

PRODUCING EFFECTIVE STORIES: THE INFLUENCE OF PRESENTATION TYPE
AND EMOTIONAL TONE ON ATTENTION, AROUSAL AND MEMORY

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by

LINDSAY BARNES

Dr. Paul Bolls, Thesis Supervisor

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The undersigned, appointed by the dean of the Graduate School, have examined the thesis entitled

PRODUCING EFFECTIVE STORIES: THE INFLUENCE OF PRESENTATION TYPE
AND EMOTIONAL TONE ON ATTENTION, AROUSAL AND MEMORY

presented by Lindsay Barnes,

a candidate for the degree of Master of Arts,

and hereby certify that, in their opinion, it is worthy of acceptance.

Professor Paul Bolls

Professor Glenn Leshner

Professor Steve Hackley

Professor Berkley Hudson

DEDICATION

To my parents,

Whose love, support, and encouragement made grad school possible. Thanks for the opportunity for a great education and to follow my dreams.

To Andrew,

Your love and delivered dinners kept me going through long nights of data collection and analysis.

To Jimmy, Melanie, and Jeffrey,

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ABSTRACT

This study explores how presentation type and emotional tone interact with attention, arousal and memory. A psychophysiological experiment was conducted in the PRIME lab where attention, arousal, valence and memory were measured using heart rate, skin conductance, self report data, and an audio recognition test.

Using the Limited Capacity Model of Motivated Mediated Message Processing, it was hypothesized that a moving and still images combined presentation would elicit greater attention and skin conductance levels than the moving image presentation or still image presentation. It was also hypothesized that stories with unpleasant emotional tone would be better remembered, elicit more attention and be more arousing than stories with pleasant emotional tone. It was predicted that memory would be best for the still image slideshow presentation.

The analysis found that participants experienced the greatest arousal during exposure to the still images presentation. The greatest cardiac deceleration occurred during the moving images presentations. Participants paid more attention to and better remembered stories with unpleasant emotional tone. Media professionals need to determine the goals of their messages and then use the proper type of presentation that will communicate the message effectively.

1. INTRODUCTION

The main purpose of this study was to examine the interaction of presentation type and emotional tone of photojournalists' work on evoked arousal, valence, attention and recognition. Since the 1820s, photographs have show people places they could never visit, people they would not otherwise meet, and things they could not have imagined. Photographs are able to capture emotion and detail that is hard for writers to put into words. Photojournalists for a long time have presented their work with slideshows. However, the invention of the Internet in the late nineteen hundreds and video camera in the 1950s, made it possible to put videos on websites. Photojournalists began to combine still photographs with moving images and turned themselves into multi-media journalists.

Newspapers and magazines have the ability to reach and influence the opinions of large audiences. This has led media scholars to research framing by photojournalists. How photojournalists cover various issues and events can influence the opinion of the public. For example, a study by Cooper (2007) found that national newspapers simplified the situation and exaggerated the role of victims in coverage of hurricane Katrina. "Photography remains a principal medium for our understanding of the world" (Fulton, 1988). Therefore, photojournalists have a responsibility to the public to provide work that is accurate and understandable. Journalists need to recognize how different ways of packaging content influences the way an individual's mind processes information. A media professional's goal should be to use the presentation type that communicates the message most effectively. A story that is attention grabbing and memorable is one step in what could be called an effective story

The human mind is set up to process information. The mind interprets sensory

information such as motion and sound. If researchers want to study how the mind processes media, then they need to define media as the brain does with sensory information, rather than how the media industry defines it. Lang, Potter, Bolls, (in press), emphasize that media should be thought of as a complex stimuli with multiple physiologically relevant variables continuously changing over time. To the brain, media are defined by psychological properties, and therefore it is important to think of TV and video as moving images and photographs as still images.

The study hopes to add knowledge to research being done on the cognitive processing of media messages. There has been a lot of research on television and still images, however there has not been a lot of research that looks at the intersection of moving and still images combined into a multi-media story package. This study will look at how elements of multi-media interact and how people process that online during exposure.

This study has practical importance. Photojournalists' work helps people understand their world, and therefore it is vital that photojournalists know how to present their still and moving images. Should photojournalists' work be presented in a slide show format, or should still images be combined with video? These are questions professionals are asking, but do not have answers to. The lack of knowledge among media professionals can result in ineffective communication, which leads to users not being interested in visiting a newspaper or magazines' website. Professionals should care about how the public is cognitively processing media, in order to understand how to create attention grabbing and memorable work.

To explore the questions posed in this study, an experiment was conducted in which twelve stories with varying levels of presentation style and emotional tone were

presented to forty participants. The three types of presentation styles included a still image presentation, moving images presentation, and still and moving images combined presentation. Emotional tone was pleasant (pleasing, gives pleasure) or unpleasant (displeasing, not giving pleasure). To measure arousal, skin conductance and a 9 point scale with one being extremely calm and nine being extremely excited, was used. To measure resources dedicated to encoding, heart rate was collected during exposure. A 9 point scale (one being extremely pleasant and nine being extremely unpleasant) was used measure valence. To measure recognition, an audio test was given to participants.

2. LITERATURE REVIEW

Some scholars look at media effects. These scholars want to know the end result after exposure, and thus ignore what happens during media exposure. These researchers try to answer the question of, “How is media effecting people?” An example of this type of study is research by Anderson and Dill (2000) who looked at the effect of playing violent video games. The researchers looked into what happened after playing violent video games, such as an increase in aggressive behavior and delinquency. The researchers examined how playing violent video games influences behavior. This type of research is valuable because it set the groundwork for media processes scholars.

Media processes and effects scholars ask, ” Why does media effect people?” Instead of asking how violent video games influence behavior, media processes and effects scholars want to know why playing the violent games causes aggressive behavior and delinquency. These scholars focus on the processes that explain the cause and effect relationship of different media on the brain’s processing. Media processes and effects scholars think about how people mentally filter information. These scholars started doing psychophysiological research. If a media processes scholar were looking at children and violent video games, the scholar would collect data while the participants were playing video games. For example, the scholar might look at arousal by measuring skin conductance while the participant played the video game.

PRESENTATION TYPE

The three types of presentations examined in this study were a still image slide show, moving images, and still images and moving images combined. One main difference between these three presentation types is whether the image is moving or still. This difference is important because it has been shown to influence cognitive processing, memory and arousal (Detenber & Reeves 1996; Detenber, Simons, Bennet 1998; Kipper 1986).

STILL IMAGES

From newspapers and magazines to billboards and television, people are constantly presented with photographs. In addition to images in the world, people form mental images in their heads. Paivio (1969) found that even if people are not presented with a physical image, they create pictures in their heads in order to fully understand a concept or process. Paivio uses the example of counting the number of windows in a house – if you know the house, you will visualize the house – or perhaps each room in the house – in order to count the windows.

Many studies have looked at still images' arousal and emotional tone in relationship to memory. Researchers Bradley, Greenwald, Petry, & Lang (1992) examined memory performance for pictures with an immediate and a one year later free-recall test. The researchers found that for still images, pleasantness did not increase memory one year later. However, one year later, pictures rated highly arousing were remembered better than low-arousal stimuli. Highly arousing images increased memory,

whether or not the image was positive or negative. Martin-Kratzer (2005) found that recognition for negative news photographs remained high a week after exposure to the stimulus. The researcher also found that people orient to negative news photographs.

