EFFECTS OF SUDDEN AUDIO DISAPPEARANCE AND AUDIO COMPLEXITY ON ATTENTION AND MESSAGE RECOGNITION

By

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To the Faculty of Washington State University:

The members of the Committee appointed to examine the thesis of YEVGENIYA SOLODOVNIKOVA find it satisfactory and recommend that it be accepted.

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Chair

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Abstract

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This experiment uses the limited capacity model of mediated message processing (LC3MP) to examine the effects of sudden audio disappearance and audio complexity on viewers' attention and message recognition. The study also investigates whether these structural features affect low and high novelty seekers differently. Fifty nine participants viewed 20 commercials, ten of which were low in audio complexity and ten were high in audio complexity. Half commercials in each audio complexity category had an audio fragment cut out from them. The participants' heart rate (HR) during message presentation was measured and used as a physiological index of mental effort and attention paid. Their overall attention to each message was also assessed using a self-report measure. Results demonstrated that compared to HR during messages with continuous audio, sudden audio disappearance elicited greater orienting responses resulting in greater HR deceleration. However, the participants did not report paying greater attention to the messages with sudden audio disappearance compared to the messages with continuous audio. The prediction that messages high in audio complexity would elicit greater attention than messages low in audio complexity did not receive support. Conversely, the participants paid more attention to the messages that were low in audio complexity than to the

messages that were high in audio complexity. Self-reported data did not reveal that the participants distinguished between the two audio complexity categories in terms of attention. However, the participants reported paying more attention to sudden audio disappearance in the messages that were low in audio complexity than to sudden audio disappearance in the messages that were high in audio complexity. Results revealed that recognition memory decreased after sudden audio disappearance and did not recover later. On the other hand, recognition memory increased steadily for the messages with continuous audio which indicated that sudden audio disappearance had negative impact on the message encoding. Unlike what was predicted, the participants' recognition memory was better for the messages that were low in audio complexity than for the messages that were high in audio complexity. Predictions concerning high and low novelty seekers did not find support.

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Dedication

This thesis is dedicated to my mother and my father who have taught me that education is one of the most important values in life.

CHAPTER ONE

INTRODUCTION

In the contemporary ad cluttered television environment, creators of media messages have to deal with a growing challenge of attracting viewers' attention that plays an important role in message reception and processing (Webb & Ray, 1979; Olney, Holbrook & Batra, 1991; Chaffee & Schleuder, 1986). Low levels of attention paid to broadcast media in general (Krugman, 1988) combined with the fact that viewers often switch to another activity or change the channel during commercial breaks (Yorke & Kitchen, 1985; Heeter & Greenberg, 1985) pose an even greater challenge to advertisers and producers of public service announcements.

The TV is an audiovisual medium. However, more than 30% of the time viewers do not look at the screen when the TV is on (Anderson & Burns, 1991). Therefore, it is essential for the advertisers to create messages that are able to elicit and maintain viewers' attention. For those who are not visually attentive to a message its auditory features become the prime determinants of whether the viewers will terminate their activities and focus their full attention on the message. Numerous studies have demonstrated that structural features of the messages play an important role in the information reception and processing (Kellaris, Cox, & Cox, 1993; Shin & Lang, 2007; Lang, Schwartz, Lee, & Angelini, 2007). In the contemporary highly competitive advertising world, messages are complex and loud. They incorporate various audio and video features. A lot of these features attract viewers' attention. For example, previous studies suggested that audio complexity impacted attention (Potter & Choi, 2006). Advertisers strive to get consumers' attention by adding unique and novel features to the messages. Since it is usual for the contemporary commercials to be loud, sudden audio disappearance is expected to be a novel and unexpected feature of the message that has the ability to attract viewers' attention even when they are visually inattentive. The

purpose of this study is to investigate the effects of these two structural audio features, sudden audio disappearance and audio complexity, on attention and memory, message recognition in particular.

Limited Capacity Model of Mediated Message Processing

This study takes the theoretical perspective of the Limited Capacity Model of Mediated Message Processing (LC3MP, Lang, 2000). The model assumes that an individual's ability to process information is limited, which means that the individual, as an information processor, can allocate only a limited reserve of mental resources to the task of message processing. LC3MP suggests that information processing consists of three main subprocesses (encoding, storage, and retrieval) and that individuals usually engage in all of them simultaneously. The subprocess of encoding involves creating a mental representation of the message information. The process of linking newly encoded information to previously encoded information is called storage subprocess. The subprocess of retrieval involves activation of previously stored knowledge to comprehend new messages and store them. Due to the receiver's inability to encode and store all of the information in the message, he or she must select which bits of the information to transfer into mental representations. This selection can be both controlled (intentional) and automatic (unintentional). Characteristics of the message and of the receiver determine which parts of the information are selected and how well the subprocesses of encoding, storage, and retrieval are accomplished (Lang, 2000). Controlled selection processes are affected by the viewer's interests, knowledge, or goals. Automatic selection processes, on the other hand, are not consciously controlled by the viewer but rather elicited by the stimulus and its structural and content features.

Sudden Audio Disappearance, Audio Complexity, and Attention

Attention can be defined as a mechanism for allocating cognitive resources to the task of message processing (Anderson, 1995). Attention can be divided into two types – long-term

or tonic attention and short-term or phasic attention. While phasic attention is mostly automatic (i.e., passive and involuntary), tonic attention involves active effort or concentration that an individual puts in any activity. Phasic attention refers to short changes in attention and is related to sudden or novel changes in the environment. Previous research has demonstrated that automatic allocation of resources often occurs through the mechanism of an orienting response (OR) elicited by novel and unexpected features of the message (Ravaja, 2004; Lang, Schwartz, Lee, & Angelini, 2007). OR is an automatic selection mechanism, occurs over seconds and is related to short-term changes in attention. A number of researchers have studied specific structural features of the audiovisual stimuli and the ability of these features to elicit attention. For example, it has been shown that production pacing (e.g., cuts, edits, etc.) and movements elicit OR (Lang, 1990; Lang, Zhou, Schwartz, Bolls, & Potter, 2000; Lang, Geiger, Strickwerda, & Sumner, 1993; Lang, Schwartz, Chung, & Lee, 2004). These structural features, however, are able to elicit attention only among those who look at the TV screen during exposure to the stimuli. Even though television is often described as a "visual" medium, the average viewer does not look at the TV more than one third of the time he or she is in its presence (Anderson & Burns, 1991).

Even though some researchers argue that to make sense of a TV message viewers must pay close attention to both channels, audio and video (e.g., Geiger & Newhagen, 1993), listening often happens independently of the focus of visual attention. Previous studies have demonstrated that heavy viewers often read, study, or do homework during television watching (Robinson, 1981; Patton, Stinard, & Routh, 1983; Anderson, Lorch, Field, Collins, & Nathan, 1986). In cases when viewers combine background TV watching with other unrelated activities and do not look at the screen, auditory features of the media message may become prime determinants of whether or not viewers will terminate their activities and focus their attention on the message (Alwitt, Anderson, Lorch, & Levin, 1980).

Being able to make the viewers look and attend to the message is essential for advertisers because, as Anderson et al. (1979) argue, the longer the viewers look at television, the longer they will continue looking at it without turning away. This is important because when the viewer is visually attentive, more resources are allocated to the task of message processing and, as a result, the information is encoded, stored, and retrieved more thoroughly (Lang, 2000).

Some researchers have looked at a number of structural features in radio messages (e.g., voice changes, sound effects, and production effects) and their ability to elicit attention (Potter, 2000, 2001; Lang et al., 2007). Others have investigated audio structural features present in audiovisual messages. For example, Alwitt et al. (1980) found that auditory changes, unusual voices, sound effects, laughter, and applause increased attention. On the other hand, the effects of background music are controversial. Even though some researchers argued that background music attracted and held viewers' attention and, therefore, contributed to the message reception (Hecker, 1984) others found that certain types of music decreased viewers' attention (Alwitt et al., 1980). Most studies have looked at the changes in audio from one type of sound to another. To date, no studies to the author's knowledge have examined sudden audio disappearance as a structural feature of the audiovisual messages.

Listening to television occurs with different levels of depth depending on whether the viewer is looking at the screen or the TV is on as a background. When not looking, individuals listen to the levels and qualities of sound and use them as cues to interesting content worthy of their full attention (Alwitt et al., 1980). Since TV viewers are used to "complex" messages with multiple layers of video (background, text, special video effects, etc.) and several audio tracks (voice over, background music, special sound effects, etc.) sudden disappearance of sound is likely to surprise them because of its novelty and

suddenness. It is likely that individuals will immediately react to the absence of the audio and look toward the TV to see what happened and why the sound disappeared.

Prior to the present investigation, a pilot study was conducted to examine whether sudden audio disappearance affected viewers' attention. A number of 30 seconds long public service announcements were manipulated to create messages with sudden audio disappearance and used as stimuli. Ten students were used as participants for the pilot study. Results showed that sudden audio disappearance did elicit OR. After the audio disappeared, the viewers started paying greater attention to the messages.

Therefore, the present study poses the following hypothesis to examine whether sudden audio disappearance will result in short-term changes in attention:

H_1: Messages with sudden audio disappearance will elicit greater attention than messages with continuous audio.

The first hypothesis is based on the idea that sudden disappearance of the audio should elicit attention because it is novel and unexpected. However, commercials may differ in their auditory structural complexity. A number of studies have demonstrated that auditory structural complexity affected the viewers' attention (e.g., Wartella & Ettema, 1974). Not only was it demonstrated that a number of structural features (e.g., sound effects, production effects, voice changes, and music onsets) elicited ORs (Potter, Lang, & Bolls, 1998) but these responses did not habituate over 2-minute radio messages (Potter, 2000). Therefore, it is expected that messages with greater audio complexity will elicit ORs more frequently than messages that are less complex. In this study, audio complexity is defined as the number of structural features contained in the message (i.e., voice changes, music onsets, sound effects, production effects, etc). Previous studies demonstrated that these structural features elicit ORs (Potter & Choi, 2006; Potter, Lang, & Bolls, 1998). It is suggested that the more

structural features are present in the message, the more attention it elicits. Thus, it is expected that:

H_2: Messages that are high in audio complexity will elicit greater attention than messages that are low in audio complexity.

