) photo manipulation is a powerful persuasive tool and b) getting people to first "buy in" to the argument with visual information is key for persuasive messages. It is possible that the processing of the visual argument will color all other processing of the information presented; individuals exposed to the “appetizing” visual arguments may cognitively process all information – the advertisement and the nutrition label – in a way that confirms their initial reactions, thoughts, and feelings about the food product regardless of the actual healthfulness of the food.

The first factor, photo manipulation, will be a manipulated variable for the level of implicit visual argument in the photograph of the advertisements shown. For the second manipulated factor, nutritional labels will serve as the source of rational arguments in the message processing condition. Individuals shown advertisements with the nutrition label will be primed for central or systematic processing through personal responsibility, in addition to having the rational, text-based information included in the label (Petty & Cacioppo, 1986). Individuals shown advertisements without nutrition labels will serve as the comparative peripheral or heuristic processing group. Lastly, visual literacy will be a measured factor in this study design through the use of a variety of scales (Avgerinou, 2007; Brumberger, 2011; Messaris, 1994, 1997).

Hypotheses and Research Questions

Based on the literature discussed in a previous chapter and the aims of this study, the following hypotheses and research questions were proposed for the investigation of main effects and moderators of photo manipulation:

H4: Individuals will have significantly more positive attitudes toward products shown in food advertisements with manipulated visual arguments than toward capture food advertisements.

H5: Food will be perceived as significantly more healthful when it is shown in food advertisements with manipulated visual arguments than food shown in capture advertisements.

RQ2: Do the effects of photo manipulation differ with or without the presence of rational counter-arguments for attitudes toward the product and perceived healthfulness?

RQ3: Does visual literacy moderate the influence of photo manipulation for perceptions of health or attitudes toward the product without rational counter-arguments?

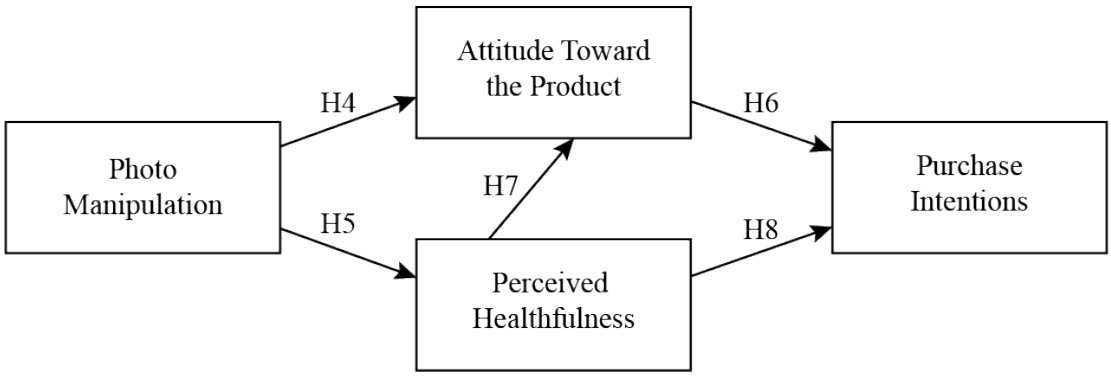
Additionally, to explore the mediated effects of photo manipulation for purchase intentions (shown in Figure 4.1), the following hypothesized research model and research question are proposed:

H6: Attitude toward the product will have positive effect on purchase intentions.

H7: Perceived healthfulness will have a positive effect on attitude toward the product.

H8: Perceived healthfulness will have a positive effect on purchase intentions.

Figure 4.1: Hypothesized Research Model



Stimuli Conceptualization and Operationalization

Given that photo manipulation is inherent in all images, it is impossible to have a true control in this study. Rather, the control group should be referred to as a comparison group (Thorson, Wicks, & Leshner, 2012). Individuals in the comparison group of capture images viewed ads with images that only have manipulation that is inherent in the capture process (e.g., camera angle, distance). Individuals in the treatment group were shown images that have been manipulated to advertising standards, with form constraint and form freedom techniques applied in post-production. Manipulation techniques included changed, moved, added, or replaced pixels to illustrate cues of appetizing food. Examples of manipulations performed include: increased brightness and contrast (holistic and localized), hue adjustments (holistic and localized), composited images, and warped or transformed shapes of objects.

Food advertisements that were primarily photo based were created for a variety of breakfast foods (yogurt, cereal, oatmeal, granola bars, waffles, blueberry muffin) for this experiment. Breakfast foods were used for this study because they are often eaten in isolation, commonly advertised as a great way to start the day, and can be healthful or

laden with unhealthy ingredients, such as excessive amounts of sugar. While media attention is increasing on the disastrous health effects of sugar, these food items still do not have the stigma of other unhealthy foods such as alcohol, desserts, and fried or fast food.

All images used in this study were created with a production style used in traditional advertising food photography. The food images were propped, styled, and shot on a studio set illuminated with Profoto strobes with light modifiers. Images were shot digitally with an EOS Canon Mark II with a 100mm macro lens. All images were first shot to produce an ideal bell curve in the histogram – no spikes of overexposed or underexposed information. Once this was captured, additional shots were taken at a variety of exposure and with light modifications to be used in the post-production manipulation of the more "appetizing" food image.

The original captured images were converted from a raw format to a jpeg with a standard web color space (sRGB ICE61966-2.1). No other manipulations were done to these images and they served as the "capture" images in all pretests and the main experiment. The same images were then manipulated for the treatment condition. Holistic and localized adjustments were made to the image's hue, saturation, and brightness. Additionally, elements from a variety of shots were composited onto the based image to create the ideal shot.