MOVING IMAGES

It was photographer Eadweard Muybridge who began to use photography to showcase movement (Phaidon, 2001). Muybridge is known for his sequences of images showing animals and humans in motion, especially horses. Muybridge used an automatic timer mechanism to release the shutters of many cameras and capture each stage of a horse's gallop. Muybridge used a machine called the zoopraxiscope to bring the images to life. "It consisted of a lantern house and a lens between which was placed a mechanism for spinning glass disc, mounted next to a counter-rotating slotted shutter... The resulting effect on the screen on that first day was a life-size image of Occident (the horse) running across the wall in real time. To those who saw it, the motion picture was born in the autumn of 1879," (Phaidon, 2001). Since those days, the means for capturing motion has come a long way.

In multi-media content, motion is likely an important psychological property. Scholars wanted to know what was going on in the brain when motion was present (Simons, Detenber, Roedema, & Reiss, 1999). Photojournalists also became interested in moving images and began the transition into multi-media journalists by recording moving images of their stories, and not just still images.

Evidence of this transition can be seen in the categories of the Pictures of the Year International contest. Started in 1944, Pictures of the Year International is one of the

premier contests for photojournalists. Traditionally, the contest had only categories for still images. However, in 2006, three multimedia categories were started. In 2008 the “Best Multimedia Project” was added, which POYi organizers said reflected photographers growing online importance (“The 65th Annual POYi Photography Competition,” 2008).

Research by Goldstein, 1989 and others (Kawakami & Okamoto, 1996) found that in the brain, there are specialized nerve cells that detect and then process motion. This study helped photojournalists understand more about what was happening in the brain when motion was present. Other studies helped further the understanding of motion. Simons, Detenber, Roedema, & Reiss (1999) found that motion exists independently of content and does not change the basic meaning of the images or what the images show. Kipper (1986) found that when a scene is filmed with a moving instead of a fixed camera, that the viewer’s memory of the physical components of the scene increases. This may mean that motion will increase the memory of the video.

Research by Detenber, Simons, & Bennet (1998) found that image motion increases self-reported and physiological arousal, especially when images were already highly arousing. A key feature of this study is that both skin conductance and self-report supported this finding. The study by Dentenber, Simons & Bennet, 1998, contradicted results Dentenber and Reeves had found in 1996. In the earlier study, Detenber and Reeves found that the subjective reports of arousal were greater during still images. However, they say the current data set from the study in 1998 is more reliable. The reasoning given for the current study being more reliable is that Detenber and Reeves measured skin conductance this time and the self-reports from the recent study gave the

same results as the physiological data. Also, the recent study was a within subjects design and they think that is a better design than the between-subjects design used in the 1996 study. Simons et al. (1999) also found data that suggests that motion increased arousal and captured and kept the subject's attention to the image.

In general, motion has been shown to increase levels of cortical arousal in viewers (Reeves, Thorson, Rothschild, McDonald, Hirsch, & Goldstein, 1985). In a study by Simons, Detenber, Cuthbert, Schwartz, & Reiss (2003), an electroencephalogram (EEG) was used as a measure of attention while participants viewed still and moving images. Reductions in alpha power are thought to indicate greater attention. Alpha power was reduced during the viewing of moving, compared with still images. In summary, motion has been show to increase arousal (both with self-report and physiological data), keep attention, and increase memory.

From the beginning photographers had trouble capturing motion. Because of very long exposures, anything that moved turned out as a blur. However, as shutter speeds and cameras improved, photojournalists were able to “freeze” and therefore capture motion. When the video camera was invented, photojournalists realized they could not only freeze motion in a photograph but truly capture motion as it appeared in real life. However, not wanting to leave photographs behind, photojournalists began integrating still images into moving images. Research is lacking on this new form of still and moving images combined. The limited capacity model of motivated mediated message processing (Lang, 2006) will provide the framework for beginning to understand how cognitive processing may be affected by this combination of still and moving images.

LC4MP

In order to better understand the processes occurring, the limited capacity model of motivated mediated message processing will be applied. The LC4MP developed by Annie Lang is a theoretical model that helps researchers explore how messages are processed (Lang, 2000). The model aims to try and describe mental activity when an individual is exposed to media content.

A foundational piece of the LC4MP is that three main processes that occur in processing messages are encoding, storage and retrieval. Encoding is making a mental representation of the stimulus; resources can be allocated to encoding through either automatic or controlled processing. Storage is connecting the newly encoded information to information that has already been encoded and stored. The more links a new piece of information has to information that is already stored, the better it is stored. Retrieval is locating the information that has been encoded and stored.

For example, these three main processes would occur when a viewer is looking at a multi-media project. For example, new information is presented about a woman caring for her elderly grandmother. For example, viewers would see the caregiver feed her grandmother. The viewers would then make a mental representation of the caregiver feeding her grandmother. The viewers would then connect this new information to other information they already have stored in the brain. For example, the viewers might connect this piece of information to a memory of caring for their grandmother. If someone's grandmother died before he or she was born, there will not be as many links to connect this new information to, and therefore the new information will not be encoded as well. It will be easier for someone who has many stored memories of a grandmother to store and retrieve the new information about the caregiver's grandmother.

The model has five assumptions. The first is that peoples' information processing capacity is limited. Processing requires resources and these resources are limited. Second, there are two motivational systems called the appetitive and aversive, which are activated in response to motivationally relevant stimuli. The appetitive system, in addition to the aversive, makes sure people survive. This system evolved to help people get food in order to ensure survival. The aversive system protects people from danger. Third, media content is composed of streams of information that come in various formats and are presented in various sensory channels. Fourth, human behavior is dynamic, meaning that it is always in a state of change. Fifth, communication is described as the overtime interaction between the human motivated information processing system and the communication message. The implication of these assumptions is that a viewer cannot encode and store all of the information presented. Processing media is complex because the viewer is constantly trying to encode, store and retrieve information.

The second assumption that the appetitive and aversive systems are activated in response to motivationally relevant stimuli is key to this particular study. Photojournalists presentations can be emotional and therefore it is important to examine motivated processing. Emotional content in media messages can automatically activate one or both of these two systems.

Varying levels of emotional tone in photojournalism presentations might affect appetitive and aversive activation, and therefore influence how the content is processed. The aversive system is activated by unpleasant stimuli and the appetitive system is activated by pleasant stimuli (Lang, P.J., Bradley, & Cuthbert 1997; Bradley, 1994). The aversive system may be activated more in people as they watch the moving and still images combined. This is because the images will be changing from moving to still, creating a complex message for the viewer to

follow. The switch from moving to still and back to moving could also be seen as a threat to the aversive system whose goal is protection (Lang 2006).

To understand how a message is processed, the researcher must understand the structure and content of the medium, and how that interacts with the three sub processes Lang describes. What the researcher tries to figure out is what is being encoded and what is not. This is where arousal and valence (two dimensions of emotion) might play a role. Arousal and valence can influence what is encoded and stored, and therefore better remembered, and what is not.

The limited capacity model has been used in many studies. In Lang (2006), Lang showed how the limited capacity model could be used to design effective cancer communication messages. In Lang, Bolls, Potter, & Kawahara (1999) the model was used to study the effect of arousing content and fast paced production on viewers processing of television messages. Fast pacing and arousing content produced self-reported arousal. However, using the combination of the two together overloaded the processing system. Therefore this supported the idea of the viewer as a limited processor. A person has only so many resources to dedicate to encoding, storage and retrieval and it was shown in this study that the viewer could be overloaded with information. The model has also been used to measure the effect of negative video. It was found that negative video in news stories increased attention, capacity needed to process the message, ability to retrieve the story and to recognized information from the negative video (Lang, Newhagen, & Reeves 1996).