The first two hypotheses predict main effects of audio condition (i.e., messages with sudden audio disappearance and messages with continuous audio) and audio complexity (i.e., messages low and messages high in audio complexity) on attention. Then what will happen when these two features are combined? Would attention increase linearly as more novel features are added? According to LC3MP (Lang, 2000), combination of different structural and content features may increase automatic allocation of mental resources, i.e. attention. Hence, it is expected that disappearance of the audio in the messages with highly complex audio tracks will be more novel (i.e., less expected) and noticeable by the viewers than disappearance of the audio in the messages with less complex audio. Therefore, sudden audio disappearance in highly complex messages may attract greater attention than sudden audio disappearance in the messages that are low in audio complexity. Therefore, it is predicted that:

H_3: Messages with sudden audio disappearance that are high in audio complexity will elicit greatest attention followed by either messages with sudden audio disappearance that are low in audio complexity or messages with continuous audio that are high in audio complexity and they will be followed by messages with continuous audio that are low in audio complexity.

Sudden Audio Disappearance, Audio Complexity, and Memory

As mentioned above, previous research has demonstrated that structural features of the messages have the ability to elicit an automatic allocation of resources to encoding (Lang, 2000; Lang et al., 2007; Potter & Choi, 2006). Some scholars investigated the effects of audio

features on message reception and memory. For example, Lang (2007) showed that recognition of fast-paced radio messages was better than of slow-paced messages. In addition, Potter and Choi (2006) demonstrated that more complex radio messages were better recalled than simple messages. Other studies have also suggested that auditory features have an important impact on the message recognition. The findings, however, are inconsistent. For instance, the effects of background music on the message recognition are still unclear and depend on its characteristics (Alwitt et al., 1980; Anderson & Levin, 1976; Kellaris et al. (1993). Some scholars suggested that background music increased message memorability (Hecker, 1984; Hoyer, Srivastava & Jacoby, 1984). Others argued that it inhibited (Haley, Richardson & Baldwin, 1984; Sewall & Sarel, 1986) or had no effect (Stewart & Furse, 1986) on remembering the message content. In addition, a number of experimental studies found that ad memorability varied across music types (Belsham & Harman, 1977; Tom, 1990). For example, Wakshlag, Reitz, and Zillman (1982) found that even though music increased attention to the messages, it inhibited learning from them. According to Kellaris et al. (1993), messages without background music were recalled and remembered as well as messages with music and, in some cases, even better. Therefore, previous studies have produced inconsistent results concerning the effects of audio on memory. Little research has examined how sudden audio disappearance affects the memorability of the messages. Adding various attention grabbing features to the messages is thought to increase the amount of information viewers have to digest. As a result, it may become difficult for the viewers to process relatively greater amounts of information because their levels of cognitive effort increase only up to a point (Lang, Chung, et al., 2002) and then cognitive overload occurs (Lang et al., 1999; Lang et al., 2002). However, sudden audio disappearance somewhat reduces the amount of information that needs to be processed. On the other hand, disappearance of the audio involves multiple changes in the audio track (i.e., voice over

disappears, background music disappears, etc.). It is unclear, however, whether sudden audio disappearance helps the viewers or decreases their abilities to encode the information in the messages. Hence, to investigate how sudden audio disappearance affects memory the study asks the following research question:

RQ: How will sudden audio disappearance affect message recognition?

As previously suggested, audio complexity has potential to grab viewers' attention resulting in automatic allocation of cognitive resources to encoding. For example, Potter and Choi (2006) demonstrated that more complex messages were freely recalled more often than less complex messages. Watt and Welch (1983) examined dynamic audio complexity and suggested that it was positively related to children's memory for the content of educational programming. A number of researchers have suggested that OR results in the allocation of processing resources to the task of the message encoding (Ohman, 1979; Dawson, Filion, & Schell, 1989). Hence, the study poses the following hypothesis:

H_4: Messages that are high in audio complexity will be recognized better than messages that are low in audio complexity.

Sudden Audio Disappearance, Audio Complexity, and Novelty Seeking

Uses and gratifications research concerns the reasons why people use different types of media and suggests that media use motivations depend on an individual's specific needs and personal characteristics (Rosengren, 1974). According to the theory, individuals are goal oriented in their media use and, therefore, play an active role in selecting and using the media. A number of studies focused on biological and genetic traits that at least partially determine people's behavior and media use (e.g., Sherry, 2001). For instance, Sherry demonstrated that temperament, which is a biologically based trait, is an important causal factor in forming television use motivations.

Another personality trait that has been of interest to scholars is sensation seeking, which is believed to have biological roots as well. According to Zuckerman (1979), sensation seeking is responsible for an individual's desire for novel experiences, physiological arousal, and their willingness to take risks to get aroused. Zuckerman (1988) argues that "persons differ reliably in their preferences for or aversions to stimuli or experiences with high-arousal potential" (p. 174). Researchers argue that high sensation seekers prefer novel, intense, and stimulating media messages (Stephenson, 2003; Donohew, Lorch, & Palmgreen, 1991). Low sensation seekers, on the other hand, prefer less stimulating and novel stimuli. According to Arnett (1994), sensation seeking is "characterized by the need for novelty and intensity of stimulation" (p. 290). He argues that novelty is an important characteristic of sensation seeking. High sensation seekers seek novelty in media messages to obtain the physiological arousal they desire. Therefore, messages that are novel and unexpected are likely to have the ability to attract their attention. Since sudden audio disappearance is expected to be novel, it will likely attract high novelty seekers more than low novelty seekers. This leads to:

H_5: Compared to low novelty seekers, high novelty seekers will pay greater attention to messages with sudden audio disappearance.

In the same vein, high novelty seekers will likely find messages with highly complex audio to be more novel, interesting, and stimulating than messages with less complex audio. Therefore, it is expected that they will pay greater attention to such messages:

H_6: Compared to low novelty seekers, high novelty seekers will pay greater attention to messages that are high in audio complexity.

CHAPTER TWO

METHOD

Design

This study used a mixed Audio Condition (2) × Audio Complexity (2) × Novelty Seeking (2) × Repetition (5) factorial design. Audio Condition, Audio Complexity, and Repetition were within-subjects factors, and Novelty Seeking was a between-subjects factor. Audio Condition had two levels represented by messages with sudden audio disappearance and messages with continuous audio. Audio Complexity had two levels represented by messages with high and low levels of audio complexity. Novelty Seeking had two levels, high and low. Five messages represented each of the four Audio Condition by Audio Complexity categories.

Participants

A total of 70 students (30 males and 40 females) were recruited from an undergraduate course at a large north-western university and participated in the study. However, due to the technical errors and incomplete responses data from 11 participants were excluded from the analyses. Of the remaining 59 students, 25 were males and 34 were females.

Stimulus Materials

First, a pool of randomly selected 30 seconds long commercials was coded to determine their audio complexity levels. The number of voice changes, music onsets, sound effects, production effects, and other auditory features was counted for each message. Messages that were low in audio complexity had 6-18 structural features and messages that were high in audio complexity had 33-57 structural features. One message that was low in audio complexity, for example, only had a father talking to his son with a natural sound of rain on the background. One of the messages that were high in audio complexity, on the other

hand, included six sound bites from six different people, several different musical fragments, natural sounds, and special sound effects used as transitions from one sound bite to another.

Next, a number of commercials that were high in audio complexity and a number of commercials that were low in audio complexity were selected. Selected messages were edited to create the category of messages with sudden audio disappearance. Six to seven seconds into each commercial, an audio fragment of four to six seconds long was cut out from the message. The duration of silence varied in different messages to insure that the content of each commercial remained clear and that the audio that was kept uncut consisted of complete sentences. Commercials that became incomprehensible after the audio manipulation were excluded from further consideration.

Among the messages with sudden audio disappearance manipulation, five commercials with the most complex audio and five commercials with the least complex audio were selected as final stimuli. In addition, 10 commercials with continuous audio (five messages with most complex audio and five with least complex audio) were selected for the study. Therefore, there were five messages for each of four Audio Condition by Audio Complexity categories. Messages were presented to each participant in a random order.

Novelty Seeking

As discussed, in addition to examining effects of the auditory structural features, this study also investigates how viewers' novelty seeking tendencies influence their responses to the messages. Participants' novelty seeking was assessed by a five point Novelty Subscale of the Arnett Inventory of Sensation Seeking (AISS, Arnett, 1994). Novelty subscale consists of 10 items (e.g., I would have enjoyed being one of the first explorers of an unknown land; I think it's best to order something familiar when eating in a restaurant, etc.). The participants were asked to indicate the extent to which each item described them (1- not at all, 5- describes me extremely well). The Novelty Subscale is provided in full in Appendix 1. The

participants' novelty seeking scores ranged from 1.80 to 4.40 (M = 3.375, SD = .519). The sample was divided into "low novelty seekers" (n= 27) and "high novelty seekers" (n= 32) by the median of the distribution of the Novelty Subscale. Those participants who scored lower than 3.4 were considered to be low novelty seekers and those who scored higher than 3.4 fell into high novelty seeking category.

Arnett (1994) reported an internal reliability of 0.50 for the Novelty Subscale of AISS. In this study, the reliability of the subscale was 0.427. Individual items were examined to investigate whether deletion of any of the ten items would improve the internal reliability. Four items were able to increase the alpha to the level greater than 0.60 if deleted. However, since there is no theoretical justification for reducing the subscale by 40% and the alpha of 0.427 compares well with Arnett's reported alpha, this study used all ten items of the Novelty Subscale to test the hypotheses.

