MEDIUM-RELATED DIFFERENCES IN COGNITIVE RESPONSE: A COMPARISON OF RADIO AND TELEVISION

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This thesis explores differences in cognitive and affective responses due to medium-related characteristics. A between-group experiment was conducted, in which 82 students were exposed to two messages equal in content but different in format, produced for television and radio, respectively. A thought-listing protocol and a questionnaire were used to measure the participants' cognitive elaboration, operationalized as thoughts indicating the activation of stored knowledge beyond the information in the stimulus, emotional reactions to the stimulus, and the perceived likelihood of the event described in the message. It was hypothesized that deeper cognitive elaboration would occur with the radio message. However, some of the findings point to the contrary: the television group reported more thoughts that suggest deeper elaboration, while the radio group listed more thoughts indicating a peripheral processing route. In terms of affective responses and the perceived likelihood of the event described, the study found no significant differences due to medium characteristics.

Approved

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Chapter 1: Introduction

Surveys consistently show that in the United States the preferred medium for information and entertainment is television. It is also a baby-sitter for many children, an educator and "the common storyteller of our age" (Gerbner, Gross, Morgan & Signorelli, 2002, p. 44). On average, people watch television four hours every day (Severin & Tankard, 2001). The American Academy of Pediatrics (2001) cites data from Nielsen Media Research suggesting that even children and adolescents watch television for almost three hours daily and warns that this does not include the time spent with videotapes and video games; adding this time gives an average of six and a half hours that young people spend every day with various visual media. Other data show that about half a million children between the ages of 2 and 11 watch every minute of network television news (Harris, 1999).

The preference for television for a diversity of uses and gratifications (Severin & Tankard, 2001), from the most consciously active, to the most passive, mind-numbing, is a symptom of our image-obsessed world. So much is our perception of the world dependent on the visual sense, that languages themselves have crystallized this belief in expressions like *seeing is believing* and *to see* for *to understand*. Slembek notes that "the eye not only dominates hearing, but also all of our senses" (1988, p. 147), as advertising prompts us to visually experience even taste, smelling and touch. She also contends that hearing has an extremely important social role in interpersonal communication that has diminished in a world overloaded with visual stimuli. This

visual bias is noticeable even in the area of communication research, which has focused much more on the visual media, particularly television, than on the "invisible" medium of radio.

If all media construct reality rather than objectively mirroring it, then it is important to ask which of them leaves more room for the receivers to contribute with their own baggage of representations, ideas and beliefs. And if the media have replaced the "primary sources," (Gerbner et al., 2002, p. 44) responsible with the socialization of children through storytelling, which medium is able to perform this role in a more beneficial way?

This thesis looks into the differences in mental responses to media messages due not to their content but to medium characteristics. The formal production characteristics of a message might be at least as important as its content in triggering and guiding certain cognitive processes. While contents vary and are often selectively consumed or rejected, medium characteristics tend to be repetitive and may affect our ways of perception and thinking in insidious ways.

Therefore, this research has been designed with the intent of providing insight into the influences of medium-related characteristics on the way individuals process news messages. For this purpose, the two broadcast media, radio and television, have been compared through an experiment: two groups of people have been exposed to the same message in two versions, each tailored specifically for one of the two media, and then their cognitive and affective responses have been measured.

Chapter 2: Literature Review

Information Processing Models: Key Concepts

The cognitive approach in media reception research attempts to understand how people select, process and remember information. Media messages present the challenge of an abundance of stimuli coming from multiple sources and addressing multiple sensory modes. Human beings have thus developed ways of coping with this overwhelming complexity. The main assumption of the information-processing approach to media reception is that the effects of the media on their audiences are due to an interaction between the two rather than to a powerful action of the former on the latter. Individuals are credited with playing an active and purposeful role in this relationship.

Information processing theories draw on research in cognitive psychology, which conceptualizes human memory as divided into long-term memory and short-term memory. Short-term memory is believed to contain a zone called "working memory," which comprises thoughts that are active in a given moment (Wicks, 2001). The assimilation of new information is a top-down process "in which interpretation of information is based upon prior experience and knowledge" (Wicks, 2001, p. 108). The information provided by sensory stimuli enters the working memory where it is sorted out, interpreted and classified in order to be integrated in the existing structures of the long-term memory.

Several models based on a representation of memory as an associative network try to explain how people organize information and create meaning: *the propositional-representations* model (Kieras, 1978), the *search of associative memory* (Raaijmakers & Shiffrin, 1981) and *the spreading activation theory* (Collins & Loftus, 1975). All of these models see memory as a network of nodes connected by links, where the nodes represent concepts and the links represent the relations between them (Kieras, 1978) or as a "richly interconnected network, with numerous levels, stratifications, categories, and trees, containing varieties of relationships, schemata, frames, and associations" (Raaijmaker & Shiffrin, 1981, p.208). New information is able to activate existing structures, and this activation spreads to related information nodes through associative pathways (Miller & Marks, 1997). Items from long term memory can thus be recalled into the working memory and used to give context to the new piece of information and make sense of it (Wicks, 2001).

One such knowledge structure that provides an orienting configuration for incoming information is the schema. Schemas have been defined as "collections of organized knowledge or frameworks" (Wicks, 2001, p.19), which act as bridges between the new and the stored information. A schema consists of general knowledge that has been abstracted from prior experiences, either personal or vicarious (Graber, 1984), and is subsequently used to "guide the processing of specific information" (Wicks, 1992, p. 117). Schemas exist for concepts, situations, people or events; event schemas are called scripts (Smith, Houston, & Childers, 1984).

Confronted with the communication complexity of the contemporary world, individuals need to practice an efficient "cognitive economy" (Wicks, 1992, p.119) and research has demonstrated that the presence of schemas or scripts is able to facilitate cognitive processes such as comprehension, encoding, retention and retrieval (Wicks, 1992). Graber (1984) identifies four roles of schemas: they help determine what information will be attended to and stored, help evaluate the information and accommodate it with previous beliefs, make possible the inference of missing information and assist in problem solving.

In addition to identifying knowledge structures such as schemas, information processing theories describe concepts such as cognitive content and cognitive processes (Bryant & Rockwell, 1991). The content of the knowledge structures consists of thoughts, attitudes and feelings, while processes refer to ways in which the content is "acquired, acted upon and utilized" (Bryant & Rockwell, 1991, p.220). New information is interpreted and integrated in memory "in the context of existing knowledge, attitudes and beliefs" (Wicks, 2001, p.19).

Cognitive Elaboration

Several factors, such as the need to assimilate information selectively, the complexity of the message and certain features of the communication environment, influence the degree in which information in working memory is elaborated upon and integrated with previous knowledge structures. Information can be processed at

different levels of cognitive elaboration, defined by McInnis and Price (1987) as “the extent to which information in working memory is integrated with prior knowledge structures” (p.475) and by Atwood (1989) as “the active relating of target information to concepts, events and other information already stored in memory” (p. 589). Low levels of elaboration produce only a stimulus recognition response, while high levels determine the activation of stored information “beyond what is provided by the stimulus” (Babin & Burns, 1998, p. 266).

Cognitive elaboration is believed to work in two modes, visual and verbal (Smith et al., 1984). Paivio’s *dual-coding theory* (1986) posits that visual stimuli activate both a visual and a verbal encoding process, while studies in advertising provide evidence that both verbal and non-verbal auditory cues are able to trigger mental visualization (Miller & Marks, 1992; Miller & Marks, 1997). The same is true for printed verbal content, to the extent that in the presence of high-imagery words, pictures have been found redundant in advertisements, because “internally generated visual imagery can substitute for externally provided pictures” (Unnava & Burnkrant, 1991, p.232).