Pretest 1: Food Images

A pretest was conducted with participants (n = 58) from Amazon's Mechanical Turk (MTurk) to initially decide which two food images would be used for the experiment. Participants in this pretest ranged in age from 21 to 64 years old (M = 34.78, SD = 11.35) and over half (59%) were male. Participants were given 60 cents for a

completed questionnaire – a pay rate of 10 cents a minute. After consent, participants were randomly assigned to view capture images or images with post-production photo manipulation applied. Each image was rated with eight seven-point Likert-type items. Three items assessed three perceived healthfulness with ratings of agreement – strongly disagree (1) to strongly agree (7) – for opinions that the food shown in the images would "would keep me healthy," "is nutritious," and "is good for my body" (Fotopoulos et al., 2009). Five items assessed attitudes toward the product with similar ratings for opinions of whether the items were "appealing," "good," pleasant," "likable," and "favorable" (Spears & Singh, 2004). While no significant differences were found between the capture and photo manipulation groups in this pretest, this was likely due to low statistical power from the small sample size. Thus, effect sizes were evaluated to determine which set of images were most likely to reveal an effect if it existed in the main experiment, as shown in Table 4.1. Images were eliminated if they did not have effect size that met the cutoff for a small effect (.01) for attitude toward the product (Keith, 2006). Of the remaining images, the two with the highest effect sizes for attitude toward the product were selected for use in the experiment: oatmeal and cereal.

Table 4.1: Effect Sizes for Perceived Healthfulness and Attitude Toward Food Images

	Muffin	Oatmeal	Granola Bar	Waffles	Yogurt	Cereal
Perceived Healthfulness (η_p^2)	.005	.008	.001	.009	.031	.012
Attitude Toward the Product (η_p^2)	.009	.031	.021	.000	.016	.073

Pretest 2: Product Brand

Pretest participants (n=81) were recruited through MTurk to determine which equivalently neutral brands would be used in the advertisements. MTurk workers were paid 75 cents for their participation. Participants' ages ranged from 21 to 63 years old (M=39.93, SD=11.07). Females comprised 62% of the sample and the remainder participants were male. Participants were asked to rate their level of perceived healthfulness of seven brands with a single semantic differential item for each brand anchored by "unhealthy for me" (1) and "healthy for me" (7).

Responses indicate that of all the brands evaluated – Kellogg's (M = 4.31, SD = 1.37), Post (M = 4.62, SD = 1.34), Arrowhead Mills (M = 4.86, SD = 1.17), McCann's (M = 4.90, SD = 1.29), Health Valley (M = 5.21, SD = 1.26), Nature Valley (M =5.52, SD = 1.13), and Nature's Path (M = 5.62, SD = 1.04) – Arrowhead Mills and Post were rated most similarly neutral. A repeated measures ANOVA confirmed there were no significant ($p > .05$) difference for perceived healthfulness of Arrowhead Mills and Post brands. Thus, Arrowhead Mills was selected as the brand for oatmeal and Post was selected as the brand for cereal in the experimental advertisements.

Pretest 3: Food Advertisements

A third pretest was conducted with Mturk participants (n=40) after the food advertisements were created – by combining the food images and logos of the selected brands – to ensure the attitude effects found previously with the images were maintained in the advertisements. Participants were paid 40 cents for the completion of a 4-minute questionnaire. Participants in the third pretest were predominately male (70%) and ranged in age from 22 to 62 years old (M = 34.98, SD = 9.85).

Participants were randomly assigned to rate two breakfast food advertisements – oatmeal and cereal – with either capture images (comparison) or the post-production

manipulated images (treatment) for perceived healthfulness, attitude toward the product, and purchase intentions. The same items for perceived healthfulness and attitude toward the product from pretest 1 were used. The additional items for purchase intentions consisted of three seven-point semantic differentials adapted from Spears and Singh (2004). Items were anchored by "definitely not buy it/definitely buy it," definitely do not intend to buy/definitely intend to buy," and "probably not buy it/probably buy it" with positively phased anchors rated as higher numbers.

A multivariate of analysis (MANOVA) was conducted for each product. Descriptive and inferential statistics from pretest 3 are shown in Table 4.2. Findings from the significance tests and effect sizes indicate that the effects of photo manipulation for attitude with the images only from pretest one were still found when the brand names were added to the advertisements and would be used in the main experiment. Notably, with the brand names added the effects of photo manipulation for perceived healthfulness disappeared. This will be explored fully in the main experiment.

Table 4.2: MANOVA Results for Advertisement Pretest for Effect of Photo Manipulation

	M (*SD*) for Photo Manipulation (treatment)	*M* (*SD*) for Capture (comparison)	*F* value	η_p^2
Oatmeal (*df* = 1, 36)				
Perceived Healthfulness	5.61 (.93)	5.43 (1.15)	.29	.008
Attitude Toward the Product	5.20 (1.11)	3.88 (1.54)	9.32**	.201
Purchase Intentions	4.30 (1.50)	2.75 (1.76)	8.59**	.188
Cereal (*df* = 1, 36)				
Perceived Healthfulness	5.35 (.92)	5.35 (.95)	.00	.000
Attitude Toward the Product	5.60 (.61)	4.88 (1.36)	4.38*	.109
Purchase Intentions	4.75 (1.10)	3.86 (1.88)	3.19	.081

Pretest 4: Nutrition Labels

Last, a pretest was conducted with a convenience sample of undergraduate students (n=198) to ensure that the nutrition label shown to participants in the rational processing condition was perceived as unhealthy. Participants ranged in age from 18 to 32 years old (M = 19.67, SD = 2.00) and were mostly female (69%). Nutrition labels were modified to include higher levels of sugar, fat, and overall calories and compared with an actual nutrient label for Nature Valley granola bars.

Participants rated the perceived healthfulness of food associated with the label shown with nine Likert-type items adapted from the Food Choice Questionnaire for food choice motives (Fotopoulos et al., 2009). Responses ranged from strongly disagree (1) to strongly agree (7). Phrases included "would keep me healthy," "is nutritious," "is low in calories," and "helps me control my weight," along with similar items. Two labels with the lowest healthfulness ratings (M = 2.59, SD = 1.04 & M = 3.01, SD = 1.01) were selected for use in the experiment as the rational argument information.

Participants

Participants (n = 301) were recruited from MTurk, an online crowd sourcing service that is a valid resource for the collection of anonymous data with online experimental designs (Crump et al., 2013). Participants were paid 50 cents for the completion of a 5-minute questionnaire, matching the recommended pay rate of at least 10 cents per minute. MTurk workers had to be in the United States, have an acceptance rate of 85% or better from previous work on MTurk, and successfully complete an instructional manipulation check (Oppenheimer et al., 2009) to be included in the final data set for this experiment.