Dependent Variables

Attention. Attention was measured in two ways. First, the participants' heart rate (HR) during message presentation was measured and used as a physiological index of mental effort and attention paid to each message. It has been demonstrated that HR is a reliable and most informative measure of both short-term automatic attention (i.e., OR) and long-term controlled attention (Ravaja, 2004). A number of studies have confirmed that short-term attention paid to an external stimulus is related to HR deceleration (e.g., Porges, 1995). Two Ag/AgCl electrodes were attached to the participant's arms to collect HR data. HR data were recorded for five seconds before and thirty seconds during each message. The data were collected using VPM software (Cook, 2003). The data were reduced offline to weighted average beats per minute over three seconds. For the analyses on novelty seeking, change scores were calculated by subtracting HR baseline (i.e., value before the message) from each HR value during the message.

In addition to HR, the participants' overall attention to each message was assessed using a self-report measure. This measure was used to examine whether the participants noticed sudden disappearance of the audio, that is, whether the audio disappearance impacted their attention on a conscious level. Hence, after viewing each message, the participants were asked to report how much attention that message made them pay on a seven point scale (1 – not at all, 7 – a lot).

Recognition Memory. Memory was measured using a forced-choice, four-alternative, multiple-choice recognition test. Three questions were formulated to test recognition of specific information presented in the audio track of each message. These three questions represented three different time points (i.e., Time 1, Time 2, and Time 3). The first question was related to the message content before audio disappearance. Two others asked about the message information after the audio returned. One of them related to the message information immediately after the audio appeared again and the other one was about the last part of the message. The participants were asked to answer each question by selecting one of the four possible answers. Hence, each subject answered 60 questions that were presented randomly using the MediaLab software (Jarvis, 2002). The full questionnaire is presented in Appendix 2.

Procedure

Each participant completed the experiment individually. Upon arrival, the participants were asked to sign the informed consent form and were given a brief instruction about the experiment. Then they were seated in a comfortable arm chair approximately three feet from the TV screen. The procedure involving the physiological data collection was explained and the electrodes were applied. The participants were familiarized with the MediaLab (Jarvis, 2002) software interface that was used to present all the instructions and the stimuli on the screen. Each participant viewed the messages one at a time and indicated how much attention

he or she paid to each of them. After viewing the last message, the electrodes were removed and the participants were asked to complete the Novelty Seeking Scale. Finally, they were asked to complete the recognition task after which they were thanked and dismissed.

Data Analysis

A repeated measures ANOVA was performed to test main effects of each independent variable and their interaction effects on the dependent variables. The participants' responses to all 20 messages were included in the analyses. Time was also included as a factor in the analyses for the physiological measure of attention (i.e., heart rate). The HR data was analyzed over time to see how sudden audio disappearance affected responses during the messages.

Time was also included as a factor for the recognition data. To examine changes in memory due to the independent variables recognition scores for the three questions representing three different time points were compared to each other.

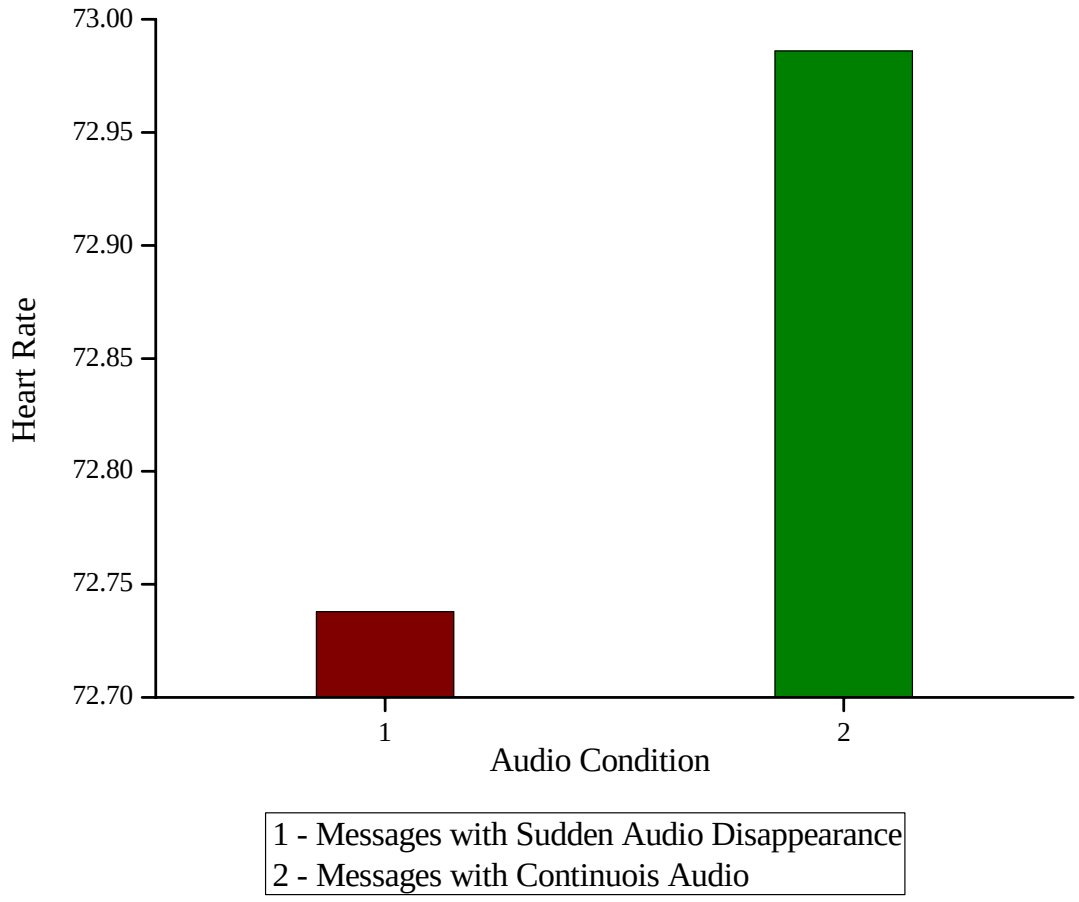
CHAPTER THREE

RESULTS

Hypothesis 1

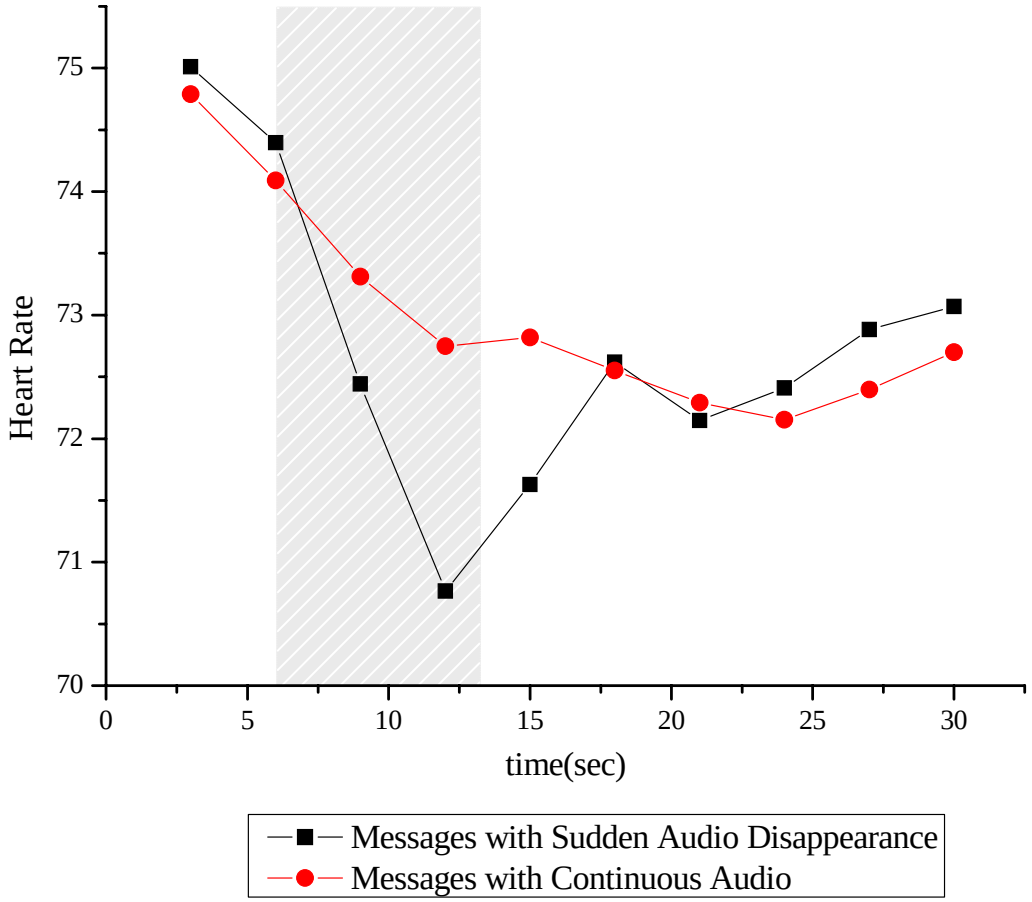
The first hypothesis predicted that Audio Condition would have an effect on attention such that messages with sudden audio disappearance would elicit greater attention than messages with continuous audio. A repeated measures ANOVA was performed on the HR data. The main effect of Audio Condition on attention was only marginally significant, $F(1, 58) = 2.907$, $p = .094$ ($\eta^2 = .048$), and is shown in Figure 1. Subjects paid more attention (which was indicated by slower HR) to the messages with sudden audio disappearance ($M = 72.738$, S.E. = 1.267) than to the messages with continuous audio ($M = 72.986$, S.E. = 1.315).