Mental Imagery

Atwood (1989) suggests that processing information through the formation of mental imagery may be more effective than verbal processing because images have more numerous connections with other information in the memory, and so they may be

more directly and more frequently retrieved. Kieras (1978) had also explained the difference between semantic and perceptual representations as a result of the number and strength of connections between concepts: while semantic representations of verbal content have few such connections, perceptual representations have many, "reflecting the great many spatial relations that objects can have with each other" (p.536). Moreover, he asserted that elaboration of high-imagery verbal stimuli generates more "redundant connections" that link not only the concepts within the stimulus, but also link them with other previously stored information (p.550).

Therefore, processing information through mental imagery is believed to be a very effective way of assimilating media content, and it has recently received detailed attention, particularly in the field of advertising and consumer research. Atwood (1989) reviewed several definitions of mental imagery and concluded that all have in common "a conceptualization of mental images as mental experiences that resemble more or less closely an actual perceptual occurrence and that may take place even when the actual perceptual occurrence (the perception of sensory information) is not currently happening" (p.587).

Imagery has been shown to share the same resources and mechanisms with perception and to produce physiological effects that parallel perceptual processes (McInnis & Price, 1987). Forrester (2000) argues that "there are at least two meanings of the word perception: one being the reception of information through the senses, the other as *mental insight,* which include processes dependent on memories and

expectations" (p.14). One study has shown that listeners process high-imagery radio commercials by actually employing visual cognitive resources (Bolls, 2002). Using physiological measures such as cardiac acceleration, the study has concluded that "visual mental imagery engaged by radio advertisements is indeed visual all the way down to a biological level" (Bolls, 2002, p.558). The fact that imagery processing and visual perception share the same resources had been previously tested through Segal and Fusella's "dual-task experiment," described by Atwood (1989, p.590). This experiment found that imagery and perception processes interfere with each other when attempts are made to perform both simultaneously. Referring to this and other similar experiments, Kieras (1978) also concluded that "image formation can interfere with perceptual processing" (p.537), especially when they occur in the same sense modality.

Therefore, because "the imagery system represents our knowledge of the world in a form that is highly isomorphic with perceptual information" (Atwood, 1989, p. 588), mental imagery is a direct way of accessing stored experiences and drawing them from the long-term memory into the working memory. Thus, media messages that contain imagery cues are likely to generate more cognitive elaboration, allowing more connections to be made with existing knowledge and attitudes. This is particularly exploited in advertising, but mental imagery is also the process by which much of the information communicated through radio is processed. Sound effects and concrete words, two production features widely used in radio, have a strong impact on imagery responses (Miller & Marks, 1997). Wicks (2001) cites Hoijer (1989), who asserts that

television also elicits mental representations, which are "not photocopies" of the images on the screen "but rather interpretations and impressions that are the result of interaction with cognitive structures in memory" (p. 105). This is consistent with the view that mental images can be generated by any type of sensory cues and can manifest themselves in any of the sensory modes. People are able to imagine not only pictures, but also sounds, tastes, smells and tactile sensations (Atwood, 1989). For instance, analyzing the effect of imagery eliciting strategies in radio advertising from the perspective of the propositional-representations theory (Kieras, 1978), Miller and Marks (1997) propose that an auditory stimulus activates directly those propositional structures stored in memory that contain the auditory information, but this activation also spreads to related structures containing visual information "as well as information in other perceptual modes creating relatively large quantities of vivid multisensory imagery" (Miller & Marks, 1997, p.340).

Numerous studies in cognitive psychology and consumer behavior have provided evidence that mental imagery mediates the effects of the message on cognitive and affective responses. McInnis and Price (1987) have reviewed an important body of research that illustrates how imagery processing affects information recall, learning, probability assessment, intentions and purchase timing. Research in advertising has shown that imagery facilitates recall (Unnava, Agarwal, & Haugtvedt, 1996) and also influences ad-evoked feelings and attitudes (Bone & Ellen, 1991; Miller & Marks, 1992;

Miller & Marks, 1997) and behavioral intentions (Bone & Ellen, 1990; Bone & Ellen, 1992).

Miller and Marks (1997) argued that the propositional-representations model of information processing (Kieras, 1978) can be also used to account for affective responses. They showed that sound effects and concrete words in radio commercials activated memory nodes that contained perceptual information from past experiences, thus creating mental images; but this activation then spread to the associated emotion nodes, and consequently the valence (positive or negative) of the ad-evoked feelings was similar to the valence of emotional structures activated.

Burns, Biswas and Babin (1993) also examined the effects of imagery vividness and elaboration on advertising effect variables such as attitude toward the ad, attitude toward the brand and intention. They concluded that vividness of mental imagery was a perfect mediator of advertising effects, linking concrete wording to the attitudinal and cognitive responses.

Another aspect of mental imagery relevant to this study is its effect on the perceived likelihood of events. McInnis and Price (1987) cite studies that have shown that "the act of visualizing an event can make the event seem more likely" (p. 480). In one such experiment (Carroll, 1987), subjects who were asked to imagine Jimmy Carter winning the presidential election predicted that he was more likely to win than did subjects asked to imagine Gerald Ford winning.

The findings in the area of mental imagery are also consistent with schema theory. MacInnis and Price (1987) distinguish between schema as a knowledge

structure and imagery as a process, a means of encoding and retrieving information. Thus, imagery processing relies on the previously acquired information organized in schemas. Smith et al. (1984) also demonstrated that schemas promote the use of mental imagery. They found that individuals who possessed a script for an event generated more mental images about that event, and that their images were more vivid than those of the subjects who did not have a script.

Information-Processing Capacity

Communication research now widely accepts the idea that meaning-making is a continuous interaction process between an individual's cognitive activity and the characteristics of a given message. One of the factors influencing the degree of cognitive elaboration is the complexity of the message and therefore the complexity of the tasks that an individual has to perform when processing it. The understanding of how people process information has shifted from a sequential model to a parallel one (Wicks, 2001). In the past it was believed that information processing developed in a series of separate stages, encoding, rehearsal and storage, but more recent research has indicated that different processing tasks occur simultaneously (Basil, 1994). The literature offers two competing views on an individual's capacity to perform cognitive tasks.

One approach is based on the *limited capacity central mechanism hypothesis* (Broadbent, 1958 as cited in Basil, 1994). This theory posits that humans have limited

information-processing resources and therefore the processing of stimuli coming from multiple sources is likely to lead to interference and incomplete encoding.

The other view draws on the *multiple resource theory* (Kahneman, 1973 as cited in Basil, 1994), which proposes that although people possess limited cognitive resources for information processing, they are able to shift them to different stages of processing, as required by a specific task. This approach is further supported by the fact that some of the processing tasks are believed to be automatic, rather than conscious (Wicks, 2001). Some production features of television messages, such as cuts, pans, zooms and sound effects appear to be encoded in an unconscious, effortless manner (Basil, 1994). But the multiple resource theory also accepts the fact that when a message is presented in two modalities, audio and video, there is a competition for resources both between the two modalities and among the different processing tasks, attention, processing for meaning and memory (Basil, 1994).

The research that attempted to test these theories has focused on three areas: the reception of television news as a dual-modality presentation, the effectiveness of audio-visual versus audio-only advertising messages and the effects of radio versus television on children's imaginative responses.

Television: A Dual-Modality Medium

Studies of television news have used measures of memory to examine how cognitive resources are shared between the two modalities of presentation and whether image processing interferes with the encoding of information from the audio channel.

These studies, reviewed by Basil (1994), have yielded mixed results. Most of them showed that pictures improved recall of information (Drew & Reese, 1984; Graber, 1990), some showed no effect (Katz, Adoni, & Parness, 1977), and only one found that the presence of images reduced the processing capacity for meaningful information conveyed by the auditory channel (Burris, 1987).