Participants were between the ages of 19 and 68 years old (M = 34.96, SD = 11.07). More than half (59%) of the participants were male. Participants reported

themselves as white (79%), Hispanic (10%), African American (5%), Asian (3%), or multiracial or other (2%). Education levels for highest degree or level of school included: some high school (2%), high school diploma (11%), some college or technical training (24%), associate's degree (12%), bachelor's degree (40%), master's degree (8%), and professional or doctorate degree (1%). No significant differences ($p > .05$) were found among the experimental conditions for age, gender, race, or education.

Procedure

Upon completion of the consent form, participants were randomly assigned to one of the four conditions in the 2 x 2 experiment; conditions were 1) post-production photo manipulation advertisements with nutrition labels, 2) post-production photo manipulation advertisements without nutrition labels, 3) capture advertisements with nutrition labels, or 4) capture advertisements without nutrition labels. Participants in the rational argument condition (with nutrition labels) were cued for centrally processing with a message to evoke personal responsibility at the start of the survey (Petty & Cacioppo, 1986). They were informed that they had been specially selected and it was important to use all the information shown in their evaluation. Participants in the control group (peripheral processing, no nutrition labels) were simply told their opinions were appreciated.

Following, the first stimuli were shown to all participants. All advertisements were shown at 600x840 pixels to present a large image, but not require left-to-right scrolling in the questionnaire. Below each advertisement, participants completed items for perceived healthfulness, attitude toward the product, and purchase intentions in a randomized order. The second stimuli were then shown and evaluative items were repeated. The order of the oatmeal and cereal advertisements was counterbalanced to avoid order effects. Lastly, all participants responded to items that measured their

perceived visual literacy, which included awareness of photo manipulation and photo manipulation experience, and demographic items.

Dependent Variable Measures

Perceived Healthfulness

Perceived healthfulness or healthiness is most commonly measured as a single item, which does not allow for reliability analysis. Thus, a scale was adapted from previous research of the Food Choice Questionnaire that assesses motives underlying food selection (Fotopoulos et al., 2009; Steptoe & Pollard, 1995). Participants responded to three Likert-type items for oatmeal (α = .96, M = 4.91, SD = 1.53) and cereal (α = .96, M = 4.93, SD = 1.41) advertisements with responses ranging from strongly disagree (1) to strongly agree (7). Items following the stem of "The product shown above…" included: "would keep me healthy," "is nutritious," and "is good for my body."

Attitude Toward the Product

Attitude toward the product was defined as the explicit assessments of the brands and was measured with five seven-point Likert-items (Spears & Singh, 2004) for oatmeal (α = .95, M = 4.34, SD = 1.49) and cereal (α = .94, M = 5.03, SD = 1.21) advertisements. Participants rated their agreement with the products shown as being "appealing," "good," "pleasant," "likable," and "favorable."

Purchase Intentions

Purchase intentions served as proxy for consumer behavior in this experiment. Three seven-point semantic differential items for oatmeal (α = .97, M = 3.35, SD = 1.76) and cereal (α = .96, M = 3.95, SD = 1.80) advertisements were anchored by "definitely do not intend to buy/definitely intend to buy," "definitely not buy it/definitely buy it,"

and “probably not/probably buy it” and averaged to represent individuals’ likelihood for behavior (Spears & Singh, 2004). Higher scores represent higher purchase intentions.

Visual Literacy Independent Variable Measures

Perceived Visual Literacy: Interpret

Ten Likert-type items (α = .96, M = 5.03, SD = .87) measured one’s perceived ability to interpret visuals or “read” meaning from visual information (Avgerinou, 2007; Lazard & Atkinson, 2015; Messaris, 1997). Ranging from strongly disagree (1) to strongly agree (7), participants rated their agreement with the follow phases for photographs: “it is easy for me to critically evaluate the visuals for meaning,” “I usually understand the photographer’s communication intentions,” and “it is easy for me to detect digital manipulation.” Participants also rated their agreement with statements for non-photographic items: “It is easy for my to identify the purpose of the image,” “I usually understand the artist or designer’s communication intentions,” and “It is easy for me to determine how the visual was created.” Lastly, they rated their agreement with items for any visual: “It is easy for me to determine what the creator wants me to think,” I usually understand the symbols or graphics used in the visual,” “I can easily tell if visuals have multiple meanings,” and “I critically evaluate the visuals for their meaning.”

Perceived Visual Literacy: Create

Seven Likert-type items (α = .86, M = 2.44, SD = .96) adapted from Brumberger (2011) were used to measure one’s perceive ability to create or “write” visuals. Participants rated how skilled they are, ranging no experience (1) to expert (6) with “drawing,” “painting,” “photography,” “presentation creation (e.g., MS PowerPoint®),” “image manipulation (e.g., Adobe Photoshop®),” “digital illustration (e.g., Adobe Illustrator®),” and “website design (e.g., Adobe Dreamweaver®).”

Awareness of Photo Manipulation

An individual's perceived level of awareness of photo manipulation in visuals was measured with six Likert-type items (α = .93, M = 5.70, SD = 1.10) adapted from Messaris (1997). Participants rated their level of agreement with items for knowledge and ability to detect photo manipulation, ranging from strong disagree (1) to strong agree (7). Items included: "I know that some [photographs, video, advertising] has been digitally altered" and "I have noticed the use of computer alteration when looking at a(n) [photograph, video, advertisement].

Photo Manipulation Experience

Experience with photo manipulation techniques was measured in addition to one's perceived level of ability to create visuals with various methods, as actual experience with the techniques used for the stimuli manipulations may have a unique moderating effect apart from general abilities to create visuals. Based on techniques common in introductory Photoshop courses and guidebooks, six Likert-type items (α = .92, M = 2.66, SD = .93) were developed to measure an individual's level of experience with photo manipulation techniques. Participants rated how often they "resize images," "crop images," "work with image layers," "change the brightness/contrast of images," "selectively correct with masks," "retouch blemishes or unwanted objects," and "add, change, or remove color," ranging from never (1) to all the time (5).

EXPERIMENT 2 RESULTS

H4-H5: Main Effects of Photo Manipulation for Attitude Toward the Product and Perceived Healthfulness

A MANOVA was run to test the proposed hypotheses in experiment 2 for the dependent variables of attitude toward the brand (H4) and perceived healthiness (H5) for

the combined scores of the food advertisement evaluations, as well as two additional MANOVAs for oatmeal and cereal independently. Attitude toward the product and perceived healthfulness were the dependent variables in the analysis and absence/presence of photo manipulation and rational argument were the independent variables. Descriptive and inferential statistics from these tests are shown in Table 4.3.