Figure 1. Effect of Audio Condition on HR (Attention).



However, the main effect of the audio condition on attention does not provide complete information about how sudden audio disappearance affects attention. Physiological responses are specific to the different features present in the messages and change from moment to moment as the message unfolds. Therefore, HR was also analyzed over time to see how this structural feature affected the participants' responses during the messages. Results revealed that there was a significant Audio Condition by Time interaction, $F(9, 522) = 19.408$, $p < .001$ ($\eta^2 = .251$). As shown in Figure 2, compared to HR during the messages with continuous audio, sudden audio disappearance elicited greater orienting responses resulting in greater HR deceleration (grey area in Figure 2 represents period with no audio). As expected, both message categories elicited initial orienting responses after stimulus onset. However, the responses differed in the middle of the messages. HR decreased significantly after the audio suddenly disappeared. It started decelerating around six seconds into the message and kept slowing down until the middle of the message. This indicates that sudden audio disappearance elicited OR, which means that the participants started paying greater attention to the message.

Figure 2. Audio Condition by Time Interaction on HR (Attention).



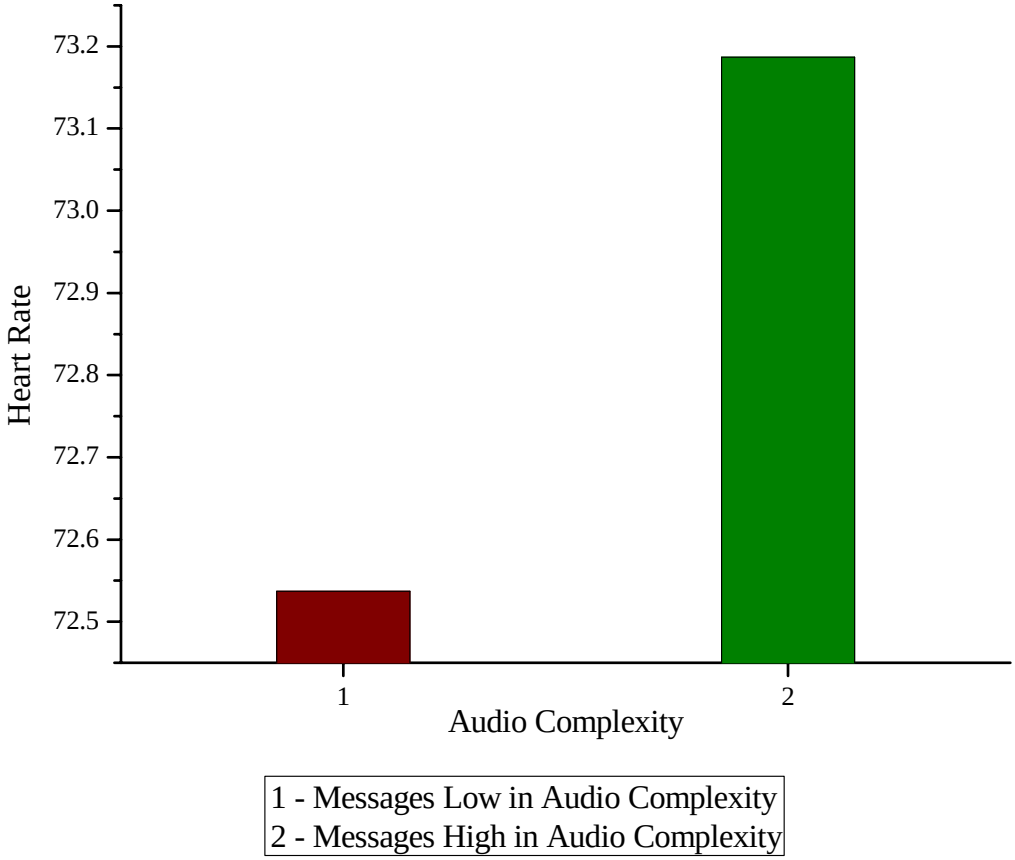
A repeated measures ANOVA was also performed on the participants' self-reported attention. Results showed no main effect of Audio Condition on self-reported attention ($F<1$). The participants did not indicate that they paid greater attention to the messages with sudden audio disappearance compared to the messages with continuous audio.

Hypothesis 2

The second hypothesis predicted that Audio Complexity would have an effect on viewers' attention such that messages high in audio complexity would elicit greater attention than messages low in audio complexity. A repeated measures ANOVA was performed on the HR data. The main effect of Audio Complexity on attention was significant, $F(1, 58) = 20.058$, $p < .001$ ($\eta^2 = .257$), but not in the direction predicted (Figure 3). The participants paid more attention to the messages that were low in audio complexity ($M = 72.537$, S.E. =

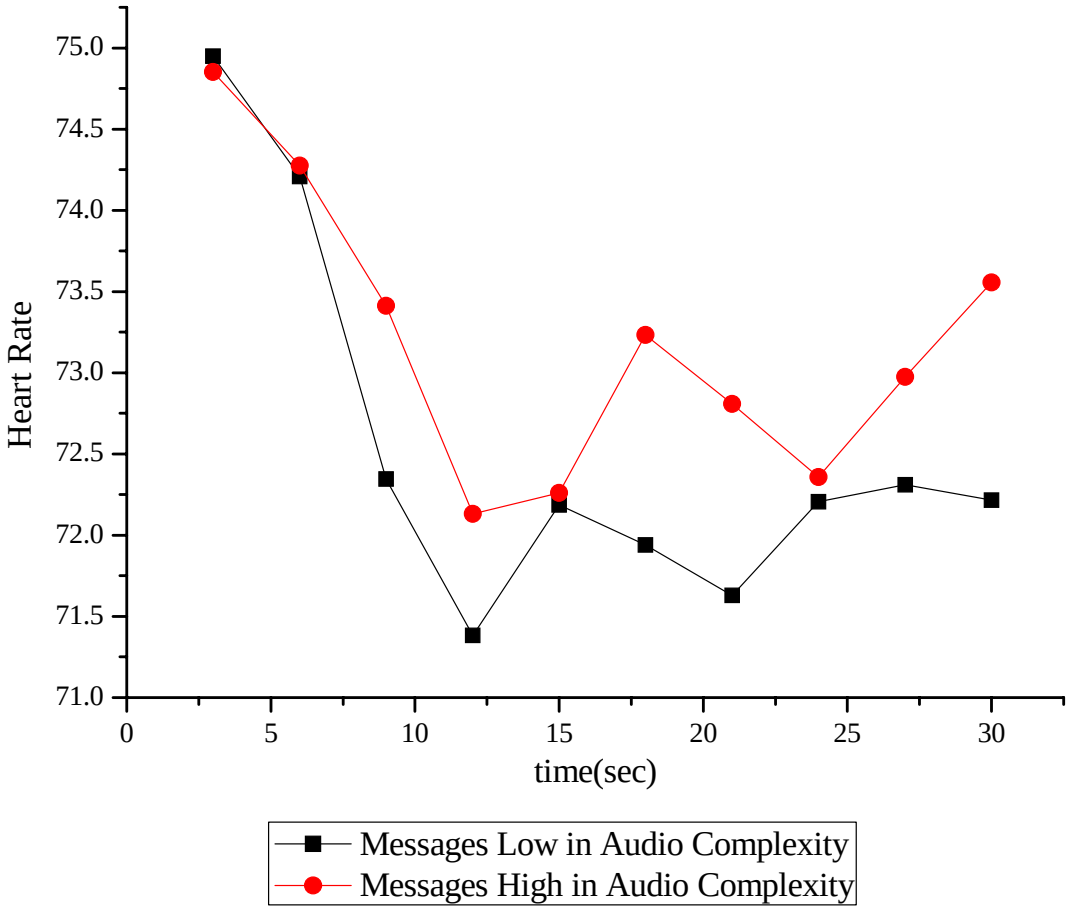
1.281) than to the messages that were high in audio complexity (M = 73.187, S.E. = 1.302). This was indicated by slower HR for the less complex messages.

Figure 3. Effect of Audio Complexity on HR (Attention).



HR was also analyzed over time to see how different levels of audio complexity affected responses during the messages. Results demonstrated that there was a significant Audio Complexity by Time interaction, $F(9, 522) = 7.244$, $p < .001$ ($\eta^2 = .111$). Both message categories elicited initial orienting responses followed by a gradual return to the baseline. However, the messages low in audio complexity showed greater HR deceleration and slower return than the messages high in audio complexity. As shown in Figure 4, the messages low in audio complexity elicited greater attention after message onset and lower overall HR than the messages high in audio complexity.

Figure 4. Audio Complexity by Time Interaction on HR (Attention).