The limited capacity model is important to understand when looking at the differences in emotion for moving images and still images. Understanding how messages are processed is one of the first steps to looking deeper into how moving versus still images influence the two dimensions of emotion, emotional valence and arousal. In order to understand the effects of

media, a researcher must understand the psychological states that are occurring when an individual is exposed to media content.

EMOTION

The dimensional theory of emotion says that three dimensions underlie all emotions: arousal, valence and dominance. (Osgood, Suci, & Tannenbaum, 1957; Russell & Mehrabian, 1977). Dominance is how in or out of control someone feels with his or her emotions. However, the two dimensions that are focused on the most are arousal and valence (Lang, Dhillon, & Dong 1995; Lang, Geiger, Strickwerda, & Sumner, 1993). Valence, also called emotional tone, refers to a range of emotions from negative or unpleasant to positive, or pleasant. Arousal can range from very excited to very calm. These two dimensions are used most often because they have been found to be the two out of the three that most explain changes in emotion (Greenwald, Cook, & Lang, 1989).

The limited capacity model makes predictions about emotion. First, content that is arousing will elicit feelings of arousal, and will create measurable activity in the sympathetic nervous system. The model also says that arousal allocates resources to encoding and storage automatically (Lang et al, 1999). This is important because still images and moving video can elicit emotional responses.

Overall emotion-eliciting messages are better remembered than messages that are not emotion-eliciting. This has been found to be true for commercials (Lang & Freistad, 1993), political commercials (Lang, 1991), and news (Lang, Newhagen & Reeves, 1996). Perhaps emotion-eliciting messages are better remembered because emotion-eliciting messages are

hard not to pay attention to, which has been the result found by Newhagen & Reeves (1992) and Lang, P.J., Bradley & Cuthbert (1997) among others.

AROUSAL

One dimension of emotion examined was arousal. In the early research of arousal, scholars were looking to document a change in arousal. Researcher Levi (1965) found that there was a positive correlation between the intensity of emotional arousal and the amount of adrenalin excreted in the urine. Scholars also thought that arousal caused all the physiological systems to act together, a view which is called the unitary view of arousal (Zillmann, 1978). When someone was aroused, it was believed that all the physiological systems increased. However, the results of experiments sometimes contradicted this believe, for example, sometimes heart rate went up and other times it went down. The physiological systems were not always acting together and in the way that scholars anticipated. This led to a directional view of arousal that said different stimuli cause some physiological measures to go up and some to go down.

The research in arousal evolved and eventually led to a new way of thinking about arousal: three-dimensional arousal that includes behavioral, cognitive and physiological arousal (Zillmann, 1982; Lacey, 1967). This means that researchers would often figure out which dimension (behavior, cognitive or physiological) was being affected in the study. Then, researchers would choose an appropriate way to measure it.

When arousal is mentioned today, most often scholars mean activation of the sympathetic nervous system. Many scholars measure this type of arousal using skin conductance. (Lang et al., 1999; Dentenber & Reeves1998). As the sympathetic nervous system is activated, the level of

sweat in the glands changes and this can be measured. As arousal increases, skin conductance levels are larger and more frequent.

EMOTIONAL TONE

Emotional tone refers to a range of emotions from negative or unpleasant, to positive or pleasant. Emotional tone is sometimes referred to in other studies as valence. Researchers look at what effect how pleasant or unpleasant something is has on the body and its processes. A study by Lang et al (1995) was one study where arousal and emotional tone were both examined. Results showed that when emotional tone is controlled, arousing messages are better remembered than calm ones. On the other hand, when arousal is controlled, people have a better memory of positive messages rather than negative ones.

Many researchers have looked at emotional tone in relation to various variables such as memory, motion, and arousal. Thorson & Friestad (1989) looked at the effects of emotional tone on memory for television commercials. Moving images and still images can have different effects depending on the range of emotional tone. Detenber & Reeves (1996) found that positive images were experienced as more positive, and negative images as more negative, when the image contained motion. Picture motion also increased arousal. A 2000 study by Bradley found that when emotional tone was negative and the stimuli was highly arousing; the aversive system was more likely to be activated. If the stimuli were not threatening then the other system, the appetitive system, was activated.

Research into the effects of emotional tone on memory has also been done. Studies have looked at negative images in the news. In a study by Newhagen & Reeves (1992), memory for material presented after negative images was better than memory for material presented before

the negative images. Emotional tone has also been looked at for public service announcements (Lang & Friestad, 1993) and political ad campaigns (Lang, 1991). Most of the studies show that memory is best for negative messages, for example Lang et al. (1996). The study found that negative video in news stories increased attention, amount of capacity required to process the message, and the ability to retrieve the story. The negative video helps people remember more information presented during the negative video and lowers the recognition of information that was presented before the negative video. In addition, self-reports indicated that introducing negative video increases negative emotional impact of the story. Overall, negative video was more arousing and better remembered. Therefore, the presentations in this experiment that have an unpleasant emotional tone, will likely be better remembered and more arousing than the pleasant ones.

ATTENTION

One of the main assumptions of the LC4MP is that people have a limited capacity to process information. How much attention a person pays to a message influences their processing. When viewing media, an entire message is not saved in a person's head, rather certain aspects of a message are encoded automatically and subconsciously, while others are not. This automatic allocation of resources is a relatively short-term response, occurring over seconds (Lang 1999). Other aspects are encoded because of viewers' goals, intentions, environment and knowledge. For example, someone interested in animals may pay more attention to a dog in scene than someone who is not interested in animals. The dog would be processed into the person's short-term memory. The viewer retrieving previous knowledge about dogs in order to better

understand the message, would use resources which influence how much information can be stored.

One way a message is automatically encoded is with the orienting response. This is a response to a new or signal stimuli in a person's environment (Graham, 1979). A new or novel stimuli is a result of a change in a person's environment, for example a sudden loud noise or a person entering a room. A signal stimuli is something a person has learned is important. A person's name is an example of a signal stimulus. If a person's name is Katie, and the name Katie is called out, that person would have a hard time ignoring that stimulus. On the other hand, some aspects of a message are encoded because a person is interested in that part of the message or because of their certain goals. This type of resource allocation is called controlled allocation.

Introducing structural features in video, for example cuts and sound effects, has been shown to increase resource allocation. These types of structural features have been examined with television and their result in increased resource allocation is referred to as the orienting response (Lang 1990). However, just because a resource is encoded does not mean memory will be increased.

A message's presentation type can influence a person's attention. Attention has been shown to fluctuate during programs due to structure and content (Thorson 1985). A video, or moving images with sound, can be very hard for a person to process because a viewer must try to keep up with the video. If there are not enough resources for encoding and storage, then some of the processes can suffer. For example, studies have shown that viewer's attention can be increased while memory is decreased, when the structural complexity of a message is increased (Lang et al, 1999). More often moving image presentations are more complex than still image

presentations, and therefore this could make memory for moving images presentations be lower than the memory of a still images presentations.

MEMORY

After a message is encoded, it needs to be stored. Storage is the process of taking new information and linking it to previously stored information. The more links between old information and new information, the better it is stored. However, even if a message is encoded, that does not necessarily mean a message is stored (Lang, 2006). The final subprocess in the LC4MP is retrieval. This is the process of searching the memory for a piece of information and reactivating it into the working memory. The more links a message has to previously stored information, the better it is stored and the easier it is to reactivate into working memory.