H4 stated that participants exposed to food advertisements with photo manipulation would have significantly more positive attitudes toward the product than those who saw ads with capture images. This hypothesis was supported. Participants had significantly more positive attitudes for food advertised with photo manipulation across all foods [$F(1,287) = 14.61$, $p < .001$], for oatmeal [$F(1,290) = 10.29$, $p < .01$], and for cereal [$F(1,294) = 8.88$, $p < .01$]. Partial eta squared effects size ranged from .03 to .05, indicating this is a small effect.

H5 stated food products shown with photo manipulation would elicit responses of significantly greater perceived healthfulness than those advertised with capture images. This hypothesis was not supported. There were no significant ($p > .05$) differences for perceived healthfulness of the product when the images were manipulated for the food combined, oatmeal, or cereal. Even though average responses were always greater for the photo manipulation condition, none of the partial eta squared effect sizes are above the minimum threshold to be considered a small effect.

RQ2: Influence of Rational Counter-Argument on Photo Manipulation Effects

RQ2 asked if effects of photo manipulation differ with or without the presence of rational counter-arguments for attitudes toward the product and perceived healthfulness. To answer this, separate MANOVAs were run for participants assigned to each rational argument condition to isolate the effects of photo manipulation when nutrition labels

were shown and when they were not shown. The significance test results from these additional MANOVAs for those that saw advertisements without labels and those that saw advertisements with labels are also shown in Table 4.3.

Generally, the main effects of photo manipulation for attitude toward the product in H4 are upheld in both message processing conditions. Specifically, data indicate that the effects of photo manipulation are still present when individuals are primed for systematic processing and given a rational counter-argument with a poor nutrition label. With the label, individuals reported having significantly more positive attitudes toward the product for the advertisements combined [$F(1,287) = 6.20$, $p < .05$], oatmeal [$F(1,290) = 4.16$, $p < .05$], and cereal [$F(1,294) = 5.64$, $p < .05$].

On the other hand, when individuals viewed only the advertisements without nutrition labels, the effects of manipulation were seen in the food combined [$F(1,287) = 8.62$, $p < .01$] and oatmeal [$F(1,290) = 6.35$, $p < .05$] advertisements only. Thus, the evidence supports that there are only limited differences for effects of photo manipulation on attitude when there is not a counter-argument present. There are no significant main effects by message processing condition for perceived healthfulness, which is expected since H5 was unsupported.

Table 4.3: MANOVA Results for for Effect of Photo Manipulation on Dependent Variables

	M (*SD*) for Photo Manipulation (treatment)	*M* (*SD*) for Capture (comparison)	*F* value	η_p^2
Food Combined (*df* = 1, 287)				
Attitude Toward the Product	4.94 (1.01)	4.43 (1.24)	**14.61*** **	**.048**
No label	5.22 (.82)[a]	4.74 (1.20)[b]	**8.62****	**.053**
With label	4.59 (1.11)[a]	4.09 (1.21)[b]	**6.20***	**.045**
Perceived Healthfulness	5.00 (1.27)	4.82 (1.41)	.75	.002
No label	5.45 (.90)[c]	5.42 (.96)[d]	.06	.001
With label	4.44 (1.41)[c]	4.19 (1.53)[d]	.64	.005
Oatmeal (*df* = 1, 290)				
Attitude Toward the Product	4.62 (1.36)	4.05 (1.56)	**10.29****	**.034**
No label	4.93 (1.19)[e]	4.37 (1.56)[f]	**6.35***	**.039**
With label	4.22 (1.46)[e]	3.70 (1.49)[f]	**4.16***	**.031**
Perceived Healthfulness	4.99 (1.53)	4.83 (1.58)	.46	.002
No label	5.58 (1.04)[g]	5.56 (1.05)[h]	.01	.000
With label	4.23 (1.63)[g]	4.03 (1.68)[h]	.47	.004
Cereal (*df* = 1, 294)				
Attitude Toward the Product	5.24 (1.08)	4.82 (1.29)	**8.88****	**.029**
No label	5.45 (.98)[i]	5.14 (1.20)[j]	3.11	.019
With label	4.97 (1.15)[i]	4.48 (1.30)[j]	**5.64***	**.040**
Perceived Healthfulness	5.00 (1.32)	4.86 (1.49)	.55	.002
No label	5.33 (1.08)[k]	5.35 (1.28)[l]	.01	.000
With label	4.59 (1.47)[k]	4.34 (1.53)[l]	.95	.007

RQ3a-c: Moderating Effects of Visual Literacy

Hierarchical multiple regressions were used to investigate whether visual literacy has a moderating role on the photo manipulation effects on attitudes toward the product and perceived healthfulness in the heuristic condition without rational counter-arguments. These analyses were conducted with participants that saw stimuli without a nutrition label to ensure the poor nutrition information did not confound moderating effects of the visual

literacy variables. Hierarchical multiple regressions were run separately for each dependent variable for oatmeal and cereal advertisements. Results are shown in Table 4.4. Details of significant interactions are described below.

The overall multiple regression was significant for attitude toward the product for the cereal advertisement [R^2 = .12, F(5,142) = 3.80, p < .01], where photo manipulation and the four visual literacy variables accounted for 12% of the variance. Following, and of greater interest here, the cross products of the four visual literacy variables were added to determine if there were significant interactions; there was one. The ability to create visuals had a significant moderating effect (b = .56, β = .38, p < .05) on photo manipulation for attitude toward the product. A visual inspection of the data indicate that perceived ability to create visuals has a positive relationship with attitude toward the product when photo manipulation, an amplified rather than attenuated effect, although there is no significant (p > .05) effect for either photo manipulation condition in isolation.