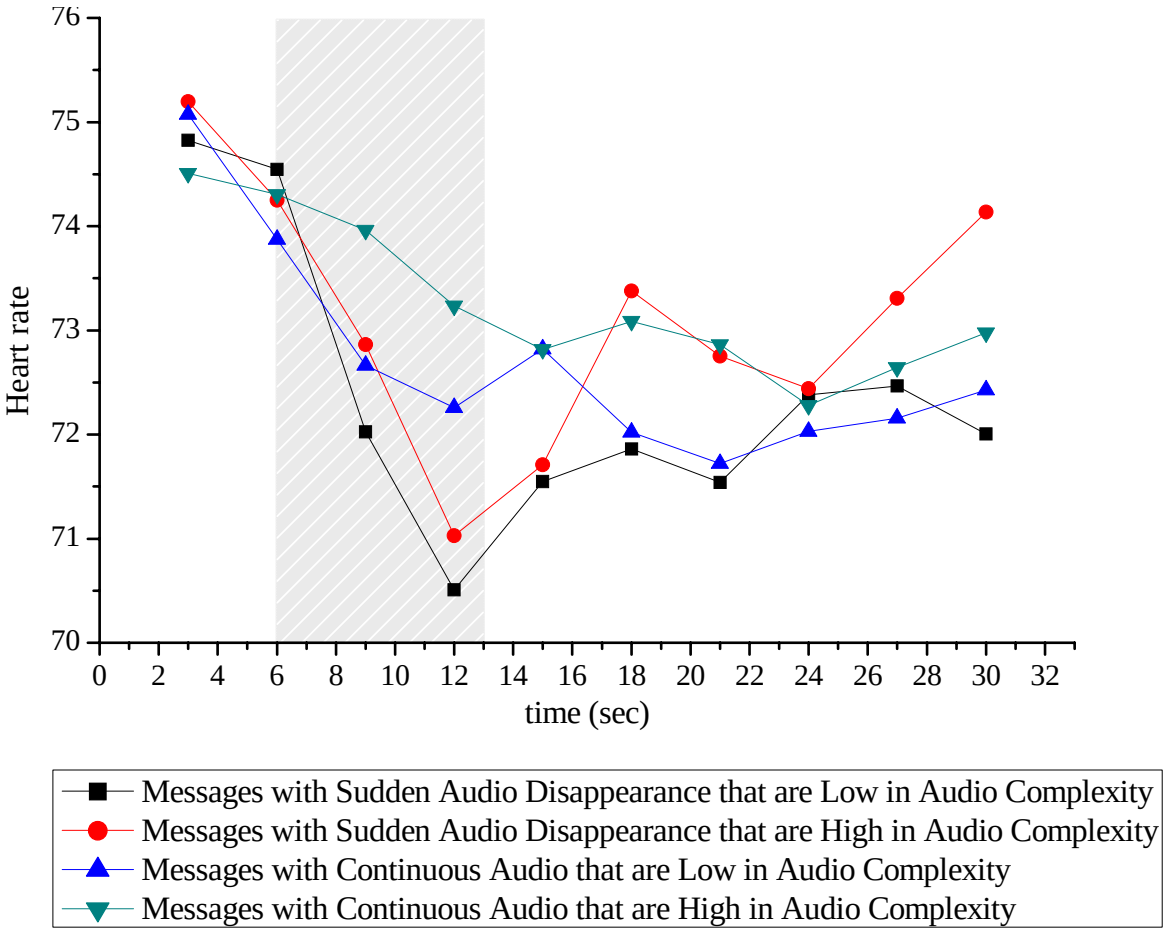
In addition to the HR data, a repeated measures ANOVA was performed on the participants' self-reported attention. Results showed no main effect of Audio Complexity on self-reported attention ($F<1$). This indicates that the participants did not report paying greater attention to the messages that were high on audio complexity compared to the low complexity messages.

Hypothesis 3

The third hypothesis predicted an interaction between Audio Condition and Audio Complexity such that, messages with sudden audio disappearance that were high in audio complexity would elicit greatest attention followed by either messages with sudden audio disappearance that were low in audio complexity or messages with continuous audio that were high in audio complexity and they would be followed by messages with continuous

audio that were low in audio complexity. A repeated measures ANOVA was performed on the HR data. The interaction Audio Condition by Audio Complexity was not significant ($F < 1$). There was, however, a significant Audio Condition by Audio Complexity by Time interaction, $F(9, 522) = 3.486$, $p < .001$ ($\eta^2 = .057$), which is shown in Figure 5 (grey area represents time with no audio). The results suggest that even though sudden audio disappearance led to short-term (phasic) attention (indicated by a sudden HR deceleration), it did not contribute to long-term changes in attention. An immediate HR deceleration was followed by significant decreases in attention level (indicated by increase in HR), especially in case of the messages that were high in audio complexity. Messages with less complex audio, on the other hand, resulted in greater overall attention.

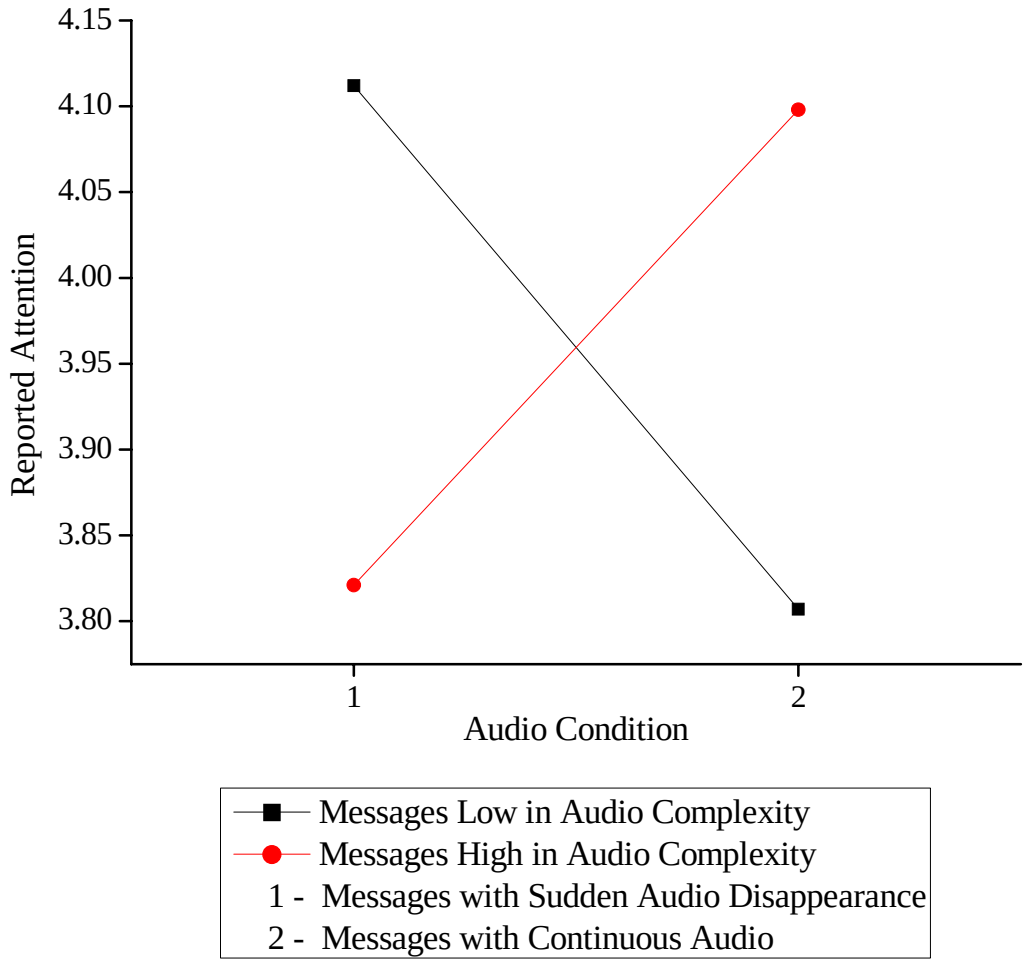
Figure 5. Audio Condition by Audio Complexity by Time Interaction.



In addition to the HR data, a repeated measures ANOVA was performed on the

participants' self-reported attention. Results showed that Audio Condition by Audio Complexity interaction was significant, $F(1, 56) = 11.557$, $p < .01$ ($\eta^2 = .171$) but not in the direction predicted (Figure 6). The participants reported paying less attention to the messages with sudden audio disappearance that were high in audio complexity than to the messages with sudden audio disappearance that were low in audio complexity. They paid more attention, on the other hand, to the messages with continuous audio that were high in audio complexity than to the less complex ones.

Figure 6. Audio Condition by Audio Complexity Interaction on Self-reported Attention.

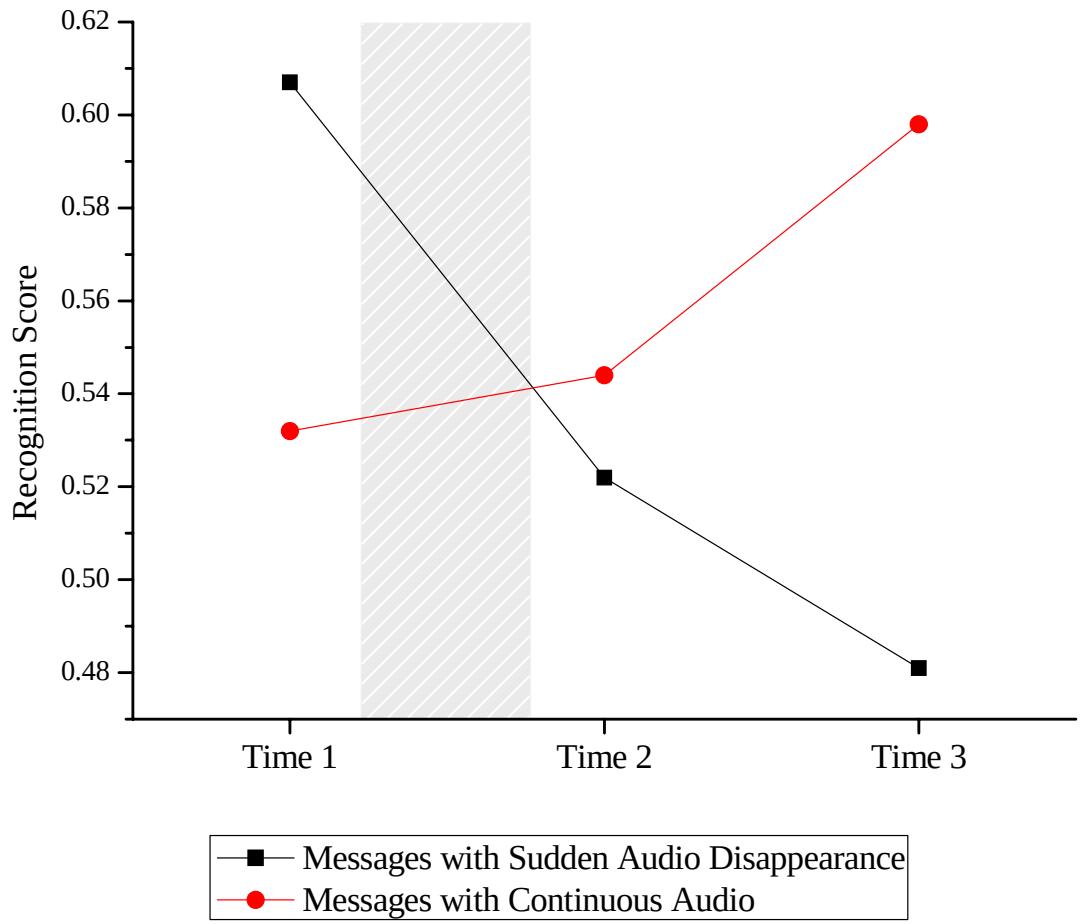


Research Question

The second research question asked whether sudden audio disappearance affected recognition of the message content. A repeated measures ANOVA was performed on the data