The content structure of a message and arousal can both influence storage. Researchers Grabe, Lang and Zhou (2003) looked at tabloid versus standard news packaging styles for calm and arousing stories. Tabloid features such as obtrusive voice narration, sound effects and music enhanced memory for the calm stories but overwhelmed a person's processing system when arousing news content was used. Whereas many studies have looked at the content of arousing news (Lang, Newhagen, & Reeves, 1996; Newhagen & Reeves, 1992), this study looked at the form of news.

Orienting responses have been studied in moving images, but not with moving images and still images combined. The transition from moving images to still images and back to moving images, may elicit an orienting response. This leads to the following research question:

RQ1: Does the transition between moving images to a still images evoke an orienting response?

One way a message is automatically encoded is with the orienting response. The presentation type that might have an advantage in getting an orienting response from participants is the moving and still images combined. A participant will be watching moving images when it will be replaced with a still photograph. There will be a noticeable difference between the moving and still images, which may cause an orienting response in the viewer. The still image presentation will have transitions from a still image to a still image, which will not be as novel as the transition from moving to still. In addition, moving images and the moving and still images combined may have an advantage over the still image presentation because it has been shown image motion increases self-reported and physiological arousal, especially when images were already highly arousing (Detenber, Simons, & Bennet, 1998). Therefore the following was predicted:

H1: Participants will experience greater cardiac deceleration during exposure to moving and still images combined than moving images or the still images presentations.

H2: Participants will experience greater skin conductance levels during exposure to still and moving images combined than moving images or the still images presentations.

Motion has been associated with increased memory. Kipper (1986) found that when a scene is filmed with a moving instead of a fixed camera, that the viewer's memory of the physical components of the scene increases. Therefore, the motion in the moving images may aid in the memory of it. However, media messages with more complex presentations such as the moving images and moving and still images combined, may have poorer memory than the still images presentation. There are a variety of factors that can influence memory and this study will help add to the knowledge of which factors, such as motion and complexity, are more influential than others. This leads to hypothesis 3:

H3: Audio recognition tests will be better for the still image presentation than for moving and still images combined or moving images. Presentations with unpleasant emotional tones will be better remembered than presentations with pleasant emotional tones.

Studies have looked at negative images in the news. A study by Lang et al. (1996) found that negative video in news stories increased attention, amount of capacity required to process the message, and the ability to retrieve the story. In addition, self-reports indicated that introducing negative video increases negative emotional impact of the story. Overall, negative video was more arousing. Therefore the following was predicted:

H4: Participants will experience greater cardiac deceleration during exposure to presentations with unpleasant emotional tone than pleasant emotional tone.

H5: Participants will experience greater skin conductance levels during exposure to presentations with unpleasant emotional tone than pleasant emotional tone.

3. METHODOLOGY

EXPERIMENTAL DESIGN

Based on the foregoing literature, the following research question arises: How do emotional tone and presentation type, including still images, moving images, and still and moving images combined presentations, influence attention, valence, memory and arousal? The limited capacity model of motivated mediated message processing has been examined in order to provide a framework for this study. An experiment was used because it provides the best causality between the independent and dependent variables.

This experiment was a 3 (presentation type: still images, moving images, and still and moving images combined) x 2 (emotional tone: pleasant/unpleasant), fractional repeated-measures design. Each participant viewed a total of 12 messages, six of those story topics had pleasant emotional tone and six had unpleasant emotional tone. The participants all viewed the same 12 story topics, with 4 stories from each presentation type. The format in which the participants viewed stories was randomized.

INDEPENDENT VARIABLES

Presentation type and emotional tone (valence) were the independent variables (IV) examined in this study. Presentation type is the manner in which information is presented to a subject. This was manipulated by formatting information into a still images presentation, moving images presentation, and moving and still image combined presentation. A still image presentation is defined as a series of still images presented one after the other with sound. A

moving images presentation is defined as a series of framed images put together to simulate motion and combined with sound. A moving and still images combined presentation uses both still images and moving images together.

The second independent variable was emotional tone. There are two levels of emotional tone: pleasant and unpleasant. This was manipulated by having six story topics that were pleasant and six story topics that were unpleasant. Emotional tone of the stories was tested in a pre-test.

DEPENDENT VARIABLES

ATTENTION: Attention is defined as allocation of cognitive resources to encoding.

Attention was measured using heart rate. Participants' heart rate was acquired during exposure to the stimuli using two Beckman AG/AGCL electrodes placed on each participant's forearms. Electrodes were filled with electrode gel and placed on the participant after the surface was wiped with a skin prep pad and then distilled water. A ground electrode was placed on the subject's non-dominant forearm. Many studies have used heart rate as an indicator of controlled attention (Lang, 1994; Bolls, Lang, Potter, 2001; Newhagen & Reeves, 1996). A decrease in heart rate has been shown to indicate greater attention (Lang, 1990; Lang, Newhagen & Reeves, 1997). Heart rate will be collected in milliseconds and averaged over a period of time because heart rate has been shown to be a slow responding physiological measure (Lang, Zhou, Schwartz, Bolls, Potter, 2000).

AROUSAL: Arousal is defined as an emotional state that ranges from exciting to calm (Mehrabian, 1980).

Arousal was measured in two different ways. First, subjects in the experiment used a 9 point scale with one being extremely calm and nine being extremely excited to rate how aroused they feel immediately after each presentation.

Second, participants' skin conductance was collected as a measure of arousal. Skin conductance is used as an indicator of activation in the sympathetic nervous system (Hopkins & Fletcher, 1994). Skin conductance was measured using two Beckman 8mm AG/AGCL electrodes placed on the participant's palm. Electrodes were placed after wiping the participant's hands with distilled water. The electrodes were filled with KY gel to make sure a connection was made between the participant's skin and the electrode.

VALENCE: Valence is defined as a range of emotions from negative or unpleasant to positive or pleasant. Valence has been examined with television commercials (Thorson & Friestad 1989), negative images (Newhagen & Reeves, 1992), public service announcements (Lang & Friestad, 1993) and political ad campaigns (Lang, 1991).

Valence was measured using a 9 point scale with one being extremely pleasant and nine being extremely unpleasant. Participants rated how pleasant or unpleasant they feel immediately after each presentation.

MEMORY: Is defined as a person's ability to encode, store and retrieve information. In order to see if there was knowledge gained from the presentations, how well information was encoded was measured. Many studies have examined if messages are memorable (Lang, 1991;

Lang, A. & Freistad, M., 1993; and Thorson, E. & Friestad, M., 1989).

Audio recognition was measured. Recognition tests measure how well information was encoded into memory. The audio recognition test included two to three second clips consisting of a complete phrase of audio being played. Four audio clips were selected from the stories. Therefore, a total of 48 audio clips and 48 foil clips were developed. The foils were chosen from similar topics but were stories not used in this study.

STIMULUS MATERIALS

Sixteen videos were identified as candidates from a collection of photojournalism videos from the College Picture of the Year contest and from submissions by University of Missouri journalism students. The arousingness of content was controlled by pre-testing the videos for arousal. This was done to enable investigation of the effect of presentation style on skin conductance, a physiological indicator of evoked arousal.

A pre-test (N=30) was completed where participants were divided into two groups of fifteen each. Group A watched eight videos, four pleasant and four unpleasant, and Group B watched eight different videos, four pleasant and four unpleasant. The participant continuously rated their arousal levels. At the end of each video, participants rated how pleasant or unpleasant they feel.

Based on the results of the pre-test, the six most unpleasant and six most pleasant video stories were chosen for stimulus stories. An example of an unpleasant story topic is a man talking about how he killed a woman while driving drunk. One of the pleasant stories is about a neighborhood that gathers together to buy their local paper delivery boy a new bike. From those videos, frames from the video were taken to create the still images for the still and moving

images combined and the still images presentations. The audio for each story in each of its three versions was kept the same. Arousal was controlled in the pre-test condition in order to be able to test for the influence of the three presentation types on arousal.