Machula (1980) compared the affective responses and the amount of cognitive learning generated by the same content presented in three different media: a television debate, its audio track and a printed transcript. She found that the television viewers had more negative feelings toward the program than the readers and the listeners, and that the audiotape produced the least amount of cognitive learning. Gunter (1991) also reported better recall for audio-video than for audio-only presentations. He suggested that this may be accounted for by the fact that visual elements grab the attention and that, according to Paivio's "dual coding theory" (1986), images are encoded both visually and verbally and therefore can be activated by a greater number of cues (Gunter, 1991).

The prediction that a single-channel presentation is more easily and more completely processed than a multiple-channel one, because more resources are available, was thus more often contradicted than confirmed. Basil (1994) suggests as one possible explanation the fact that a television presentation is simply "more interesting" (p. 191) than a radio one, because television's formal features are considered not only to be processed automatically, but also to elicit reflexive attention responses (Lang, 1995; Singer, 1980). Along the same lines, Edwardson, Grooms and Pringle (1976) suggested that "film may indeed increase a newscast's entertainment

value" (p. 377), but do not necessarily contribute to information gain; they found that television viewers did not learn more when news stories were presented through film than when they were told by a talking head.

Thus, it could be argued that a television presentation is more attractive precisely because it allows the mind to be lazy; it keeps it busy with processing images, a task that is less difficult than processing verbal content (Graber, 1990; Lang, 1995). In order to be elaborately encoded, information has to be rehearsed in one's mind immediately after being perceived, yet "television, by the rapidity or novelty it presents, works against imaginative replay" (Singer, 1980, p. 51).

Another body of research reviewed by Basil (1994), which indicates that the combination of visuals with audio demands more resources than an audio-only message, involved reactions to secondary task cues. In general, these studies showed that individuals took longer to respond to those cues when they were exposed to a dual-channel presentation than to a single-channel one. This confirms the hypothesis that there is a "common resource pool" (Basil, 1994, p. 195) for the two modalities and that the visuals engage the cognitive resources that would otherwise be used for a deeper elaboration of the auditory content. However, a few of those experiments showed that the secondary task interfered only with that part of the message that was conveyed in the same modality (e.g. Treisman & Davies, 1973). This suggests that cognitive resources are modality-specific and that "information consumes attentional resources specific to

its particular modality" (Basil, 1994, p. 196). In this case, visual elements should not use up the resources dedicated to processing auditory content.

Television versus Radio Effectiveness in Advertising

The "resource" theories have also been relevant to research attempting to compare cognitive responses elicited by commercials tailored for different broadcast media. Like the research on television news, these studies also reported inconsistent findings. Studies that have predicted higher effectiveness of radio messages on cognitive elaboration embraced the theoretical perspective of the *limited processing capacity*: television images overload the viewers' processing system and interfere with the cognitive elaboration activity. On the other hand, studies that have hypothesized more elaborated responses in the case of television rely on the *picture superiority effect* due to the multiple encoding paths available for images (Buchholz & Smith, 1991).

Edell and Keller (1989) found that subjects exposed to a television ad reported more total thoughts and more evaluative thoughts than those exposed to the corresponding radio ad, indicating a more elaborate cognitive response for the television version. Liu and Stout (1987) found that TV ads generated more counterarguments than the same ads presented in an audio-only format. On the other hand, Warshaw (1978) reported better recall for commercials in audio-only and video-only presentations than for a combination of the two modalities.

One possible explanation for the lack of consistency among these findings is that the relationship between the characteristics of the medium in which the message is

conveyed and the audience response is a very complex one. Several factors are held to affect the relationship between the type of message presentation and the audience's cognitive processes. Some of these factors are audience involvement with the message (Buchholz & Smith, 1991) and, in the case of television, the degree of redundancy between the audio and the video stimuli (Basil, 1994; Lang, 1995) and which of these two modalities carry the meaningful content (Basil, 1994) .

Buchholz & Smith (1991) provided insights into the role of audience involvement in the cognitive elaboration of broadcast ads. Their experiment showed that under low-involvement conditions television messages proved to be more efficient. The researchers explained this from the perspective of the *elaboration likelihood model* (Petty & Cacioppo, 1983), which states that individuals uninvolved with a persuasive message will use a superficial, "peripheral" processing route, paying more attention to the formal and expressive features of the message, whereas those more involved will use cognitive elaboration to process the message.

Thus, low involved subjects attended more to the television message because it provided attractive features through its visuals and required less effort to be processed. However, for the subjects in the high-involvement condition "radio was shown to produce significantly more personal elaborations than the TV commercials" (Buchholz & Smith, 1991, p. 15). Radio's lack of visual stimuli that could use the subjects' short-term memory capacity and could cue them to elaborate on irrelevant visual elements was thought to be the reason for this finding.

Lang (1995) examined the effect on cognitive processing of messages containing different levels of audio-video redundancy. She found that memory for visual information is not affected by the level of redundancy, but memory for auditory information is compromised when there is low correspondence between the two channels. A similar finding was reported by Drew and Grimes (1987) in the case of auditory memory: it was higher when there was high between-channel redundancy; however, they found a reverse pattern for the information conveyed through visuals: they were remembered better when the degree of redundancy was low. Therefore, taking memory for information as a measure of cognitive elaboration, it appears that elaboration of television messages with a low level of audio-video redundancy may be defective if the "location of meaningful content" (Basil, 1994, p. 188) is in the audio channel, as it is usually the case with news stories.

Television versus Radio Effectiveness in Children's Learning

Another area in which researchers have focused on comparing cognitive responses to radio and television is developmental psychology. Greenfield, Farrar and Beagles-Ross (1986) asked children to complete stories presented in radio and television formats; those who heard the audio version incorporated more original and fewer repetitive ideas in their responses than those who watched the stories on television. The researchers concluded that while television limited children's creativity by supplying ready-made images, radio stimulated their imagination, which compensated the absence of visuals with mental pictures.

Valkenburg and Beentjes (1997) replicated the study, intending to test an alternative explanation, “the faulty-memory hypothesis” (p. 21). They suggested that children provided more creative responses to the radio story because they remembered it less well, and therefore had to make up for that effect by inventing novel ideas and situations. However, children exposed to the radio story twice did not generate fewer original responses than those who heard it only once, and thus the faulty-memory hypothesis was not supported. Moreover, children who watched the television story produced more repetitive ideas than both those who heard the radio story once and those who heard it twice. Therefore, the “visualization hypothesis” proposed by Greenfield et al. (1986) received further support.

Drawing on this literature review, several ideas appear useful to the present study. First is the concept of cognitive elaboration understood as the process through which incoming information activates knowledge stored in memory structures, such as schemas or scripts, and thus becomes integrated within memory. Secondly, it is the idea of elaboration through mental imagery as a powerful way of processing information from the media, leading to superior encoding and retention. However, because imagery and perception share the same cognitive resources, the formation of mental images may interfere with the simultaneous perception of visual elements. This leads to the importance of the redundancy issue: if, in the case of television, the relevant content is in the audio channel and the redundancy between the audio and video channels is low, the attempt to visualize the verbal content and thus to elaborate upon it on a deeper level may be hindered by the processing of visuals.

Chapter 3: Research Question and Hypotheses

As the literature review shows, the majority of the research that has actually attempted comparisons of cognitive processing elicited by different media has involved advertising. The purpose of this study is to expand this approach to media messages with an informative rather than a persuasive content and to answer the following *research question*:

Which of the two broadcast media, radio or television, will elicit more elaborate information processing in a news context? In other words, which of the two media will create more beneficial conditions for the activation of mental links outside the immediate factual content of the message?