obtained by the recognition test. According to the results, there was no main effect of Audio Condition on the participants' recognition scores, $F(1, 58) = 1.899$, $p = .173$ ($\eta^2 = .032$). There was, however, a significant Audio Condition by Time interaction, $F(2, 116) = 17.808$, $p < .001$ ($\eta^2 = .235$), which is shown in Figure 7. Further analysis showed that the impact of audio condition was linear, $F_{Contrast}(1, 58) = 38.914$, $p < .001$ ($\eta^2 = .402$). As mentioned above, three questions were formulated to test recognition of specific information presented in the audio track of each message. These three questions represented three different time points. Time 1, Time 2, and Time 3 correspond to recognition of early, middle, and late information accordingly. The results demonstrated that recognition memory changed differently for the two audio conditions. As shown in Figure 7 (grey area represents period with no audio), recognition memory decreased after the audio suddenly disappeared. Further, memory did not recover later. The results demonstrated opposite pattern for the messages with continuous audio. Unlike in the messages with sudden audio disappearance, recognition scores increased steadily for the messages with continuous audio. This indicates that sudden audio disappearance had a negative impact on encoding of the message information.

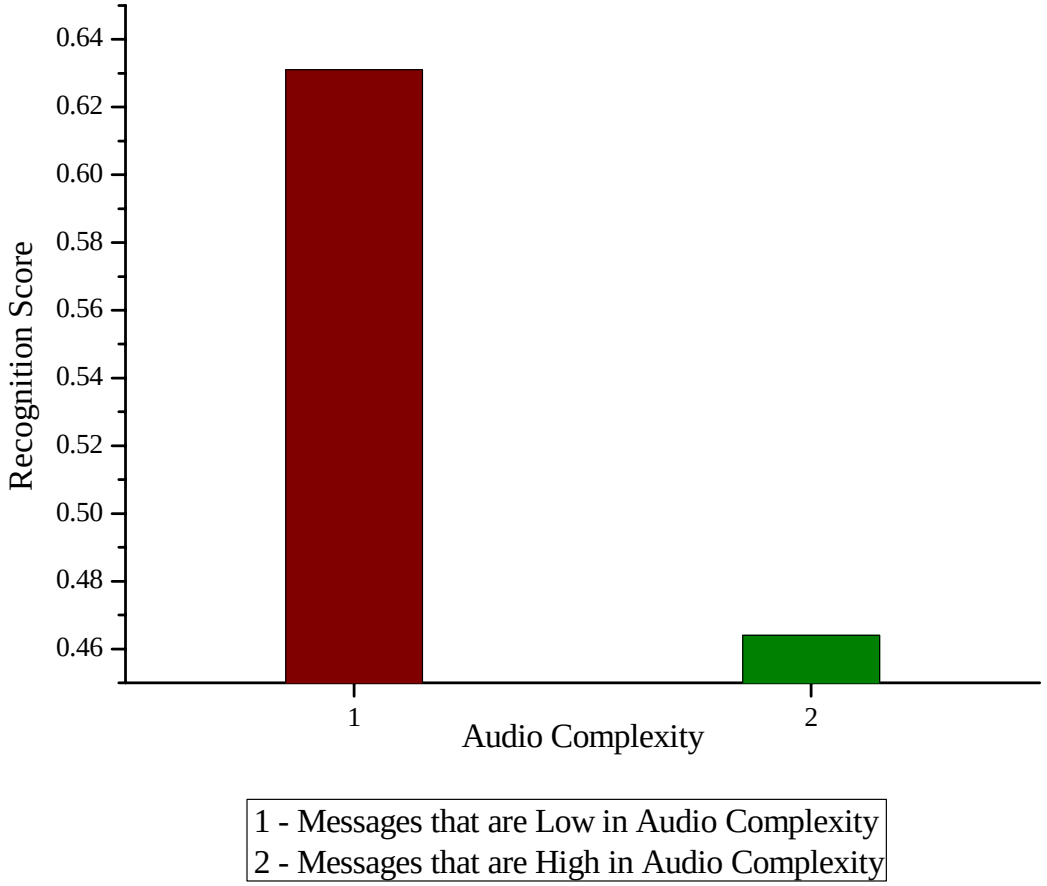
Figure 7. Effect of Audio Condition by Time Interaction on Message Recognition.



Hypothesis 4

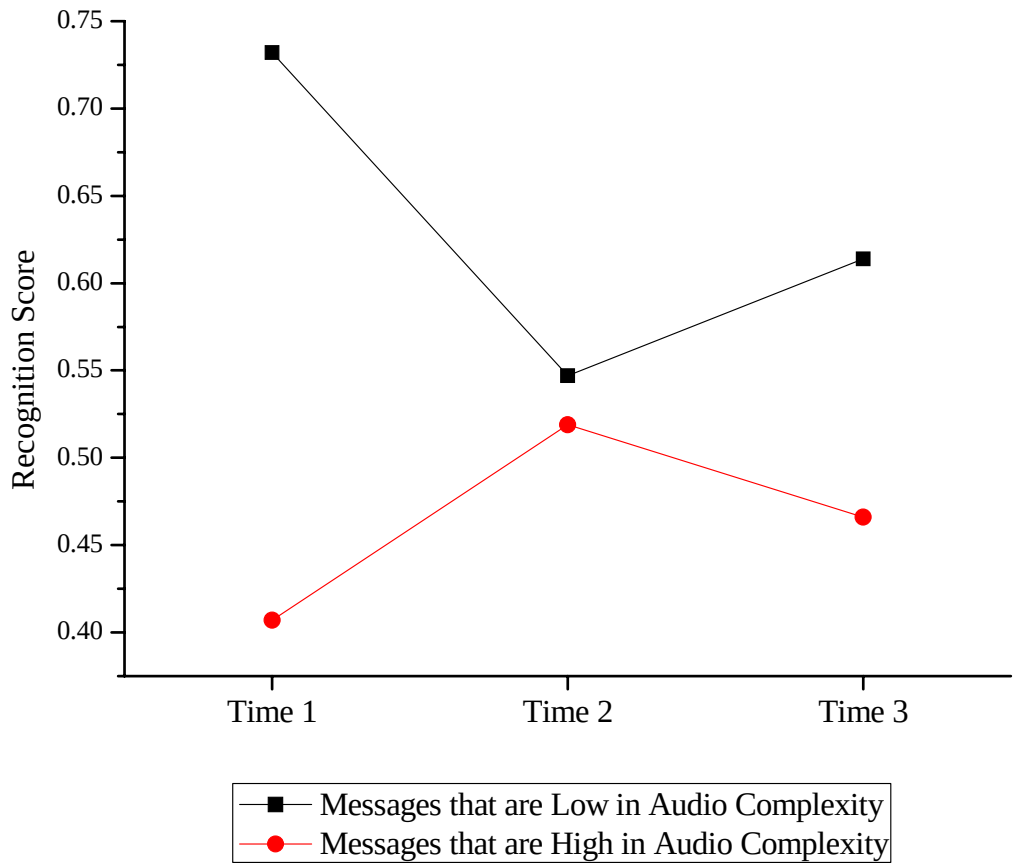
The fourth hypothesis predicted that Audio Complexity would have an effect on message recognition such that messages that were high in audio complexity would be remembered better than messages that were low in audio complexity. A repeated measures ANOVA was performed on the recognition data. The results revealed that there was main effect of Audio Complexity on recognition, F (1, 58) = 108.343, p < .001, (η^2 = .651), but not in the direction predicted (Figure 8). The participants scored higher for the messages that were low in audio complexity (M = .631, S.E. = .020) than for the messages that were high in audio complexity (M = .464, S.E. = .015). Further analysis showed that the impact of audio complexity was quadratic, $F_{Contrast}$ (1, 58) = 38.882, p < .001 (η^2 = .401).

Figure 8. Effect of Audio Complexity on Message Recognition.



Audio Complexity by Time interaction was also significant, $F(2, 116) = 33.232$, $p < .001$ ($\eta^2 = .364$) which is shown in Figure 9. This means that recognition scores for the three time points differed significantly for the messages high in audio complexity and for the messages low in audio complexity. Results showed that for the messages that were low in audio complexity recognition scores decreased from Time 1 to Time 2 but then slightly increased at Time 3. Hence, recognition memory was the greatest at the beginning of the messages. The respondents scored the worst for the questions related to the middle parts of the messages contents. The results were different for the messages that were high in audio complexity. Recognition scores increased from Time 1 to Time 2 but then slightly decreased at Time 3. The participants scored the highest recognizing the information from the middle parts of the messages.

Figure 9. Effect of Audio Complexity by Time Interaction on Message Recognition.