PROCEDURE

The study was conducted in the University of Missouri PRIME Lab. PRIME stands for “Psychological Research on Information and Media Effects.” The lab’s psycho-physiological data collection equipment was used to collect physiological responses to stimuli. Participants (N=42) were recruited through classroom visits at the University of Missouri-Columbia. Informed consent was obtained from each participant, and participants received extra credit or class participation points for their participation. Participants completed the experiment one at a time in the Prime Lab. When participants arrived they were greeted by the researcher and asked to read and sign a consent form in the lobby of the Prime Lab. After consent was given, participants were led into the Prime Lab and asked to sit in a lounge chair. The participants were then prepared for data collection.

The palm was wiped with distilled water, and skin prep pads and then distilled water were used on all other areas where sensors were placed. To measure heart rate, Beckman AG/AGCL electrodes were placed on each participant’s forearms. These electrodes were filled with electrode gel. One sensor was placed on the wrist of the left arm, about 1 inch down from the palm in the center of the arm. Another was placed on the left arm about two inches down from the elbow, off centered, closer to the body. Another sensor was placed on the right arm, and mirrored that of the one placed on the left arm. To measure skin conductance, two Beckman 8mm AG/AGCL electrodes were placed on the participant’s palm. One sensor was placed on the

thick part of the palm near the wrist, and the other sensor was placed across from it, down from the pinky. These sensors were filled with KY gel.

The computer program MediaLab was used to present the material. Participants watched the presentations on a computer screen. Participants were asked to follow the instructions on the screen. There was a total of twelve story topics. Each participant viewed a total of twelve messages, six of those story topics had pleasant emotional tone and six had unpleasant emotional tone. The participants viewed the same twelve story topics, but in different formats. The format the participants viewed the stories in was randomized.

The experiment had six conditions. Each story topic appeared in each condition. The moving images format of each story appeared in two conditions, the still image format appeared in two conditions, and the moving and still images combined format appeared in two conditions. In the six conditions, each story appeared three times in the first half of the experiment and three times in second half of the experiment. The first six stories contained all three story formats and the last six stories contained all three story formats. The six pleasant story topics that appeared had two stories that were moving images formats, two stories in the still images format, and two stories with the moving and still images combined format. The same applied for the six negative stories in each condition.

After each story, participants rated their arousal (calm/excited) and valence (pleasant/unpleasant) using a 9 point scale. The order participants answered these questions in was randomized. After viewing all of the stories, a distracter video was presented to clear the short-term memory. The distracter video was a clip from the PBS television show Antiques Road Show. It was 3 minutes 56 seconds long, and showed a man having a blanket appraised. After completing the recognition test, participants were debriefed, thanked and dismissed.

4. RESULTS

MANIPULATION CHECK AND DATA ANALYSIS

The messages were checked to insure they conveyed what they were selected to convey. Negative messages were rated more unpleasant than positive messages, and positive messages were rated more pleasant than unpleasant ones. This was true for all presentation styles. The self-report data were analyzed using SPSS. A 3 (presentation style) x 2 (valence) repeated measures ANOVA run on self-report valence data revealed a significant effect for valence ($F(1,41)=208.705, p<.001, \text{partial } N^2=.835$). Multimedia negative messages were rated more unpleasant ($M=5.929, SD=.239$) and multimedia positive messages were rated more pleasant ($M=2.619, SD=.145$). Negative moving images messages were rated more unpleasant ($M=6.202, SD=.264$) and positive moving images messages were rated more pleasant ($M=2.571, SD=.195$). Still image presentations with negative messages were rated more unpleasant ($M=5.774, SD=.256$) and still image presentations with positive messages were rated more pleasant ($M=2.917, SD=.211$).

The physiological data were collected at 833 samples per second. To clean the data, the samples were averaged into one second intervals. Data plus or minus 20 units away from the average was considered an outlier. Participants with numerous outliers were thrown out. Data from 32 participants was used for the skin conductance and 42 participants for the recognition analysis. The data from 26 participants were used in the analysis of heart rate.

The self reported arousal data were analyzed by submitting it to a 3 (Presentation Style) x 2 (Arousal) repeated measures ANOVA.

Heart rate data were analyzed to see if the transition between moving images to still images evoked an orienting response. The heart rate data were analyzed by submitting it to a 3

(transitions in each story) x 4 (stories per condition) x 11 (time, one second of baseline plus ten seconds after the beginning of the still image) repeated measures ANOVA.

Heart rate data were also analyzed by submitting it to a 3 (presentation style) x 4 (stories per condition) x 54 (time) repeated measures ANOVA. The times of the presentations varied in length. For analysis, the data were truncated. The shortest story out of the 12 was 54 seconds long, and therefore the other 11 stories were truncated by averaging neighboring seconds together (For example second 52+second 51/2). The average time of the presentations before truncation was 83 seconds. The same process was followed for skin conductance data.

To analyze valance, heart rate and skin conductance, data were analyzed by submitting it to 2 (Valance, pleasant/unpleasant) x 6 (story) x 54 (time) repeated measures ANOVA. The data were truncated following the procedure described above.

Participants listened to 48 target clips and 48 foil clips. The target clips were heard by the participants in the experiment, while the foil clips were not. The participant answered yes if they heard the clip during the course of the experiment or no they did not hear the clip. A simple percent correct analysis was run on the targets for the audio recognition data. The data were submitted to a 3 (style) x 2 (valence) repeated measures ANOVA.

RESEARCH QUESTION ONE

Research question one asked, “Does the transition between moving images to a still images evoke an orienting response?” Orienting response was operationalized by a phasic cardiac deceleration in heart rate. One second of baseline right before the image changed from moving to still, plus ten seconds after was examined. The transition from a moving image to a still image did not evoke an orienting response in participants.

HYPOTHESIS 1

Hypotheses one predicted that participants would experience greater cardiac deceleration during exposure to moving and still images combined than moving images or the still images presentation. This hypothesis was not supported.

There was a significant style by time Huynh-Feldt interaction ($F(32.407, 745.37) = 1.55$, $p = .027$, partial $N^2 = .063$), however the greatest cardiac deceleration occurred during the moving images presentation.