Thus, one of the insights that this research attempts to provide is whether the externally provided images of television or the ones internally generated by radio contribute to more efficient processing of information. One qualification that needs to be made here is that, in a news context, this also depends on the nature of those images: television may be more efficient when completely new and unseen images are to be transmitted and when it is absolutely necessary that any ambiguity be avoided. Radio, on the other hand, may be more efficient when listeners already have mental representations to draw upon and so they can use their mental resources for the processing of meaning rather than to assimilate visuals. Basil (1994) identifies three phases in information processing: attention, meaning-based processing, and memory. If resources need to be divided between different processing stages, while the visual

elements of television may help by orienting attention toward the message, they may take up valuable resources needed for the next phase, the meaning-based processing, which is the level of elaboration, where new information is compared to mental models and integrated into long-term memory (Basil, 1994).

The communication benefits of one or the other of the broadcast media also depend on the type of program that is to be produced. News programs should attempt to reduce ambiguity as much as possible, while features, documentaries and dramas could benefit from the work of the imagination.

Although the reviewed literature has yielded inconsistent findings, certain considerations regarding the characteristics of the two media under discussions and some particularities of the stimulus message have encouraged the formulation of several hypotheses. First, from a "medium is the message" perspective, Marshall McLuhan's definition of radio as a hot medium (1964), requiring a low degree of participation, invites a distinction between perceptual activity and cognitive involvement. While radio demands a low amount of perceptual activity, it requires active cognitive involvement from the listeners. Susan Douglas (1999) mentions the work of Dr. Mark Tramo, a neurobiologist from Harvard Medical School, who argues that the "sensory purity" (p.28) of radio is what makes it powerful and conducive for deep cognitive processing.

Just like radio, print texts also encourage those who experience them to a more active, more intimate and more personal relationship than television does. It can be argued, however, that radio allows a greater degree of mental freedom than both television and print, because it is the most transparent of all the media. The content of

every medium is transmitted to the receiver though an interface, a concrete, physical object that represents the medium in a particular communication situation. Therefore, if transparency is understood as the absence of the interface, “so that the user is no longer aware of confronting a medium, but instead stands in an immediate relationship to the contents of that medium” (Bolter & Grusin, 1999, p. 24), then radio is the only medium that can truly achieve this. Radio as an interface can be invisible; if one hides the loudspeakers, sound seems to come from nowhere and everywhere. By contrast, both television and print constrain the users’ perception to a fixed point in space, a physical surface that is always situated in front of them and that needs light in order to be experienced.

Moreover, sound as a stimulus is unique in the sense that it envelops and pervades the listeners, and it comes to the listeners rather than requiring them to direct their sense organs toward it, as visual interfaces do. In other words, listening is centripetal, while sight is centrifugal (Douglas, 1999); listening is omnidirectional, while sight is forward-oriented (Ihde, 1976). All these, together with the fact that sound can be experienced in the absence of light, permit the radio audience to enjoy a state of great mental freedom, unequaled by any other medium. In his well-known aphoristic manner, McLuhan calls radio a “tribal drum” or “the subliminal echo chamber of magical power to touch remote and forgotten chords” (1964, p. 302), alluding to the power of radio to activate our innermost resources, among which past experiences,

memories and associations. Therefore, it can be predicted from this perspective that a greater amount of cognitive activity will occur with radio than with television.

One of the arguments in support of the "picture superiority effect" of television on cognitive elaboration and learning has been the fact that images are encoded both visually and verbally (Paivio, 1986), thus being accessible through multiple associative paths. However, there has been a consistent tendency in experiments that have tested this hypothesis to use the soundtrack of a television production as the "radio" version. But, in real life, radio productions are often enhanced with very vivid, concrete words and sound effects precisely with the intent to offer the listeners a "visual" experience for their inner eyes. Although radio and television have much in common as electronic media that attempt to bring the world to us through our sense perceptions, the differences, however subtle, in their aesthetics are emphasized for those who want to master their production skills. Discussing radio techniques, Hilliard (2000) points to the fact that radio writing should depict word pictures and that "background material, which can be shown in its entirety on television through visual action alone, must be given on radio through dialogue, music and sound" (p.8). He also argues that, for instance, "you can easily tell the difference between the quality of a commercial expressly written for radio and that of a television commercial whose soundtrack is used for a radio spot" (p. 8).

It has been demonstrated that concrete words and sound effects have the ability to generate mental imagery (Miller & Marks, 1992; Miller & Marks, 1997); therefore,

the verbal content of the audio-only messages can also be encoded both semantically and visually. And while imagery represents the world in a form that is isomorphic with perceptual information (Atwood, 1989), television offers an abundance of constantly changing images "generated by various techniques - camera cuts, pans across scenes, zooms in and out, and so on, that are not found in ordinary perception" (Cognitive and emotional functioning, 1982, p. 24).

Additionally, internal images generated by vivid verbal content involve a memory search through which additional inferences about the concepts presented in the stimuli and additional relationships are activated (Kieras, 1978). But does this elaboration occur in the same degree when an individual has to process verbal information and visual elements at the same time, given that the interference between the formation of mental images (generated by the verbal content) and the perception of external visual stimuli has been demonstrated experimentally (reviews in Kieras, 1978; Atwood, 1989)?

It should also be noted that some predictions about the possible findings of this study may be made based on the particularities of the stimulus messages. Because it describes a possible event - a hurricane that could provoke a devastating flood in the city of New Orleans- and not one that has already occurred, the television feature does not present a high degree of between-channel redundancy. As we hear about the characteristics and possible effects of the hurricane, we do not actually see images of the hurricane, except for a few archival images of such events from the past; we see, however, researchers and other people who try to find solutions for this problem.

Therefore, while the radio story might activate the “hurricane” script in the listeners, who might start imagining such an event, the television viewers might engage less in this type of processing because of the interference of the external images. Thus, radio listeners might produce more connections and inferences outside the facts shown in the story, because they will have more resources available for deeper cognitive elaboration, while the TV viewers might generate more thoughts that will reflect more strictly the information presented in the story. Based on these considerations, the following hypotheses have been formulated:

H1: Radio listeners will generate more elaborated thoughts and more personal connections than television viewers.

H2: Television viewers will generate more thoughts reflecting strictly the factual information in the message than radio listeners.

Furthermore, drawing on experimental research involving mental imagery, which has suggested that this type of cognitive processing mediates the effect of a message on affective responses and on the perceived likelihood of events, two more hypotheses have been proposed:

H3: Radio listeners will be affected emotionally more than television viewers.

H4: Radio listeners will perceive the event described in the message as more likely to happen than television viewers.

Chapter 4: Method

Stimulus Messages

The messages that have been selected for this experiment are segments of two documentaries about the possibility of a devastating flood that might hit the city of New Orleans. The radio version (Zwerdling, 2002, Sept. 20) aired during the NPR program *All Things Considered*, while the television version (Zwerdling, 2002, Sept. 20) was part of the PBS program *Now*.

In order to preserve the ecological validity of the experiment, it was important that two real messages were chosen. Most of the previous studies that have compared broadcast media have used a television message for the audio-visual condition and its soundtrack for the audio-only condition. However, in reality, the audio channel of a television feature may differ significantly in production terms from a feature that has been specifically intended for radio. There are certain differences in writing styles, the length of segments, the use of ambient sounds and even the order of information between radio and television. The best evidence in support of this argument is the fact that the *Hurricane Risk for New Orleans* story was produced in two different versions adapted for the two different media, when the producer could have just taken the audio part of the video story and used it for radio, or could have simply added images to the radio version and thus create the television story.