Hypotheses 5 and 6

The fifth hypothesis predicted an interaction between Audio Condition and Novelty Seeking such that, compared to low novelty seekers, high novelty seekers would pay greater attention to the messages with sudden audio disappearance. Results demonstrated that Audio Condition by Novelty Seeking interaction was not significant ($F<1$). Furthermore, the three way interaction of Audio Condition by Novelty Seeking by Time was not significant, $F(9, 513) = 1.176$, $p = .308$ ($\eta^2 = .171$). Hence, hypothesis 5 was not supported.

The sixth hypothesis predicted an interaction between Audio Complexity and Novelty Seeking such that high novelty seekers would pay greater attention to the messages that were high in audio complexity, compared to low novelty seekers. This hypothesis was not supported. The Audio Complexity by Novelty Seeking interaction was not significant ($F<1$).

The three way interaction including Time was not significant either ($F<1$). Thus, there was no significant difference between low and high novelty seekers in their reaction to the messages with different levels of audio complexity.

CHAPTER FOUR

DISCUSSION

Using LC3MP (Lang, 2000), this study examined how structural audio features of the audiovisual stimuli affect viewers' attention and memory recognition. The model suggests that characteristics of the message and the receiver determine which parts of the information are selected and how well the processes of encoding, storage, and retrieval are completed. Not always do viewers intentionally select information for processing. At times, such selection is elicited by the structural features of the message rather than being consciously controlled by the viewer. This study examined how sudden audio disappearance and different levels of audio complexity affected viewers' attention and message recognition. Also, novelty seeking was taken into consideration to see whether sudden audio disappearance and audio complexity affected high and low novelty seekers differently.

This study has demonstrated that sudden audio disappearance and audio complexity play an important role in the process of message reception and processing. This study found that sudden audio disappearance elicited greater attention than continuous audio which was indicated by slower HR. Analyses of the HR data over time demonstrated that sudden audio disappearance elicited ORs from the viewers. Even though viewing of the messages of both audio conditions was associated with the HR deceleration over time, sudden audio disappearance resulted in greater decrease in HR. After the initial OR, the subjects' HR dropped rapidly right after the audio suddenly disappeared. After the audio returned, HR increased indicating some loss of attention. Messages with continuous audio, on the other hand, showed a different pattern. Viewing of the messages with continuous audio was related to the gradual HR deceleration, i.e. attention increased over time.

The results of the study demonstrated that sudden audio disappearance did elicit ORs. However, the fact that the viewers started paying greater attention to the messages after the

audio disappeared did not result in better recognition of the messages. Surprisingly, the participants recognized information presented early in the messages much better than middle and late information. They did the worst recognizing information from the last parts of the messages. It is possible that sudden audio disappearance attracted viewers' attention to the unexpected silence but distracted them from processing of the message content. Recognition of the messages with continuous audio, on the other hand, improved as messages unfolded. Information presented early in the messages was poorly recognized by the participants and information presented late in the messages was recognized the best. These results are consistent with previous studies that have demonstrated that increased attention is associated with better message recognition (e.g., Potter & Callison, 2000). In addition, it is possible, that, as the message unfolds, it starts making more sense to the viewers since they receive more information related to the main point of the message.

Results of the study revealed that the participants recognized early information presented in the messages with sudden audio disappearance better than early information presented in the messages with continuous audio. One possible explanation may be due to the fact that disappearance of the audio was so unexpected for the viewers that they had to access recently stored information in an attempt to find logical explanation for what happened to the audio. Thus, they accessed what was encoded prior to the audio disappearance; in other words, they rehearsed the information retrieval. This might have strengthened their ability to recognize the early information because it became mentally more vivid and accessible. Since the audio did not disappear in the messages with continuous audio, the viewers did not need to access information right after it was stored. As a result, information presented early in the messages with continuous audio was recognized less successfully than early information from the messages with sudden audio disappearance.

In this study, attention was also measured using a self-report measure to examine whether sudden audio disappearance and audio complexity made the viewers realize that their attention was affected by these two auditory features. The viewers did not report paying greater attention to the messages with sudden audio disappearance than to the messages with continuous audio. Moreover, the participants scored equally recognizing messages of both types. There may be a couple of explanations for these results. First, it is possible that the viewers did not report that the two audio conditions had different effects on their attention because of the shortness of the audio disappearance. In the future, duration of the silence gap needs to be taken into consideration. Another explanation for these findings may be the participants' possible willingness to be consistent with what they thought was expected from them – that is to be attentive to the messages. It is possible that they just did not want to admit paying less attention to any of the messages. Therefore, in the future, the question concerning attention paid to the messages should be rephrased. The participants need to indicate whether audio disappearance made them pay greater attention to the messages or whether it distracted them from the messages' contents.

It was predicted that the constant calls for orienting caused by the messages that were high in audio complexity would result in greater attention to them compared to less complex messages. Therefore, less cardiac activity during the messages with high audio complexity compared to the less complex ones would indicate increased attention. Even though the self-reported data did not reveal that different levels of audio complexity had an effect on the participants' self-reported attention, HR data did show significant difference. However, contrary to the prediction, the results demonstrated that the viewers' attention was significantly greater during the messages low in audio complexity. Thus, the data did not indicate increased attention to the messages that were high in audio complexity. This may be explained by the fact that even though the audio is the prime focus of the study, the video

portions of the messages should not be disregarded. It is likely that the messages that were high in audio complexity were also high in video complexity compared to the less complex messages. Therefore, it is possible that it caused the viewers to engage in greater levels of mental imagery which, according to previous studies, could have resulted in increased cardiac activity (A. Lang, 1994; Bolls, 2002). The messages used in this study were not pretested for their level of imagery. Therefore, HR results may be confounded. Future research should take mental imagery generation into consideration.

The results of this study contradict previous findings that suggested that messages that were high in audio complexity would be remembered better than messages that were low in audio complexity. The results of the study revealed the opposite. Less complex messages were remembered much better than more complex ones. This can be explained by the fact that, according to the HR data, the participants paid significantly greater attention to the messages that had less complex audio. When HR data were analyzed over time to see how different levels of audio complexity affected responses during the messages, the results demonstrated significant changes in attention. According to the results, the participants' attention was increasing during first halves of the messages, both low and high in audio complexity. It is possible, however, that the participants got bored by the middle of the less complex messages, which decreased their abilities to recognize the information later on. Then they regained their interest towards the end and, as a result, their recognition scores increased. The participants lost their attention during the second portions of the messages that were high in audio complexity. These results suggest that less complex messages are more manageable for the viewers and it is much easier for them to hold their attention during the viewing. The viewers remembered second parts of the messages that were high in audio complexity better than first and third parts. Prior research proposes a possible explanation for these findings. Previous studies suggested that increased production pacing, for example,

increases viewers' level of cognitive effort to a message, at least up to a point (Lang, Chung, et al., 2002). This increase in cognitive effort disappears with further increase in production pacing because cognitive overload occurs (Lang et al., 1999; Lang et al., 2002). This may explain why the participants' recognition scores increased from Time 1 to Time 2 and then decreased at Time 3. Present study used only messages that were very low and very high in audio complexity and did not include messages that were medium in their audio complexity level. In the future, more research is necessary to address this limitation. It is possible that messages that are medium in audio complexity will elicit greater attention than messages that are low in audio complexity and than messages that are highly complex.

Analysis of the self-reported data demonstrated significant audio condition by audio complexity interaction. Sudden audio disappearance in the messages that were high in audio complexity elicited less attention compared to sudden audio disappearance in messages that were low in audio complexity. It is possible that sudden audio disappearance in the highly complex messages made the participants feel frustrated or annoyed and it reflected on their reported attention. Emotions were not considered in this study, however. A number of researchers have demonstrated that emotions have an important effect on attention and memory (e.g., Lang & Friestad, 1993; Newhagen & Reeves, 1995; Christianson, Goodman, & Loftus, 1992; Yuille & Tollestrup, 1992). Therefore, future research should examine how sudden audio disappearance and different levels of audio complexity influence viewers' emotions and how these emotions, in turn, affect attention.

Analysis of the audio condition by audio complexity interaction over time revealed that sudden audio disappearance is associated with short-term or phasic attention. Sudden audio disappearance attracts viewers' attention momentarily but is not able to hold it over time. Audio complexity, on the other hand, relates more to long-term or tonic attention.

The study suggests an interesting theoretical implication. Additionally to LC3MP (Lang, 2000), this study employed uses and gratifications theory to investigate whether novelty seeking personality trait plays role in information processing. Uses and gratifications research focuses on personal characteristics that determine media use motivations. LC3MP, in turn, suggests that personal characteristics define which parts of the information in a message are selected and how well the subprocesses of encoding, storage, and retrieval are accomplished. Therefore, both theories emphasize the importance of personal characteristics and could be used together. Incorporation of uses and gratifications theory into LC3MP can potentially expand the model.

This study did not find evidence for the predictions concerning high and low novelty seekers. There are several possible explanations for these results. First, this could be due to the low internal reliability of the Novelty Subscale of the Arnett Inventory of Sensation Seeking (Arnett, 1994). The results of this study suggest that some items (e.g., I don't like extremely hot and spicy foods) of the subscale are highly inaccurate indicators of what they attempt to measure. Previous studies have also found low internal consistencies of AISS and its subscales (e.g., Roth, 2003; Andrew & Cronin, 1997). Therefore, it is necessary to develop a valid and reliable novelty seeking scale in the future. Second, it is possible that high sensation seekers seek novelty experiences in situations when they have control of them. Laboratory environment limits an individual's ability to make choices. Therefore, lack of autonomy might have subdued novelty seeking effect on attention. Finally, it is possible that high sensation seekers focus on audio and video portions of the stimuli unequally. If they are more concentrated on the video, changes in the audio may not be as noticeable and effective as changes in the video. Future research should investigate the extent to which high and low novelty seekers focus on the different audio and video characteristics of the messages.