Heart Rate Analysis: Style x Time

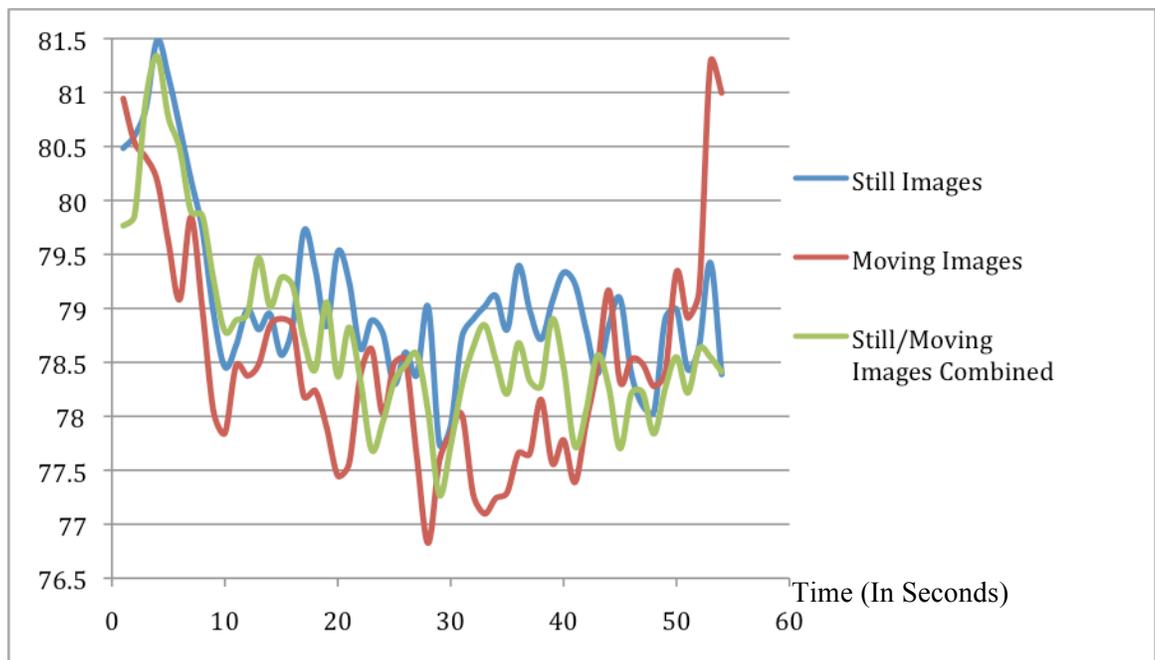


Figure 1: Heart Rate Style x Time

HYPOTHESIS 2

Hypothesis two predicted that participants would experience greater skin conductance levels during exposure to moving and still images combined than moving images or the still images presentation. Hypothesis two not supported.

There was a significant style by time interaction ($F(106,3074)=2.196, p < .001, \text{partial } N^2=.07$). However, the still images presentation was the most arousing, rather than the hypothesized moving and still images combined presentation.

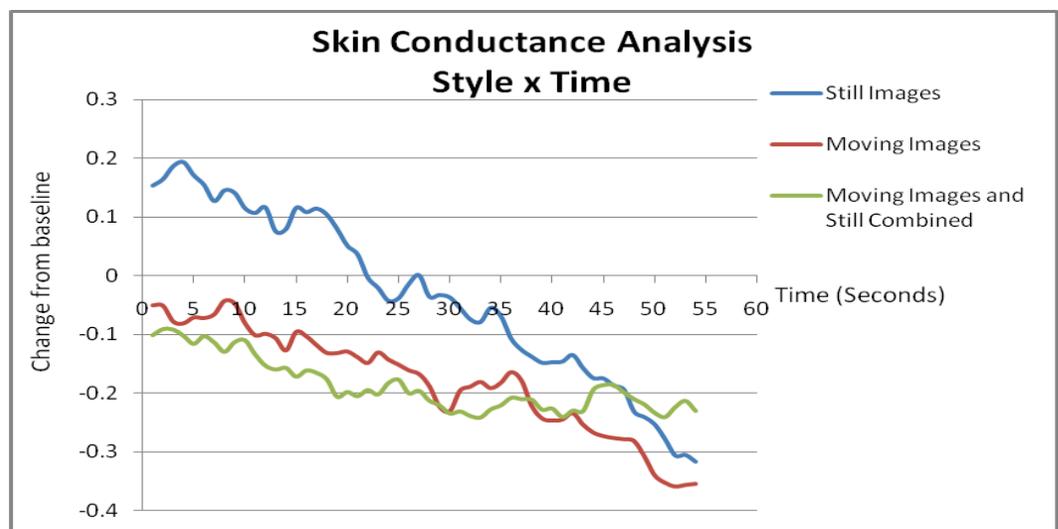


Figure 2: Skin conductance: Style x Time

Self report data contradicted the skin conductance data. A 3 (presentation style) x 2 (arousal) repeated measures ANOVA run on self report arousal data showed a significant finding for presentation style ($F(2,82)=3.337, p=.04, \text{partial } N^2=.075$). Participants rated arousal using a 9 point scale with one being calm and nine being excited. The moving and images combined presentations were rated the most arousing ($M=4.44, SD=.243$) followed by the moving images ($M=4.375, SD=.211$) and lastly the still images ($M=3.923, SD=.197$).

HYPOTHESIS 3

Hypothesis three predicted that audio recognition tests would be better for the still image presentation than for moving and still images combined or moving images. It further predicted that presentations with unpleasant emotional tones would be better remembered than presentations with pleasant emotional tones. There was partial support for this hypothesis.

When a repeated measures ANOVA was run on the accuracy of targets in audio recognition data from the messages, there was a significant main effect for valence ($F(1,30)=11.205, p=.002, \text{partial } N^2=.899$). The percent correct for targets was higher for stories with unpleasant tone ($M=.886, SD=.021$) compared to stories with pleasant emotional tone ($M=.810, SD=.019$).

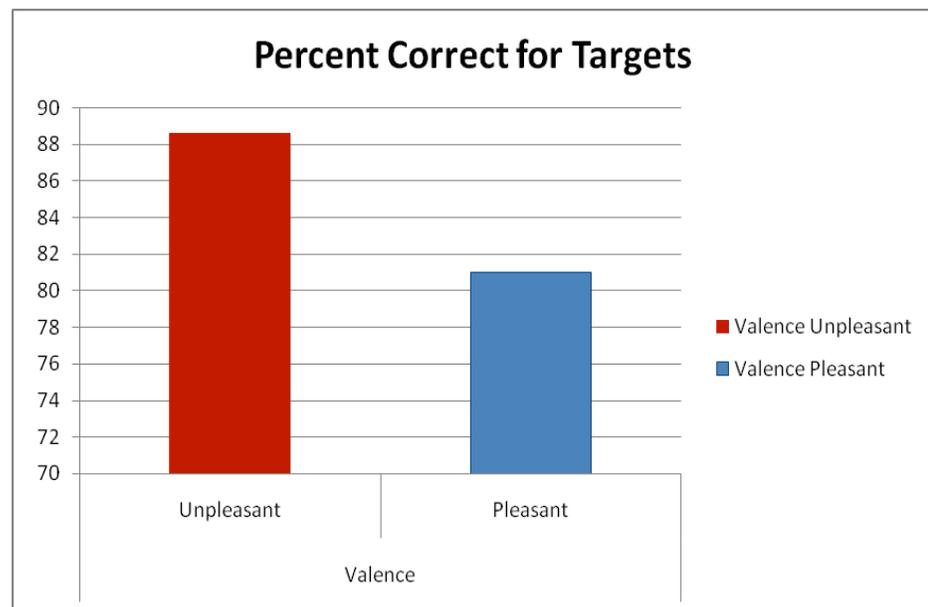


Figure 3: Percent Correct for Targets: Valence

HYPOTHESIS 4

Hypothesis four predicated that participants would experience greater cardiac deceleration during exposure to presentations with unpleasant emotional tone than pleasant emotional tone. Hypothesis four was supported.

There was a significant valence by time interaction ($F(53,1219)=2.194, p>.001$, partial $N^2=1.0$). This interaction shows that throughout the course of the message, messages with unpleasant emotional tone had the greatest deceleration in heart rate (See Figure 4).