The main reason given by previous researchers for altering messages in order to create different versions, or for constructing messages altogether for experimental

purposes has been the need to compare one particular feature of those messages, while strictly controlling for the others. However, in this case, the purpose was not to test the effect of a specific message feature (which would require that all the other features should be equal). Rather, the idea was to compare messages as a whole, being aware that the differences between them that are due to medium-specific differences in treatment - including ordering of information, length of quotes and choice of words - may be meaningful. As Valkenburg and Beentjes (1997) state, "The point of media comparison experiments is to investigate differences between media. Therefore, one should not control for differences between the two media" (p. 29). Moreover, even if the two messages are not completely identical, one can assume that the producers meant the two features to be equal and not to deprive any of the audience groups (radio and TV) of any information.

Another issue related to the selection of messages was that their actual length was not appropriate for an experiment. The radio documentary was 20 minutes, while the television one was about 30 minutes long, and presenting them in full length could have risked abusing the subjects' time and attention span, considering that their participation in the experiment was voluntary. Therefore, only segments of about 6 minutes were selected as stimulus messages from both the radio and the television documentaries**.**

Participants

The participants in this experiment were 82 students enrolled in one large class in the Journalism School at Ohio University. They were unsystematically divided into two groups, based on their seating arrangement in the classroom. The students seated in one half of the room were assigned to the radio group and those seated in the other half were assigned to the television group. There were 36 students in the television group and 46 in the radio group.

Because the participants were not randomly divided into two groups, several test were performed before the actual data analysis in order to test whether there were significant between-group differences independent from the experimental treatments. These differences could have been due to gender distribution, and levels of verbosity and media use. The results of these tests are explained in detail in the results section.

After the distribution of the participants, one group remained in the same room for the radio part of the experiment, while the other group moved to an adjacent classroom, where another graduate student administered the television treatment. The radio stimulus message was recorded on a compact disc and was played on a regular CD player placed in front of the classroom. The television stimulus message was recorded on videotape and was played on a regular TV set, also placed in front of the classroom, so that it was easily visible for all the participants. Both the radio and the television messages had been cued before the participants entered the two rooms, so that when the viewing and listening sessions began, the moment approximated the real-life situation

of turning on the radio or the television for news, rather than merely playing previously recorded material.

Experimental Procedure

In order to assess the cognitive and affective reactions to the stimulus messages, both open-ended and close-ended measures were used. The former were in the form of the free listing of the participants' thoughts in reaction to the message, a method which is widely used in research that attempts to measure cognitive processing (Wright, 1980; Edel & Keller, 1989; Buchholz & Smith, 1991; Miller & Marks, 1992). As Price, Tewksbury and Powers (1997) point out, "thought-listing is the principal and indeed one of the only means available for gathering observations of the knowledge activated by people during message processing" (p.487).

One of the issues related to thought-listing is whether it occurs concurrently or retrospectively in relation to the performance of the experimental task. While concurrent reporting may be the ideal, it is more appropriate in cases where subjects are able to control the pace of the task, such as reading a newspaper article (Shapiro, 1994). In the case of radio and television messages, however, concurrent reporting may be "so unnatural or so mentally burdensome that reporting interferes with natural performance of the task" (Shapiro, 1994, p.6). Additionally, previous research has demonstrated that if done immediately after the exposure to the stimulus, retrospective reports can be fairly accurate and complete (Ericsson & Simon, 1978 as cited in Shapiro, 1994). In this

case the thought reporting was done retrospectively, immediately after exposure to the message.

Several studies report a time limit of 2-3 minutes for thought-listing; this has been established based on the assumption that it will eliminate the possibility of making-up thoughts (Wright, 1980). However, these studies generally deal with advertising stimuli, which are normally shorter than news messages. Considering the length of the messages used for the present experiment, the time limit for the thought report was set at 5 minutes.

As Shapiro (1994) points out, the safest way to ensure that the experimenter's instructions do not interfere with the thought reporting is for the instructions to be as general as possible. In this case, the participants were simply asked: "Please write down all the thoughts that have passed through your mind while watching/listening to this news segment." In order to facilitate the coding process, the participants were instructed that they did not have to formulate their responses in complete sentences, and that they could use simple phrases or even bullet points (Valkenburg, Semetko & DeVreese, 1999).

One of the concerns facing though-listing procedures is whether the respondents will be candid in their reports (Wright, 1980). Some participants might feel tempted to express thoughts that they believe are expected from them or that they deem more acceptable. In order to minimize this effect the participants were assured that their responses would be anonymous and that they would not be used in evaluating their skills, mental abilities or performances in any way.

The close-ended measure was a short questionnaire, which has been designed by drawing on research on elaboration and mental imagery (see Appendix A). The purpose of this study was to assess the depth of elaborative thinking generated in response to the same content presented in two different media. Elaboration has been defined as the process by which incoming information is linked with already accumulated knowledge and by which thoughts not present in the stimulus material are activated. One such type of link is represented by personal links, that is, connections with one's past experiences (Ellen & Bone, 1991, Buchholz & Smith, 1991). Some of these experiences may have been abstracted into schemas, which, as Graber (1984) has noted, may also be based on knowledge acquired vicariously, for instance through previous exposures to the media. It was therefore predicted that a story like *Hurricane Risk for New Orleans* would activate schemas created either through a personal encounter with a similar situation, or at least through the numerous instances when the mass-media have presented disaster scenarios, either real or fictional.

Thus, in addition to the open-ended responses, the degree of cognitive elaboration was measured by asking participants to respond to two statements: *While I was watching/ listening to the story, I was reminded of similar experiences from my past* and *While I was watching/ listening to the story, I imagined myself in a similar disaster scenario*. The next item of the questionnaire, which asked the participants to respond to the statement *The story worried me*, was intended to assess the participants' affective responses to the messages. Based on the assumption that cognitive elaboration, particularly in the form of imagery processing, has been shown to activate emotional

structures, it was predicted that the more people would elaborate and the more their imagination would be stimulated by the story, the stronger their feelings generated by the story would be.

The fourth item in the questionnaire was grounded in research that had assessed the perceived likelihood of imagined events (Carroll, 1987). Thus, the participants were asked to what degree they agreed or disagreed with the statement that *A devastating flood in New Orleans is very likely to happen.* The assumption here was that if participants were prompted to elaborate on the event described in the features through personal mental imagery, then they would perceive the event as more likely to happen. The responses to all the five items of the questionnaire were made on a 5-point Likert-type scale anchored with *strongly agree* and *strongly disagree*, as shown in Appendix A. Finally, the questionnaire contained two items intended to assess the respondents' levels of news media use, by asking them to report how many days in a typical week they watch television news and how many days they listen to news radio (Stempel & Hargrove, 1996).

At the beginning of the experimental session, the investigators explained to the participants that the study had been designed to gather information about people's reactions to a radio or television story, then they secured their informed consent and familiarized them with the thought listing procedure and the questionnaire. The information given to the participants at the beginning of the experiment was enough for them to feel comfortable and to be able to perform their tasks, but not too detailed, because a thorough description of the research questions and expected findings could

have influenced the spontaneity of their responses. However, after the experiment, both groups received debriefing information, which explained in more detail that the aim of the study was to compare cognitive and affective responses to a message presented in two versions, for radio and television. They were also told why this information had been withheld from them at the beginning of the experiment.