Although there was no main effect for photo manipulation and perceived healthfulness, and interaction was found for awareness of photo manipulation and photo manipulation for this dependent variable. The overall multiple regression for perceived healthfulness for the oatmeal advertisement was significant [R^2 = .14, F(5,143) = 4.45, p < .01]; meaning that photo manipulation and the four visual literacy variables account for 14% of the variance in perceived healthfulness. Additionally, the cross product of awareness of photo manipulation was significant (b = .33, β = .27, p < .05), indicating that awareness has a moderating effect on perceived healthfulness when controlling for other visual literacy abilities and experience. Visual inspection of the data indicates that this moderating effect is most pronounced when post-product photo manipulation is absent. When isolating for those in the capture condition, there is a significant negative effect (b = -.34, β = -.35, p < .01) for perceived healthfulness, which indicates that people

with higher levels of awareness of photo manipulation gave poorer ratings of perceived healthfulness when the images were not manipulated.

Table 4.4: Effect of Photo Manipulation and Visual Literacy on Dependent Variables

	β	*b* (SE_b)	β	*b* (SE_b)
	Oatmeal		Cereal	
Attitude Toward the Product				
VL: Interpret	-.09	-.21 (.29)	-.02	-.03 (.23)
VL: Create	.25	.47 (.33)	**.38***	**.56 (.25)**
Awareness of Photo Manipulation	.12	-.20 (.23)	-.01	-.02 (.18)
Photoshop Manipulation Experience	.02	.04 (.33)	-.29	-.47 (.26)
Perceived Healthfulness				
VL: Interpret	-.14	-.23 (.20)	-.24	-.48 (.21)
VL: Create	-.02	-.03 (.23)	.32	.51 (.28)
Awareness of Photo Manipulation	**.27***	**.33 (.16)**	-.08	-.12 (.20)
Photoshop Manipulation Experience	.14	.21 (.23)	-.14	-.23 (.29)

H6-8: Indirect Effects of Photo Manipulation on Purchase Intentions

Structural equation modeling (SEM) was used to investigate the indirect effects of photo manipulation with the research model proposed with H6-8. SEM is preferred over traditional path modeling because it is a more robust test that provides complete decomposition of effects, control for measurement error, and estimates of model fit (Kaplan, 2008). Using Mplus v6.12, the structural model specified by H4-H8 was tested for relationships among the constructs.

The structural model (Figure 4.2) fits the data well according to common fit statistics ($\chi 2 = 1.711$, $p = .19$, $df = 1$; AIC = 2541.41; CFI = .998; TFI = .990; SRMR = 0.013 RMSEA = .05. 90% CI = .000, .174]. Table 4.5 displays all standardized correlations among constructs. The model accounts for 60% of the variance found in

purchase intentions, the criterion variable. The model also accounts for 44% of the variance in attitude toward the product. However, the model only accounts for less than 1% of the variance of perceived healthfulness, demonstrating that additional variables are need to truly understand what influences perceived healthfulness of food in advertisements.

Four of the five hypotheses were supported with this model. The model includes H4 and H5, which hypothesized main effects of photo manipulation as reported above. Reiterating these findings, photo manipulation had a positive effect on attitude toward the product (H4; $b = .43$, $\beta = .187$, $p < .001$). The one unsupported hypothesis was H5; there was no significant effect ($p > .05$) of photo manipulation for perceived healthfulness.

The newly examined relationships in this model were all supported. Attitude toward the product had a significant positive effect on purchase intentions (H6; $b = .81$, $\beta = .609$, $p < .001$). Attitude toward the product was significantly predicted by perceived healthfulness (H7; $b = .54$, $\beta = .621$, $p < .001$). Lastly, perceived healthfulness had a positive effect on purchase intentions (H8; $b = .27$, $\beta = .231$, $p < .001$). However, because there is no significant effect of photo manipulation on perceived healthfulness, the indirect relationships via perceived healthfulness for attitude toward the product or purchase intentions are not explained by the experimental manipulation of this study.

Figure 4.2: Structural Equation Model Results for All Participants (n = 288)

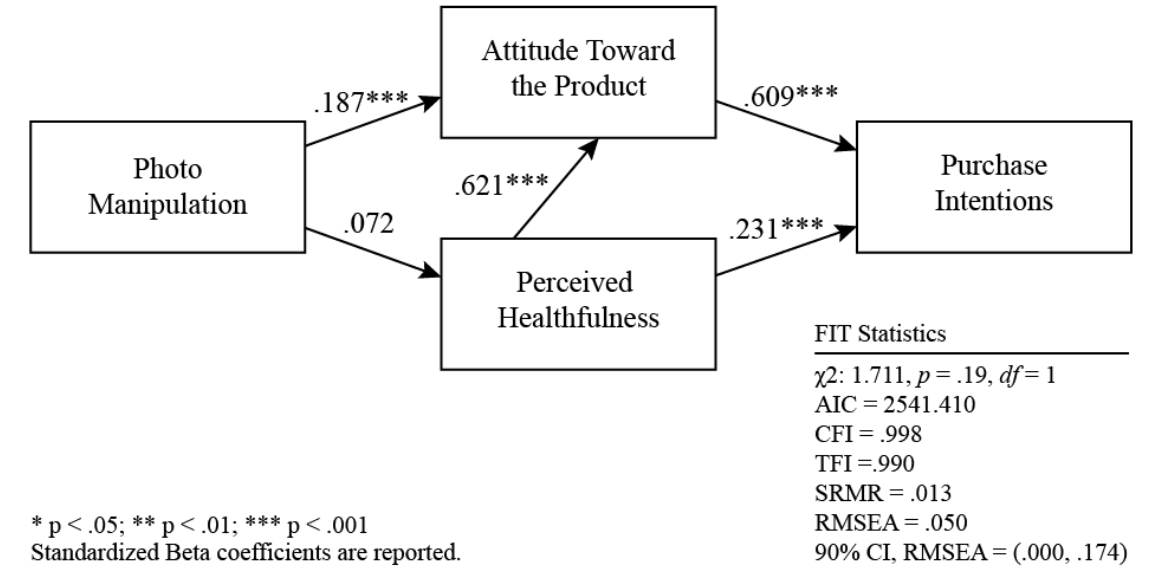


Table 4.5: Standardized Correlations Among Constructs

	PM	PH	A_{pr}	PI
Photo Manipulation (PM)	1.00			
Perceived Healthfulness (PH)	.07	1.00		
Attitude Toward the Product (A_{pr})	.23***	.64***	1.00	
Purchase Intentions (PI)	.11	.62***	.76***	1.00

The indirect effects of photo manipulation on purchase intentions are of interest in this study and the decomposition of effects are shown in Table 4.6. While there are three possible paths to purchase intentions in the model, only one was found to significantly explain this relationship through consistent significant direct effects – via attitude toward the product. This significant indirect effect (p < .001) suggests that photo manipulation has an effect on purchase intentions when mediated by attitude toward the product.