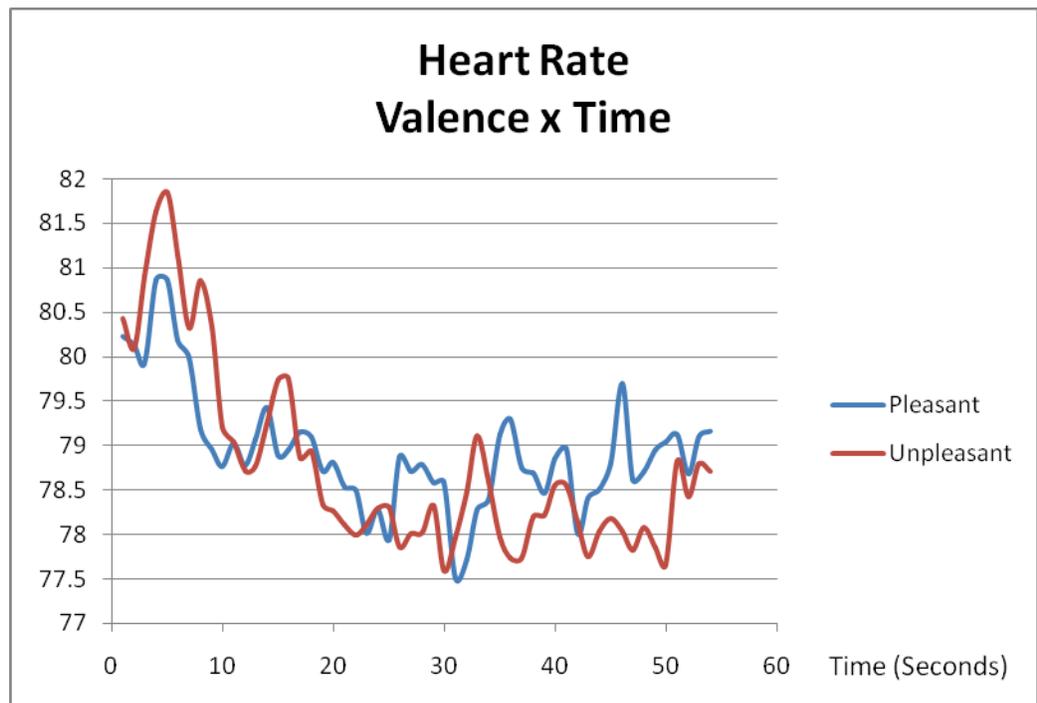


Figure 4: Heart Rate: Valence X Time

There was also a significant main effect for valence, ($F(1, 23)=4.983, p=.036$). The average heart rate for stories with unpleasant emotional tone ($M=78.495, SD=2.171$) was lower than presentations with pleasant emotional tone ($M=79.004, SD=2.196$).

HYPOTHESIS FIVE

Hypothesis five predicted that participants would experience greater skin conductance levels during exposure to presentations with unpleasant emotional tone than pleasant emotional. There were no significant results, and therefore this hypothesis was not supported.

5. DISCUSSION

OVERVIEW

The main purpose of this study was to examine the interaction of presentation type and emotional tone of photojournalists' work on evoked arousal, valence, attention and recognition. It was hypothesized that attention and arousal would be the greatest during exposure to moving and still images combined. However, when it came to memory, it was predicted that audio recognition tests would be the best for the still images presentation. It was hypothesized that unpleasant emotional tone would lead to greater attention and arousal, and therefore greater memory.

Results of this experiment revealed significant effects of presentation style on valence (See Figure 5). In general, it appears that unpleasant emotional tone is very influential. Messages with unpleasant emotional tone attracted the most attention and were better remembered. The presentation style with moving and still images did not create an orienting response, but led to greater self-reported arousal than the moving images and still images presentations. Heart rate data showed the moving images were the most attention grabbing, while skin conductance levels were the highest for the still image presentation.

One of the media professional's goals is to use the presentation type that communicates the message most effectively. If an attention grabbing message is the goal, then a moving images presentation can do this. However, another part of having an effective story is making it memorable and arousing. Skin conductance levels were highest for the slide show presentation, and unpleasant emotional tone was more memorable.

Summary of Results					
H#	Hypothesis	Concept	DV	Finding	Supported
1	Participants would experience greater cardiac deceleration during exposure to moving and still images combined than moving images or still images.	Attention	Heart Rate	Participants experienced the greatest deceleration during the moving images presentation, followed closely by the moving and still images combined and still images presentations.	No
2	Participants would experience greater skin conductance levels during exposure to still and moving images combined than moving images or the still images.	Arousal	Skin Conductance	Participants rated the moving and still images combined presentation as the most arousing, but skin conductance data showed the still image presentation was the most arousing.	No
3a	Audio recognition tests would be better for the moving images than for moving and still images combined or moving images.	Memory	Audio Recognition	Percent correct analysis had no significant results for style.	No
b	Presentations with unpleasant emotional tones would be better remembered than presentations with pleasant emotional tones.			Simple % correct was higher for unpleasant compared to pleasant.	Yes
4	Participants would experience greater cardiac deceleration during exposure to presentations with unpleasant emotional tone than pleasant emotional tone	Attention	Heart Rate	Valence by time interaction showed, messages with unpleasant tone had the greatest deceleration in heart rate. Average heart rate was lower for presentations with unpleasant tone.	Yes
5	Participants would experience greater skin conductance levels during exposure to presentations with unpleasant emotional tone than pleasant emotional.	Arousal	Skin Conductance	No significant results.	No

Figure 5: Summary of Results

ATTENTION

Heart rate was used as a measure of resources allocated to encoding, also referred to as attention. One way a message is automatically encoded is with the orienting response. This is a response to new or signal stimuli in a person's environment. It was predicted that participants would orient to the transition from a moving to still image, however this did not happen. It is possible that the still image did not introduce enough of a content change to be a novel stimulus. Post hoc analysis of the transitions story by story indicated that most of the transitions caused a cardiac acceleration. Acceleration in heart rate is associated with a decrease in the allocation of cognitive resources, and therefore less attention being paid to the stimulus (Lang, 1990). This could indicate that people do not enjoy the transition from moving to still. This result is still helpful to know because in media it is important to understand which types of transitions evoke an orienting response, and which do not.

While the intent of this study was to look at the transition from moving to still, it is also interesting to examine the transition from still to moving. A post hoc analysis was done to examine the transition from still to moving. A 2 (transition) x 4 (stories) x 11 (time) repeated measures anova was run. There was a significant transition by time interaction ($F(10,290)=4.669$, $P<.001$, partial $N^2=.139$). The first and second transitions in each story were examined. The third transition was not analyzed because a majority of the stories were not long enough to examine 10 seconds after the third transition from still to moving. There was not an orienting response for the first transition, however the second transition did elicit an orienting response.