Coding Procedure

The first step in coding the participants' thought lists was to unitize them; each response was segmented roughly in independent clauses, that is, sentences containing a single action or idea. In some cases, rather than looking at units as grammatical entities, it was more useful divide them in "propositions" (Kintsch, 1974). As applied by Valkenburg et al. (1999), "a proposition (thought) contains a predicate (verb) and one or more arguments (e.g. subject, objects, and adjectives)" (p.558). Some of the responses contained such "arguments" that were in fact subordinate clauses, so even if grammatically they formed a separate entity from the main clause, they were considered together as a single unit for the purposes of the coding procedure, because they formed a single thought. Some example of such sentences were: "All of new Orleans' cemeteries have above ground mausoleums because the ground is too wet to bury people,""I found it entertaining to listen to the clicks of the stick to show how high the water would be in a hurricane," and "People keep saying that hurricanes won't happen, but they do."

Also, whenever a sentence that repeated a factual piece of information from the message was accompanied by a cognitive or affective reaction from the respondent, the two were considered together as a single unit; for the purpose of the coding process, the interest was in whether the piece of information from the message was elaborated upon and not merely reproduced. For instance, sentences like "Have they halted city growth as a result of finding out that a level 5 hurricane could level the city?" or "It was troubling how quickly a hurricane could kill 40,000 people if it hit New Orleans" were considered as one unit because the parts that repeated the information provided in the message ("a level 5 hurricane could level the city"; "a hurricane could kill 40,000 people if it hit New Orleans") were used by the respondents only to provide a context for their reactions and elaborations and not as thoughts in themselves (as opposed to the situations when respondents listed as their thoughts information reproduced almost verbatim from the message, without elaborating on it in any way, such as in "Level 5 hurricane" or "New Orleans is below sea level"). More examples of thoughts from the unitized thought reports are listed in Appendix B.

In order to facilitate the coding decisions, before beginning the coding process, the transcripts of the stimulus messages were also segmented into smaller units (see Appendix C). Non-verbal information was also taken into account, in the form of sound effects for the radio version and visual elements for the television version.

The initial coding system contained only three categories adapted from the ones proposed by Greenwald (1968, as cited in Wright, 1980, p. 153): *message-supplied*

thoughts, *receiver reactions* to message content and *receiver-originated thoughts*. In the *message-supplied thoughts* category were included those thoughts that directly reproduced factual information presented in the stimuli, verbally in the radio version and both verbally and visually in the television version. For example, some thoughts coded in this category were: "New Orleans is a place where a natural disaster is very possible," "They showed the traffic jams that resulted from the attempted use of the evacuation routes," "The fact that a level 5 hurricane could come from the Keys and dump 25 feet of water on New Orleans is something I never considered" (see more examples of thoughts from all the coding categories in Appendix B).

In the *receiver-originated thoughts* category were coded those thoughts that were triggered by the content of the message but did not reflect directly or exclusively the assertions made in the message. They did not merely repeat the factual information in the stimulus, but revealed an expansion of thinking beyond that. Their production was deemed to signal the presence of a higher-order processing activity. Some of the thoughts included in this category were opinions or evaluations regarding a situation presented in the message (e.g. "Officials need to come up with better plans for what to do if a hurricane hits"; "They should just focus on developing a sure fire emergency plan now"), or denoted associations with general knowledge or personal experiences previously stored in respondents' minds (e.g. "Natural disasters are something humans have little power over"; "In Ohio, you don't really think about earthquakes and hurricanes"; "I was reminded of hurricane Bonnie, which ruined my trip to New Jersey

with my grandparents") or were descriptions of mental images evoked by the message (e.g. "I pictured the bustling street lined with old brick buildings and red window valances"; "I tried to imagine the streets I had walked on flooded completely"; "I saw a family stuck in a car on the road panicking to get out of the city") or were simply questions that the message brought to their minds (e.g. "What do residents of the city feel about the situation?"; "Who would want to move there?"; "Does tourism slow down during hurricane season significantly?").

The *receiver reactions* category included expressions of attitude and emotions generated by the content of the message, such as: "It is scary that New Orleans could be washed away"; "I was concerned for the safety of the relatives that I have in the South"; "Forty thousand people dying is horribly tragic."

Three other categories were added to the initial coding system after the examination of the thought listing protocols. Deciding on some of the categories after reading the thought reports is not uncommon in exploratory studies dealing with cognitive responses (Shapiro, 1994). First, as journalism students, the participants related not only to the content of the message, but also to its quality as a journalistic product or its broadcasting context, and consequently the category of *thoughts about journalistic and production values* was added. Here are some examples of such thoughts: "The coverage of this story was very complete and showed all aspects of the story"; "The narrator's voice was annoying"; "What news source / station is this

from?”; “When did the story air?”; “Good sound effects with the clicking noise of the stick.”

Secondly, after reading the thought listings, the researcher realized that some of the participants had reported thoughts that could not have occurred during the watching or listening session, but were rather a posteriori analyses of the processes and incidents that happened to them or others during exposure to the message. These items were coded as *thoughts about thoughts.* Some examples are: “I can remember bits and pieces of the story”; “By the end of the story I found my thoughts drifting to other things on my mind”; “The laughter stopped”; “I can’t really even summarize the story because it was so hard for me to pay attention.”

And finally, a separate category needed to be created for the thoughts that had no connection to the message, not even for example, a connection with the city of New Orleans, such as Mardi Gras or jazz music. Instead, these thoughts were a good sign that the respondents had been at least temporarily distracted from the message and that their minds had wandered to something else. These were coded as *thoughts irrelevant to the message* and included examples such as: “I have a tanning appointment in half an hour”; “I thought about when I have to work next week”; “I thought about my boyfriend and just different things about our relationship that are not normal.”

Before beginning the coding process, a random sample of 15 out of the total of 82 thought reports were coded by the experimenter together with two other coders, both female journalism graduate students, in order to assess intercoder reliability. Previously,

the coders read the coding instructions, which contained the category definitions and examples from each category, as shown in Appendix D, and were trained in order to "achieve a common frame of reference" (Stempel, 2003, p. 216). All three coders coded five responses together and the results enabled the researcher to detect the weak points in the coding system and to refine some of the definitions. The differences in perception were solved through discussion and a more careful explanation of the coding categories. After the three coders considered that they had reached a common understanding of the coding system, the whole sample was coded.

Next, intercoder reliability was calculated for each category, using the percentage of agreement test, through which "coders determine the proportion of correct judgments as a percentage of total judgments made" (Riffe, Lacy & Fico, 1998, p. 127-128). Intercoder reliability for this study ranged from 70% for the *receiver reaction message content* category and 72% for the *thoughts about thoughts* category, to 81%, 90% and 91% for the *receiver-originated thoughts*, *thoughts about the journalistic or production values* and *message-supplied thoughts*, respectively. Thus, the reliability for the most difficult categories was 80.8 %. For each of the other four categories, which were non-problematic, there was 100 % agreement among the three coders. Adding those to the percentages of agreement for the difficult categories led to an overall intercoder reliability of 89.3 %.

Chapter 5: Results

This study hypothesized that a news message presented in a radio format will generate more cognitive elaboration than the same message presented in a television format. Cognitive elaboration was operationalized as thoughts that denote the activation of stored knowledge and personal links beyond the information contained in the stimulus message, emotional reactions to the stimulus, and the perceived likelihood of the event described in the message, as a result of the formation of mental imagery.

Between-Group Differences

As mentioned, the participants in the experiment were unsystematically and not randomly assigned to the two experimental conditions. Therefore, before beginning to test the hypotheses, several tests were performed to make sure that the two groups had been comparable before they were exposed to the treatments. This was done with the awareness that the findings of the experiment might have been contaminated by extraneous variables such as the participants' gender, their levels of verbosity and media use, which a random assignment would have distributed approximately in the same way between the two groups (Wimmer & Dominick, 1997).