Table 4.6: Effects of Photo Manipulation on Attitude Toward the Product (A_{pr}) and Purchase Intentions (PI)

Path	Direct Effect	Indirect Effect(s)	Total Effect
PM, A_{pr}	.187***	.045	.232
PM, PH, A_{pr}, (H5)		.045	
PM, PI	n/a	.158***	.158
PM, A_{pr}, PI (H4)		.114***	
PM, PH, PI (H6)		.017	
PM, PH, A_{pr}, PI		.027	

EXPERIMENT 2 DISCUSSION

Dual processing models for persuasive message processing posit that visual evaluations are most influential with peripheral or heuristic processing, when processing resources, motivation, or abilities are low (Chaiken, 1987; Petty & Cacioppo, 1986). However, dual processing models for perception present a different story, where visual processing comes first, instinctually and without conscious control, and can have influential effects for all subsequent rational processing (Barry, 2002; Gazzaniga, 1989; LeDoux, 1986). Whether consciously available or not, initial visual processing has been shown to greatly affect our thoughts, feelings, and behavior (Gazzaniga, 1989). Thus, the main goal of this study was to investigate whether implied visual arguments – created by photo manipulation – are persuasive for all processing conditions and if the initial processing of these arguments had an impact on subsequent rational processing and behavioral intentions.

This study demonstrates that photo manipulation does have an impact on attitudes toward food shown in advertisements. When images manipulated to be more appetizing were shown, individuals had more positive affective responses toward the products. Participants were swayed by the visual arguments indicating that the food was more appealing; arguments implied through holistic and localized adjustments made to the

image in post-production. More importantly, this persuasive effect still holds true when individuals are given counter arguments in explicit arguments; individuals had more positive attitudes toward food advertised with photo manipulation even when they saw poor nutrition labels. This finding indicates that visual processing may in fact come first and color all processing.

In the main experiment, photo manipulation did not influence the perceived healthfulness of the advertised products. The effect sizes in these comparisons were well below the cutoff for even a small effect. The results in the main experiment, replicate the great contrast seen in the influence of photo manipulation for perceived healthfulness from pretest 1 to pretest 2. In the first pretest with images only, effects sizes were near or above the cutoff for a small effect in four of the images, including the two images selected for use in this study. However, once the brand names were added to these images in the advertisements, these effects are greatly diminished. This insight generated from the difference in pretest effect sizes and seen in the main experiment, may complement other findings that brand image is a more powerful predictor of purchase intentions than other product attributes (Bian & Moutinho, 2011). Replicating these findings with larger samples sizes and increased statistical power could reveal whether perceptions of the brand's healthfulness already held in the consumer's mind overpowers any visually implied argument.

Visual literacy was measured in four unique ways to determine if perceived abilities and experience had moderating effects for perception of images with or without photo manipulations. Two moderating effects were found, although in perhaps surprising directions. First, for the cereal advertisements, perceived ability to create visuals actually lead to more positive attitudes toward the product when participants were shown

manipulated images. It is possible that greater knowledge for the creation process lead to more positive thoughts about the food when it was presented with great care.

Second, awareness of photo manipulation also had moderating effect for perceived healthfulness in the oatmeal advertisements. Interestingly, this effect was only significant when post-production was absent. For capture advertisements, when individuals had greater awareness of photo manipulation, they rated the products as less healthful. It is possible that people with greater awareness of photo manipulation also have an expectation for photo manipulation in advertisements and were disappointed when their expectations were not satisfied. Future studies are needed to see if this possible explanation is valid.

The research model used to investigate the indirect effects of photo manipulation on purchase intentions fit the data quite well and explained the majority (60%) of the variance in purchase intentions. The influence of photo manipulation on purchase intentions is best explained by its mediated relationship through attitude toward the product. This finding indicates that visually implied arguments via photo manipulation function as an antecedent variable to the widely supported attitude-intention relationship (Spears & Singh, 2004). While there was support for direct effects of perceived healthfulness on attitudes for the product and purchase intentions, the variance of this construct was unexplained by the presence of photo manipulation. Brands for this study were selected by their neutral ratings in a pretest. It is possible that these already held perceptions of brand healthfulness diminished any effect of the visual arguments in the advertisement and should be explored in future work on persuasive appeals.

Limitations and Future Research

This experiment is not without its limitations. While the experiment was designed to test differences in peripheral/heuristic and central/systematic processing, there is no way to ensure that participants engaged in these specific types of processing in their assigned conditions. Future studies should incorporate ways to test for processing type along with tests of photo manipulation for attitudes and behavior.

The advertisements used in this study were primarily photo based. While this choice is logical to test for effects of visual arguments, advertisements with copy and taglines are needed to increase the ecological validity of these findings. Furthermore, future studies with advertisements for both implicit and explicit arguments would help shed light how these variables interaction for the processing of persuasive messages.

Chapter 5: General Discussion

Vision is the most heavily relied upon senses for the majority of people (Williams, 2005). Naturally then, visual design should be considered a powerful method for communication in persuasive messages. It is not just what the message says (explicitly), but also how it looks that can influence consumers' perceptions and message engagement (Lazard & Atkinson, 2015). This dissertation provided empirical evidence and theoretical contributions for dual processing models by focusing on the role of visual communication for attitudes toward food advertising.

Taken together, the studies presented in chapter three and four demonstrate that message exposure is not simply message exposure. Rather, influential message processing begins at this initial exposure, processing that is not accounted for in widely used dual process models for persuasive communication. Thus, these studies provide evidence that dual processing models are likely in need of refinement. By leaving out the initial processing of visually implied arguments in message design, the whole picture of persuasive message processing is not being considered.

During initial exposure to messages, individuals process the visual arguments, produced by photo manipulation, in the message design. Photo manipulation has a cause-and-effect relationship with attitudes when non-rationally or rationally processing all other message elements. Initial processing of visual arguments colored all further processing – heuristic or systematic – for attitudes toward the product in the food advertisements shown, regardless of one's visual literacy.