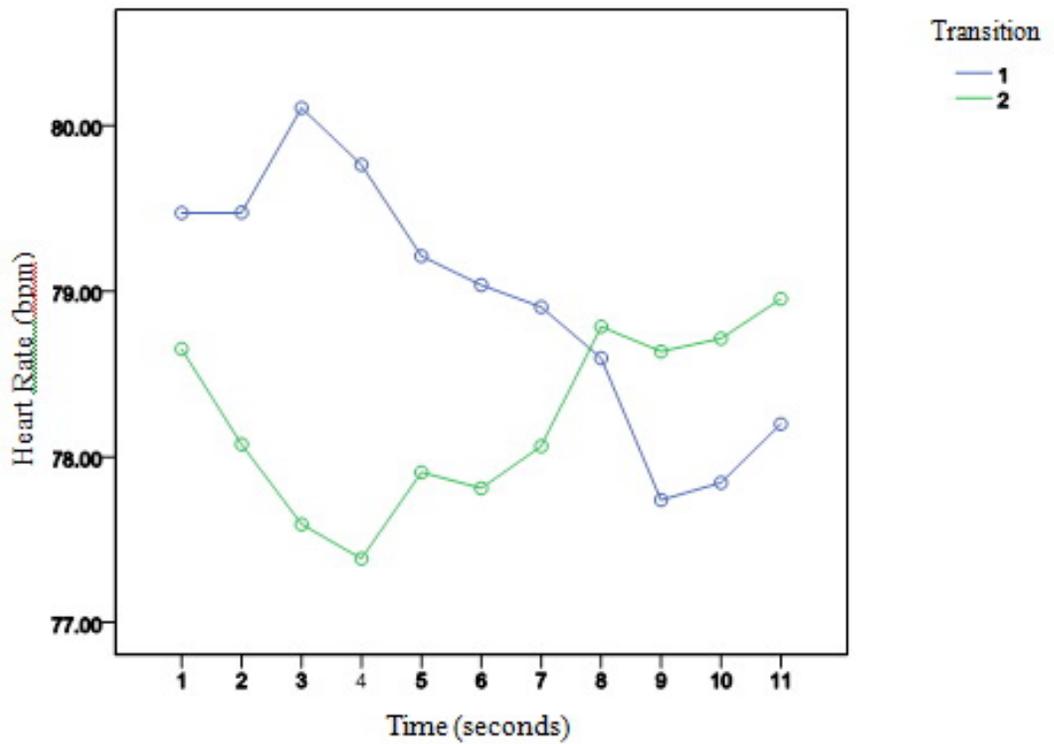


Figure 6: Transitions from still to moving.

These are puzzling results. It is expected that if any transition caused an orienting response, it would be the first transition because it would be the most novel. The second transition should be less novel to the viewer. There are no overriding theoretical reasons to explain this pattern of results. The orienting response, including the transition from moving to still and still to moving, needs to be further examined by future researches. Future research should look at more than two still to moving transitions.

When attention was examined across the message as a whole, cardiac deceleration was the greatest for moving images followed by the moving and images combined and the still images presentation. It was hypothesized that the moving and still images combined would be the most attention grabbing. There are theoretically and practical reasons why this hypothesis

was not correct. There could have been errors in data collection, cleaning, and analysis. The opposite reaction to the transitions, acceleration in heart rate rather than an orienting response, influenced the overall heart rate. Future research should further explore the emotion around transitions from moving to still images.

Significant results were found that participants experience greater cardiac deceleration during exposure to presentations with unpleasant emotional tone than pleasant emotional tone. These results support other studies that have shown unpleasant emotional tone increases attention (Lang, Newhagen & Reeves 1996).

AROUSAL

Skin conductance and self report data were used as a measure of arousal. Skin conductance is a measure of the level of sweat in the glands as the sympathetic nervous system is activated. As arousal increases, skin conductance levels are larger and more frequent. For self report data, subjects in the experiment used a 9 point scale with one being calm and nine being excited to rate how aroused they feel immediately after each presentation.

There were conflicting results between self-report and skin conductance data. Participants rated the moving and still images combined presentation as the most arousing, with still images being the least arousing. However, skin conductance levels showed the still image presentation was the most arousing. If the skin conductance results are accurate and free of errors, then the participants did not do well rating their own arousal levels. Participants may not have felt comfortable or completely understood how to judge their arousal. The benefit of having self-report and physiological data is that both can be examined. When the self-report and skin conductance data diverge, more participants or another study can help to explain what happened.

There were not significant findings when the arousal of unpleasant and pleasant emotional presentations was examined. This was surprising due to the fact that attention and memory were greater for presentations with unpleasant emotional tone. Possible errors in the data include incorrectly placing the sensors during collection, not correctly identifying outliers during cleaning, or miscalculating during analysis. If skin conductance data were not collected and measured properly, it could mean participants were accurately rating their arousal and that errors in skin conductance data led to the two not aligning.

VALENCE (EMOTIONAL TONE)

Valence is defined as a range of emotions from negative or unpleasant to positive or pleasant. Valence was measured with self-reported data. Self-report data were gathered using a 9 point scale with one being extremely pleasant and nine being extremely unpleasant. Participants rated how pleasant or unpleasant they feel immediately after each presentation.

A 3 (presentation style) x 2 (valence) repeated measures ANOVA revealed a significant effect for valence ($F(1,41)=208.705, p<.001, \text{partial } N^2=.835$). Negative messages for all three presentation styles were rated more unpleasant, and positive messages were rated more pleasant. There were not significant findings for a presentation style and valence interaction.

Interactions of valence with memory, attention, and arousal were examined. For memory, presentations with unpleasant emotional tone were remembered better than those with pleasant tones. More resources were allocated to encoding presentations with unpleasant emotional tone than pleasant presentations. No significant interactions were found between valence and arousal. It was predicted that unpleasant emotional tone would lead to greater skin conductance levels.

INDUSTRY IMPLICATIONS

Right now there is a lack of knowledge among media professionals about how different ways of packaging content influence the way an individual's mind processes information. This can result in ineffective communication. A media professional's goal should be to use the presentation type that communicates the message most effectively. A story that is attention grabbing and memorable is one step in what could be called an effective story.

If the goal is to create a highly attention grabbing piece, an unpleasant or moving images presentation is best. If the goal is an arousing or memorable piece, a presentation with an unpleasant emotional tone is best.

There has been a lot of research on television and still images, however there has not been much that looks at the intersection of moving and still images combined into a multi-media story package. More experiments need to be conducted to see if the transition from moving to a still image is disliked by viewers. In this study, the transitions caused cardiac acceleration rather than an orienting response.

Overall, unpleasant stories increase attention and memory better than pleasant stories. Perhaps media professionals have already caught onto this aspect, leading to the phrase, "If it bleeds, it lead," which refers to the media's use of many violent, unpleasant stories. If the goal of the presentation is memory, then an unpleasant presentation or still image slideshow works the best.

LIMITATIONS

This study had several limitations. First, only 26 participants' data were examined for heart rate data, and 32 participants for the other analyses. Several more were tested, yet had to be

thrown out due to issues with data collection. Some of the results that were nearing significance might have been significant if more participants had been run.

The study took place in a lab. The advantage of a laboratory experiment is control that helps strengthen internal validity and eliminate confounding variables. However, this also means a loss of external validity, or the degree to which the results would hold true for people in other places at other times. In a different setting other than a lab, participants may only watch part of a presentation and then leave, or multitask at the same time. This would all lead to a decrease in the available resources for encoding. There is also the possibility of experimenter error when collecting and analyzing data.

It is also important to note that the presentations varied in length and some of the data had to be truncated in order to be analyzed. For the longer presentations, two neighboring data points were averaged into one data point until the number of data points match the other presentations.

FUTURE RESEARCH

In order to further the field of psychophysiology, researchers should raise additional questions that could be answered in the future. For example, how does production pacing influence the processing of these types of presentations? This study tried to keep that variable constant, but it could be manipulated for future studies.

There has not been a lot of research done that looks at the intersection of moving and still images combined into a multi-media story package. Research should explore other variables and use different presentations. It was found that in this study the transition from a moving to still image did not create an orienting response. Other

structural features should be examined. It would also be interesting to look at the transition from a still to moving image.

It would also be beneficial to study different groups of people. For example, does one age group have better memory for one presentation type than other age group?

Increasing the number of participants would also help results.

CONCLUSION

This study hoped to add knowledge to research being done on the cognitive processing of media messages. There has been a lot of research on television and still images, however there has not been a lot of research that looks at the intersection of moving and still images combined into a multi-media story package.

While answering some questions, this study also leads to more questions for future research. The more presentation styles and their interactions with other variables are examined, the more researchers will understand. Media professionals should learn as much as they can about how the brain processes media, in order to effectively communicate with their audiences.

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