A chi-square test was used to assess the effect of participants' gender as a confounding variable. In the television group, 8 students (22%) were males and 28 (78%) were females, while in the radio group there were 12 males (26 %) and 34 females (74 %). The chi-square value was 0.1635, much lower than the critical value of

3.84 for a probability level of .05 at one degree of freedom. This means that there was no statistically significant relationship between the gender of the participants and the group in which they were included. In other words, the distribution of males and females between the two groups was balanced, which suggested that the effect of gender as an extraneous variable would not be so strong as to skew the results.

Similarly, the possible effects of the participants' differences in reported levels of media use and verbosity were tested with the help of two *t*-tests. As part of the questionnaire, the students had been asked how many days in a typical week they watch news television and how many days they listen to news radio. A *t*-test was used to test whether there were significant differences in news media use between the two groups. The *t* values for the TV news viewing and radio news listening variables were 1.048, and 1.447 respectively, corresponding to probability levels of .289 and .152, both higher than the accepted level of .05. Thus, the *t*-test revealed that the differences between the two groups were not significant in relation to either one of the media use variables.

As the experimental procedure involved thought reporting, one of the confounding variables could have been the participants' degree of verbosity. Therefore, a second *t*-test was used to compare the mean numbers of thoughts listed by the two groups. For the radio group this mean was 9.80, while for the television group it was 10.47. The difference was not statistically significant, as shown by the *t*-test ($t = .895$, $p = .374$).

Thus, although the two experimental groups were not randomly formed, the results of these tests have enabled the researcher to rule out alternative explanations for

the findings that could have resulted from individual differences among the participants, separately from the experimental treatments.

Dependent Variables

After the content analysis of the thoughts listing protocols, two of the categories, *receiver-originated thoughts* and *receiver reactions to message content* were collapsed into a new category, *receiver-originated thoughts and reactions*. In the *receiver-originated* category were included those thoughts that reflected an expansion of thinking beyond the factual information presented in the stimulus. *Receiver reactions to message content* were thoughts that expressed emotional reactions or attitudes towards the content of the stimulus message (see Appendix B for examples). The reason for collapsing these two categories was the fact that they both reflect a process of elaboration on the message coming from the receiver as opposed to the category indicating mere recognition of its factual content *(message-supplied thoughts)*, and to the one signaling a shift in attention from the content of the message to its formal features *(thoughts about journalistic and production values)* or to something totally unrelated to the message *(thoughts irrelevant to the message),* and to the category of thoughts that were not about the message but more about the respondents' mental processes and behavior during exposure to the message *(thoughts about thoughts).* Examples of thoughts from all these categories are also given in Appendix B.

Before discussing the hypotheses, it is interesting to note that both groups taken together generated significantly more *receiver originated thoughts and reactions,* with

a mean of 6.28, than *message-supplied thoughts*, for which the mean was 1.55 ($t = 8.431$, $p < .01$). Each of the two groups listed more *receiver originated thoughts and reactions* than *message-supplied thoughts*, but for the radio respondents the difference in percentages between the two types was smaller than for the television respondents. In the radio group, almost half of the thoughts (49.6 %) were originated by the respondents, while 18.4 % were directly supplied by the message. In the television group, the respondents originated more than two thirds of the thoughts (77 %), while 11.6 % were message-supplied. Table 1 shows the percentages of different types of thoughts, calculated out of a total of 451 thoughts for the radio group and 377 thoughts for the television group.

Testing of Hypotheses

H1: Radio listeners will generate more elaborated thoughts and more personal connections than television viewers.

In order to investigate the first hypothesis, three dependent variables were used: the number of thoughts in the *receiver originated thoughts and reactions* category (see Appendix B) and the scores for the questionnaire items that asked the respondents to what extent they agreed or disagreed with the following statements: *I was reminded of similar experiences from my past* and *I imagined myself in a similar disaster scenario.*

The mean values for all these variables were calculated for each group and then compared through *t*-tests (see Table 2). The television group listed an average of 6.69 *receiver-originated* thoughts, while the radio group listed an average of 3.46. When the

values for this category were computed with the ones in the *receiver reactions to message content* category, as explained above, the mean values that resulted for the *receiver-originated thoughts and reactions* category were 8.08 for television and 4.87 for radio. As shown in Table 2 the differences between the two groups for both categories were statistically significant at $p < .01$.

Table 1

Percentages of Different Thought Types for Radio and Television Groups

Thought types	Radio	TV
Message-supplied thoughts	18.4	11.6
Receiver originated thoughts and reactions	49.6	77
Thoughts about journalistic/production values	21.9	10.3
Thoughts about thoughts	7.3	0.5
Thoughts irrelevant to the message	2.2	0.2
Total	100 (n =451)	100 (n =377)

The second part of H1 was concerned with the personal links that the message activated in the respondents' minds, considered as indications of cognitive elaboration processes. These links were often expressed in the thought reports and were coded in the *receiver thoughts and reactions* category (e.g. "I wonder why my parents still live in Puerto Rico, where hurricanes hit all the time"; "I used to want to live in New Orleans";

"How would I handle the situation?"). Additionally, a close-ended measure was also used to explore these personal connections: the degree to which the respondents agreed or disagreed with the statements *I was reminded of similar experiences from my past* and *I imagined myself in a similar disaster scenario.*

As shown in Table 2, for the item *I was reminded of similar experiences from my past*, the means scores were 0.96 for the radio group and 1.61 for the television one, and the *t*-test indicated that the difference was statistically significant ($t = -2.204$, $p < .05$). The other questionnaire item, *I imagined myself in a similar disaster scenario*, yielded a mean score of 2.17 for the radio group and 2.33 for the television group, but the difference was not significant ($t = -0.519$, $p = .605$).

In summary, the television group had consistently higher scores for the variables used to test the first hypothesis, which suggests that this group engaged in a higher degree of cognitive elaboration and activated more personal links than the radio group. Therefore, H1, which predicted that radio listeners will generate more elaborated thoughts and more personal connections than television viewers, was not supported.

H2. Television viewers will generate more thoughts reflecting strictly the factual information in the message than radio listeners.

In order to test this hypothesis, the *message-supplied thoughts* category was used as the dependent variable. This category included thoughts that reflected directly the factual information provided in the stimulus message, as illustrated by the examples in Appendix B.

Table 2

Mean Number of Thoughts and Mean Scores for Questionnaire Items by Group

	Radio	TV	*t*
Types of thoughts			
Message-supplied thoughts	1.80	1.22	1.263
Receiver-originated thoughts	3.46	6.69	-4.284**
Receiver reactions	1.41	1.39	0.076
Receiver-originated thoughts and reactions	4.87	8.08	-3.927**
Thoughts about journalistic/production values	2.15	1.08	2.065*
Thoughts about thoughts	0.72	0.06	3.067**
Thoughts irrelevant to the message	0.22	0.03	1.420
Total number of thoughts	9.80	10.47	-0.895
Questionnaire items			
I was reminded of similar experiences from my past	0.96	1.61	-2.204*
I imagined myself in a similar disaster scenario	2.17	2.33	-0.519
The story worried me	2.00	2.36	-1.281
A devastating flood in New Orleans is very likely to happen	2.30	2.26	0.179

Note. *$p < .05$; **$p < .01$

The radio group had a slightly higher mean score (1.80) than the television group (1.22), but the *t*-test revealed that this difference was not statistically significant ($t = 1.263$, $p = .210$), as reported in Table 2.

In conclusion, the second hypothesis, which predicted that television viewers will generate more thoughts reflecting strictly the factual information in the message than radio listeners, did not receive support either. In fact, as illustrated by Table 2, the findings generated by testing the first two hypothesis point to a direction contrary to what was predicted. They suggest that the television viewers engaged in a deeper elaborative process than the radio listeners, because they had higher mean scores for the variables indicating cognitive elaboration: the categories of *receiver originated thoughts* and *receiver originated thoughts and reactions* and the questionnaire item asking respondents how strongly they agreed with the statement *I was reminded of similar experiences from my past*.