Implications for Policy and Practice

The physical evidence that documented photographic processes is no longer relevant, as negatives and transparencies are relegated to the realm of experimental fine

arts. With digital photography, there are no negatives to resort to in case of controversy (Ritchin, 2010). There is no longer definitive evidence of a moment in time associated with imagery. Thus, in this era of shifting photographic processes, society as a whole has a tremendous opportunity to change the norms, assumptions, and practices around digital photography by addressing issues of photo manipulation (Ritchin, 2009). This is not an area that should be left to hindsight (Ritchin, 2010).

How these practices are going to shape future uses of photography and photo manipulation are questions that remain unanswered. The emerging generations of professionals have a fundamentally different education and view of imagery (Spalter & van Dam, 2009). The darkroom principles that guided professional and ethical positions may be eroding as useful tools (Mäenpää & Seppänen, 2010). Without the darkroom training, the divides between the analog, tactical process and what can be done on the computer are meaningless. These changes, one way or another will impact all communication sectors.

Currently, industry practices that rely on visual communication of information put the burden of truth detection on the viewer. There are few to no indications from a source regarding the level of manipulation that has (or has not) occurred. This is especially problematic as technology continues to improve methods for seamless photo manipulation. Visual systems to identify "at-a-glance" whether an image has been manipulated have been proposed (Kee & Farid, 2011; Ritchin, 2010), however, much research is needed to better understand the processing of manipulated photographs before such systems could be proposed with any feasibility.

Media attention on photo manipulation is currently negative. Retouching techniques are regularly used to transform models into an unachievable thin ideal with widespread negative effects for society (Holmstrom, 2004). However, photo

manipulation is not limited to model slimming and focusing on this single context creates tunnel vision unnecessarily. Photo manipulation can be used for good just as easily as it can be used for intentional or unintentional "evil."

Indeed, the findings of these two experiments suggest that photo manipulation can be a persuasive tactic for increasing the appeal of food. A variety of breakfast foods were shown, but this was replicated across both studies for oatmeal and cereal. Specifically, oatmeal, a food perhaps better known for its health benefits rather than appetizing appeal, was found more appealing, even with poor (inaccurate) nutrition information, both initialing and when people gave it greater thought.

Public health practitioners loath the visual appeals that are rampant in food marketing to children, as young minds are most susceptible to these implied arguments. Indeed, there is no doubt that exposure to sweetly design food advertising is influential for people of all ages. Rather than bemoan the current system, the findings of these studies shed new light on how photo manipulation can be used to increase appeal for healthy food choices. Public health campaign efforts to shift food consumption for balanced diets should consider photo manipulation as a way to visually engage and convince audiences of their message intentions.

As long as there is food photography, photo manipulation will be present. Public health communication effects can (and should) focus on designing visuals that resonate with audiences through immediate, emotional appeals. Attention to the design of visual arguments could potentially improve message effectiveness by influencing initial reactions that in turn impact rational processing and behavior. Getting audiences to "buy in" early may increase the likelihood that they will process and understand information more easily.

FUTURE RESEARCH FOR PHOTO MANIPULATION

The persuasive effects of photo manipulation remain largely uncharted waters. Chapter two contained refining typology suggestions to aid the conceptualizations of photo manipulation so that effects can be systematically studied; a necessary step to be able to advance theory. We cannot aggregate our findings if we do not have the same (or a comparable) object of study. Furthermore, the effects studied in chapter three and four were primarily focused on attitudes, with some implications for consumer behavior intentions. The effects of photo manipulation, however, should not be limited to only attitudinal evaluations.

Research using a variety of messages with photo-manipulated visuals will begin to shed light on some of the necessary qualities for implicit arguments that already exists for explicit ones. For example, what does it take for a visually implied argument to be categorized as strong or weak and how do these differences influence message perception? Strong versus weak visual arguments may function similarly to text-based arguments, but no conceptualization exists for understanding these differences or evidence of their effects. Along similar lines, research that demonstrates visual design tactics, such as stylistic techniques, comparable to those in text-based information that trigger message relevance or identification with messages would be of great value. Last, getting back to the nature versus nurture debate that is unique to visual arguments, are implied arguments more effective if they incorporate biological or socially constructed cues for meaning?

Additionally, there are many aspects of viewers' reactions to photo manipulation beyond attitudes that are important to consider. While there is some evidence of consumers' perception, evaluation, and preferences for varying levels of photo manipulation beyond the work presented here, this is only the beginning of a research

agenda. There are only a handful of studies that have directly tested the effects of photo manipulation (Greer & Gosen, 2002; Kelly & Nace, 1994; Wade, Garry, Read, & Lindsay, 2002), leaving much to explored in the following proposed areas.

Believability and Credibility

An experiment by Kelly and Nace (1994) was conducted to determine if knowledge about digital imaging techniques would influence perceptions of believability and credibility in news images. Their results did not show any significant effects for level of knowledge, thus indicating that "photographs have a credibility beyond that of the medium of photography itself." (Kelly & Nace, 1994, p. 18). Kelly and Nace (1994) contended that perceptions of believability and credibility may be more dependent on the content, rather than the level of manipulation. As long as the content is compatible with their schema of the world, it is interpreted as reality. Additional studies that explore the effects of non-rational and cognitive processing for varying levels of photo manipulation in news, editorial, and advertising contexts are needed to see if these effects can be replicated and if they are context or processing route dependent.

Attention and Appeal

Advertisers, newspapers editors, and other mass media communicators understand the need to attract the attention of audiences. This task is often the responsibility of the visual imagery in a message. Although viewers now expect photo manipulation in advertising and fashion publications (Farid, 2009), theses manipulations can be still be visually enticing and powerful. Many facets of attention and appeal need to be systematically tested for effects of photo manipulation, beyond attitude toward the product, including: personal identification, positive emotions, attitude toward the message (or brand) (Delbaere et al., 2011; Messaris, 1997).