Another limitation of the study is the use of undergraduate students for the

experiments, who are not representative of the general population. Future studies should increase external validity of the experiment by using more heterogeneous sample. It is worth another mentioning that to expand external validity of the results future studies should use wider variety of messages and include stimuli that are low, medium, and high in audio complexity. Also, questions used for the recognition test were not pretested for their difficulty level. This possibly confounded the results concerning recognition memory. In the future, recognition questions need to be pretest for their difficulty level.

This study suggests interesting practical implications for its findings. Producers of media messages need to be aware of the effects that different structural features have on viewers' attention and memory. As the results have demonstrated, for example, that messages that are high in audio complexity do not attract viewers' attention and are not recognized well. Other structural features, such as sudden audio disappearance, for example, are related to a significant increase in attention but result in worsening of message recognition.

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APPENDIX 1

NOVELTY SEEKING SCALE

1. I can see how it would be interesting to marry someone from a foreign country.
2. If I have to wait in a long line, I'm usually patient about it.
3. When taking a trip, I think it is best to make as few plans as possible and just take it as it comes.
4. I think it is fun and exciting to perform or speak before a group.
5. I would like to travel places that are strange and far away.
6. I would have enjoyed being one of the first explorers of an unknown land.
7. I don't like extremely hot and spicy foods.
8. I often like to have the radio or TV on while I'm doing something else, such as reading or cleaning up.
9. I think it's best to order something familiar when eating in a restaurant.
10. If it were possible to visit another planet or the moon for free, I would be among the first in line to sign up.

APPENDIX 2

RECOGNITION TEST QUESTIONS

Message 1

1. I was actually sitting right here when I got the call. I was so _____.
   - surprised
   - glad
   - shocked
   - unhappy

2. That's when I called Aladdin Bail Bonds. The minute I made the call _____.
   - I felt better
   - they were able to help me
   - I felt relieved
   - they explained the procedure

3. They got my son out, and they got _____.
   - him through it
   - him a job
   - me through it
   - us through it

Message 2

1. You can work in a beautiful stress-free setting as a _____.
   - dental assistant
   - massage therapist
   - pharmacist
   - chef

2. You can make a good living by helping people_____.
   - relax and rejuvenate
   - make their lives better
   - enjoy their vacations
   - when they need you

3. To learn more call Apollo College now for _____.
   - free information
   - this video or DVD
   - a free DVD
   - more information

Message 3

1. Another good thing about Geico is that they've got _____ working there 24/7.
   - professionals
   - best specialists
   - real live people
   - support people

2. You want an English Muffin they literally _____ with butter and jam.

- give it to you
- toast it for you
- smear it
- hand you a toasted muffin

3. That's a complete _____, of course, but you get my point.

- dramatization
- joke
- staging
- improvisation

Message 4

1. There are a lot of great causes and, frankly, they deserve_____.

- your support
- our help
- your involvement
- your time

2. We have a great cause too: helping people _____.

- realize their goals
- make the world a better place to live
- become self sufficient
- improve their lives

3. But to support our cause you have to make a real sacrifice, you have to be willing to_____.

- shop
- help
- work
- spend

Message 5

1. Emily's cut was so small. I thought _____ it was enough.

- wiping
- putting a band-aid on
- washing
- rinsing

2. Neosporin kills more types of infectious bacteria than even the leading prescription. And it helps cuts heal _____ days faster.

- three
- four
- five
- six

3. Nothing protects better against _____. Neosporin.

- serious infection
- serious bacteria
- viruses
- bad bacteria

Message 6

1. Hey, you are me. _____ years ago.
   - five
   - ten
   - fifteen
   - twenty

2. These don't make me look fat? Are you _____?
   - crazy
   - kidding
   - foolish
   - joking

3. Introducing Slimage. The weight lost supplement that's clinically proven to boost your metabolism to levels from your _____.
   - twenties
   - youth
   - teenage years
   - adolescents

Message 7

1. – 6 am, man!
   – Yeah, yeah.
   – I'll start with _____.
   - mozzarella sticks
   - spicy southwest breakfast burrito
   - eggs with bacon
   - breakfast special

2. – It's 6 o'clock in the morning.
– Oh, yeah, I hear you. It's early. Let me get a _____.
   - cheeseburger and 4 large tots
   - eggs with bacon
   - turkey sandwich and diet coke
   - corn dog and 4 butter finger blasts

3. Get up and add them this morning with Sonic Spicy Southwest Breakfast Burrito. Grab one any time because Sonic offers _____.
   - a full menu all day
   - breakfast all day
   - spice all day long
   - delicious burritos all day

Message 8

1. - Where are my fries?
   - What do you mean?
   - onions
   - pickles
   - fries
   - mini-burgers

2. And you've got ketchup on your _____.
   - face
   - mouth
   - cheeks
   - lips

3. The perfect crime. You're filthy sons of …Oh my God! _____!
   - Sherlock Holmes
   - Gary Sinise
   - David Caruso
   - Gill Grissom

Message 9

1. Hey, thanks for stopping by. You know I've followed _____ since the first episode. I'm a big fan. Big fan.
   - this show
   - your story
   - your character
   - this series

2. Very _____ content. Too _____ for the kids. So, I'll have to block you.
   - adult … adult
   - adult … unfit
   - negative … adult
   - mature … dangerous

3. - Oh, man
   - Yeah, well, _____.
   - I'll block you
   - Goodbye!
   - have a good one!
   - take care!

Message 10

1. You have that training back there to do two things you've never done before. At least not the same time. You shook my hand and then you looked me square in the eye. _____
   - Where did that come from?
   - How did you learn that?
   - Who taught you that?

- You're a real man now!

2. Call 1-888-349-ARMY now for a free DVD and learn about the _____ and other benefits that come from serving as a soldier in the US Army.
- US Army training
- training, education
- future opportunities
- education, life insurance

3. You'll also get a free _____. Are you ready to answer the call?
- backpack
- uniform
- booney hat
- brochure

Message 11
1. This February the most electrifying games. The _____ players.
- most unstoppable
- most thrilling
- greatest
- best

2. Direct TV presents the 2007 _____.
- Championship Gaming Invitational
- Gaming Championship
- Gaming Competition
- Challenge Gaming Invitational

3. Coming February 10th and 11th. Exclusively on _____ and only on DirectTV.
- 101
- 121
- 102
- 111

Message 12
1. Little kids would love to go to school. So how about a day at the Fun To Learn _____?
- preschool center
- kid center
- preschool station
- station

2. There are letters to learn, numbers to count, _____ to create, and shapes to discover.
- music
- figures
- riddles
- masterpieces

3. The Fun To Learn preschool center. Now they love school _____.

- even before they get there
- and can't wait to start it
- and are excited to learn
- and become smarter every day

Message 13

1. The Golf channel. _____ nights. Their dream is to play on the LPGA tour.

- Monday
- Tuesday
- Wednesday
- Thursday

2. If you're not watching The Big Break _____ Hawaii, what're you waiting for?

- IV
- V
- VI
- VII

3. The Big Break V Hawaii. On _____.

- ESPN
- the Golf Channel
- DirecTV
- the Travel Channel

Message 14

1. So this truck driver came into H&R Block and he said, 'Don't forget I can deduct _____.'

- my Union dues
- truck loading and unloading fees
- my loan books
- motel bills

2. He looked at me and he said. You do this for all _____?

- truck drivers
- your clients
- your customers
- professions

3. The maximum _____ guaranteed or your return is free. H&R Block.

- satisfaction
- refund
- tax return
- reimbursement

Message 15

1. Nobody has all the answers. But after bathing about a _____ babies we know there's more to it than soap and water.

- hundred
- thousand
- million
- billion

2. Introducing Johnson's Moisture _____.
- Shower Gel
- Soap
- Shampoo
- Care Wash

3. New Johnson's Moisture Care Wash. This _____ right
- is
- feels
- must be
- sounds

Message 16

1. The 2007 Lincoln MKZ with a powerful 3,5 liter engine and available in all-wheel drive.
- 3
- 3.5
- 4
- 4.5

2. It'll take you _____.
- for the ride of your dreams
- to the places you've always dreamed about
- for the ride of your life
- to the exciting places

3. Life's going_____?
- How about you?
- Where to next?
- Are you?
- Are you with it?

Message 17

1. This Mother's day do something special for Mom. Like doing the dishes. Or _____ the house.
- cleaning
- straighten up
- washing
- vacuuming

2. And give her a call after you strangle Monk. Then join her for _____ episodes of Monk in a raw.
- 10
- 11

- 12
- 13

3. The Monk Mother's Day Marathon. Starting _____ on USA characters welcome.
- Saturday at noon
- Saturday at one
- Sunday at noon
- Sunday at one

Message 18
1. Tuesday when Wynonna Judd and Cowboy Troy host an all new Nashville Star. It's original song night and only _____ contestants remain.
- three
- four
- five
- six

2. Plus Wynonna takes it to the stage and shows to them how _____.
- it's done
- to sing
- to perform
- it should be done

3. Tuesday at 10. only on USA. Characters welcome. Presented in part by _____.
- Chevrolet
- Chrysler
- Nissan
- GMC

Message 19
1. Head aches? Dizzy spells? Doubts of _____?
- abnormality
- irregularity
- inconsistency
- vagueness

2. Don't wait till _____. Get help of the professionals at Rent-A-Center.
- everything stops working
- you lose your mind
- you get to the end of your road
- it's too late

3. Rent-A-Center. We make it easy to _____.
- make it your own
- make you happy
- make you fully equipped
- become the owner

Message 20

1. This is Don. And this is Dan. Both love _____.
   - computer games
   - Xbox 3
   - handheld video games
   - Playstation

2. While Dan has fun learning math, vocabulary, and more and the incredible graphics of this VSmile Pocket, Don enjoys _____.
   - destroying monsters
   - crashing cars into walls
   - shooting aliens
   - wrecking cars

3. Vsmile Pocket. Turn game time into _____ time.
   - smart
   - learn
   - brain
   - useful