Visual rhetoric scholars have begun some of this work through investigations of visual metaphors that are a product of morphing or other techniques in the form freedom classification (Delbaere et al., 2011). The appeal of this type of imagery has been attributed to the brain trap they elicit, which can be an enjoyable, yet "unresolvable tug-o-war" (Messaris, 1997, p. 7). Investigating the influence of photo manipulation on attention and appeal for more varied applications are needed to see to what degree any manipulation will attract viewers. This is especially important in strategic messages beyond advertising, such as health and science communication, where limited budgets might not allow for hiring design professionals for the creation of sophisticated designs.

Susceptibility and Message Effectiveness

Images with varying degrees of photo manipulation likely have differing abilities to persuade viewer's to not only believe the imagery, but also internalize the proposed argument or information presented as personally relevant. In an extreme example of this, individuals have been shown to create false childhood memories from manipulated photos (Wade et al., 2002). When shown manipulated images that contain a photomontage of a participant's childhood image in a fictitious setting, over half the participants tried to recall, partially recalled, or had a clear false memory of the event (Wade et al., 2002). These results indicate that "photographs might provide subjects with a jumping off point, a leg up that makes it easier for them to conjure images, thoughts, and feelings associated with a genuine experience" (Wade et al., 2002, p. 602). Further research is needed to determine relevance of these findings for other photographic messages and investigate whether the same effects are found in less personally relevant images or arguments.

Ethical Evaluations

Although the proposed typology of photo manipulation was constructed along a dimension of voluntariness, there is reason to believe that the classification system maps onto other studies of ethical dimension for specific contexts (Harris, 1991; Reaves, 2005). Even in areas where photo manipulation standards would seem to be systematic and objective, there is evidence of a "slippery slope" of ethicality (Harris, 1991). Individuals from different image production contexts – magazine editors versus newspaper editors – have varying opinions on the ethicality of photo manipulation (Reaves, 1991, 1992). Research that compares these standards to those of lay audiences would provide valuable insight for similarities and differences for how this typology is practiced and conceptualized for ethical evaluations.

Ethical issues with image manipulation not only reside in perception of others in these images, but also have implications for perceptions of self. Visual information is a powerful tool for memory formation, retention, and recall (Paivio & Csapo, 1973; Wade et al., 2002). Because the processing of photography is differentiated from other image categories, photographs and their inherent photo manipulation warrant unique areas of investigation.

Detection and Awareness

The "obviousness" or detection of photo manipulation, while not a natural ability, may prove to be a worthwhile area of study for visual literacy education efforts. The type of image (subject category, source, etc.), awareness of photo manipulation practices, and/or perceived practices all likely influence the obviousness of photo manipulation (Messaris, 1994, 1997; Messaris & Moriarty, 2005). Thus, the variation in level of detectable photo manipulation or obviousness is not a direct outcome of the photo manipulation, but rather should be investigated as a moderator that indirectly influences

perception.

Generally, an individual's neurological response to an image makes it difficult to detect photo manipulation. Our brains are wired to view mediated images as reality, when they have a photorealistic appearance (Barry, 1997). This initial processing as reality thus leads viewers to believe the image content which then must be un-believed if photo manipulation is detected – a very demanding cognitive task (Barry, 1997). Additionally, photo manipulation techniques are advancing at rates that match or exceed detection capabilities and practices (Farid, 2009). Research is needed to determine how detection or obviousness moderates audience perceptions of photo manipulation techniques. There have been claims that viewers can distinguish the difference from photojournalism and photo illustration, but there is little evidence that this distinction is detectable or meaningful to the average consumer.

Taken together, the possible next steps would provide a more complete picture of how, when, and what degrees of photo manipulation are most influential in message perception. Understanding the role of implied arguments opens up possibilities for investigating media effects that complement (and possibly contradict) much of which is already known about explicit arguments. As visual communication becomes more prevalent in our digital age through media and user generated images, understanding the impact of human action in the creation of imagery will greatly improve theorizing of dual processing and communication broadly.

Chapter 6: Conclusion

We have entered another pictorial turn where digital media are revolutionizing the way that we create and consume imagery (Mitchell, 2008). With the invention of digital capture, manipulation, and sharing technologies, our society is at a point in time that resembles other pivot moments in history when image technologies (e.g., oil painting, photography, halftone printing) were introduced (Mitchell, 2008). How individuals react to the increasing breadth of digital image capabilities and the narratives that play out in the mass media will determine the positive or negative effects this era will have on communication.

Photorealistic mediated images are likely processed as real images in many areas of the brain. However, evolution does not work on a time scale that would allow for humans to have developed separate mechanisms for processing these life-like photo representations in the less than 200 years since the invention of photography (Barry, 1997). Indeed, photographs – unlike other image media – are more likely to be experienced as direct human contact, revealing a relationship with vision and touch that is unique to these representations with a naturalistic modality or closely resembling "the natural word" (Emme & Kirova, 2005).

As we encounter unprecedented numbers of visual messages daily (Petty et al., 2009), the visual arguments presented in photographs are processed instinctually, immediately, and often without our awareness (Barry, 1997, 2002, 2005; Gazzaniga, 1989; Williams, 2005). The initial reactions activate implicit attitudes that are influential for our thoughts, feelings, and behavior (Greenwald & Banaji, 1995; Perugini, 2005). The studies in this dissertation taken together demonstrate that photo manipulation, specifically in post-production, is greatly influential on the perception and subsequent

non-rational and rational processing of visual arguments in food advertising.

Unlike text-based messages, arguments presented with visual information are always implied. There are no syntactical properties for visual information to explicitly state that "a is like b" (Messaris & Moriarty, 2005). Because of this, viewers must infer the connection, which often happens almost instantaneously, without much conscious effort (Witkoski, 2003). This allows visual messages to communicate ideas and associations to audiences below their register for critical thought – some of which may seem outrageous or odd if stated verbally – without the image producer necessarily taking much responsibility the implied arguments (Messaris & Moriarty, 2005).

Revealing the effects of photo manipulation was the necessary first step to further calls to action that individuals need to be educated to regard images with purposeful uncertainty, questioning the photo creation process and viewing experience (Emme & Kirova, 2005). Evidence from these studies hinted that awareness of photo manipulation might temper the persuasive effects of visually implied arguments. Future investigations that further explore the interaction between photo manipulation and knowledge of the 'subjectivity' or human influence that is ubiquitous in image production may hold promising avenues for visual literacy scholars and educators.

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