On the other hand, the radio respondents seemed to have been less involved with the content of the message, as they scored significantly higher on the variables indicating a shift in attention from the content of the message to its formal features and production values *(thoughts about journalistic or production values*) or to the examination of their own thinking or behavior during the listening session (*thoughts about thoughts*). The mean numbers of *thoughts about journalistic or production values* were 2.15 for radio and 1.08 for television, while for *thoughts about thoughts* they were 0.72 for radio and 0.06 for television. The differences between the two groups for both variables were statistically significant at $p < .05$ or $p < .01$ (see Table 2). The radio

group also had a higher mean number of thoughts completely *irrelevant to the message* than the television group (0.22 versus 0.03), although the difference was not statistically significant ($t = 1.420$, $p = .159$).

H3. Radio listeners will be affected emotionally more than television viewers.

Two measures were used to assess the affective responses to the message: expressions of feelings and attitudes in the thought listing protocols (*receiver reactions* category; see examples in Appendix B) and an item in the questionnaire that asked the participants how strongly they agreed with the statement that the story worried them. As Appendix E illustrates, a Pearson correlation between the number of *receiver reaction* thoughts and the scores for the questionnaire item suggests that those who reported a higher number of emotional thoughts also tended to be more worried by the story ($r = .363$, $p < .01$). While this positive correlation does not give any indication about a causal relationship between the two variables, it provides an index of the validity of the measurement.

In order to compare the emotional effect of the stimulus message on the two experimental groups, *t*-tests were conducted with the mean number of *receiver reaction* thoughts and the mean scores for *The story worried me* item in the questionnaire. For the first variable, the mean numbers of *receiver reaction* thoughts were almost equal for the two groups (1.41 for radio and 1.39 for television), while for the *"worry"* questionnaire item the mean score of the television group was slightly higher than that

of the radio group (2.36 versus 2.00), but not high enough for the difference to be statistically significant (see Table 2).

This analysis indicates that medium-related characteristics did not influence the affective response to the stimulus message. None of the two versions of the news story, for radio or for television, elicited more or stronger emotional reactions that the other one. Thus, H3, which predicted that radio listeners would be affected emotionally more than television viewers, did not receive support.

H4. Radio listeners will perceive the event described in the message as more likely to happen than television viewers.

The fourth hypothesis was based on the findings reported in the literature that the formation of mental imagery is likely to increase the perceived likelihood that the visualized scenario will actually happen. This study predicted that mental imagery would occur more with radio listeners than with television viewers and therefore the former were expected to score higher on the questionnaire item intended to measure the perceived likelihood effect. This item asked the respondents to what extent they agreed or disagreed with the statement *A devastating flood in New Orleans is very likely to happen*. Contrary to the expectations, the mean scores for this item were almost equal for the radio and television groups (2.30 versus 2.26).

Again, as in the case of emotional reactions, the perceived likelihood of the event described in the news story (a hurricane that might cause the complete flooding of New Orleans) was not influenced by medium-related differences in the production

treatment of the story. Although this effect has been demonstrated to increase with the ability to imagine the event, it is difficult to make inferences about imagery processes based on the data for the perceived likelihood variable, in the absence of indications of a causal relationship between the two. The fact that the two groups had an almost equal perception of the likelihood that the hurricane would happen could have been caused by the fact that both groups imagined the event while it was discussed in the story; but this could also have been caused by some other factor, such as the fact that one of the sources in the story expressly mentions that "the probability is yes" for the category 5 hurricane in New Orleans "to happen in our lifetimes."

Other Findings

Some other findings might be of interest, although they are not necessarily related to the predictions of this study, because they take into account the totality of the respondents, rather than looking for differences due to the medium to which each group was exposed. As shown in Appendix E, the Pearson correlation test revealed some other positive inter-correlations between the questionnaires items. For instance, those who reported a high perceived likelihood that the hurricane would happen also tended to agree more with the statement that the story worried them ($r = .537$, $p < .01$). Those who imagined themselves more in a similar disaster scenario also tended to be more worried by the story ($r = .500$, $p < .01$) and to perceive the hurricane as more likely to happen ($r = .394$, $p < .01$). Given the fact that the relationship between these variable is quite intuitive, these correlations indicate that the respondents were consistent across their

answers. It can also be concluded that these correlations support the previous findings that imagery processing as a form of cognitive elaboration is associated with the activation of emotional responses and with an increase in the perceived likelihood of events.

Other correlations presented in Appendix E involved the media use variables. The scores of news media use, both radio and television, correlated positively with the number of thoughts about the quality of the journalistic approach and production values ($r = .253$, $p < .05$ for radio use; $r = .230$, $p < .05$ for television use). While the presence of these thoughts may be attributed to the fact that the respondents were all journalism students, and therefore trained to evaluate news messages from this perspective, it may also enable the conclusion that the greater the involvement with news, the greater the importance attached to its quality as a journalistic product.

Chapter 6: Discussion

Implications

The results of the analysis did not provide support for any of the initial predictions that the radio message would trigger a greater amount of cognitive elaboration than the same message produced for television. In fact, as mentioned previously, for the variables intended to provide insight into the elaboration process, television viewers either scored higher than the radio listeners or the differences between the two groups were not statistically significant. With respect to the emotional reactions and the perceived likelihood of the event described in the news message, the study also found no significant differences between the two groups.

A possible explanation for these results might be found in the respondents' patterns of news media use. In the questionnaire, the respondents were asked how many days in a typical week they watch television news and listen to news radio. The participants from both experimental groups taken together reported watching television news an average of 3.66 days per week and listening to radio news an average of 1.85 days per week. Thus, their reported use of television for news was twice as high as their use of radio.

The respondents were divided into regular and non-regular users, the former being those who had reported watching news television or listening to news radio for four or more days in a typical week (Stempel & Hargrove, 1996). This analysis revealed that out of the total of 82 respondents, 28 (34 %) do not get their news from radio at all,

37 (45 %) turn on the radio for news one, two or three days per week, while only 17 (21 %) are regular news radio users. In the case of television, only 5 respondents (6 %) reported not using it for news at all, 33 (40 %) said they watched the news one, two or three days a week, while 44 (54 %) were regular users. Table F1 in Appendix F reports the frequency distributions according to the number of days in a typical week that the respondents reported watching TV news or listening to news radio and also according to the experimental group they belonged to. It is interesting to note that as far as television news is concerned, the number of people generally increases as the number of reported days increases, while in the case of radio news, this relationship is inverse: the number of people decreases as the number of reported days increases.

It is obvious thus that the participants in this study generally prefer television as a source of information, and more than half of them use it regularly for this purpose. Taking into account the age group they belong to, it is safe to assume that they grew up surrounded by television and other visual media and much less with radio. In her defense of radio as a medium that promotes the freedom of imagination, Douglas (1999) asserts that radio listeners tend to develop a special kind of relationship with the medium based on the fact that as children they have been socialized to respond to storytelling by making up images in their minds; because radio encourages them to do the same, the relationship with this medium carries some of the intimacy and the sense of trust and comfort associated with storytelling, which would account for its appeal.

However, one should bear in mind that for the younger generations, television more than the parents or educators has assumed the role of storyteller. This, together

with their extensive exposure to video games and the Internet, has probably contributed to the development of a different way of processing information. It might be possible that by growing up in the constant presence of fast-paced visual stimuli and information conveyed in a non-linear manner, the participants in this study, just like others in their age group, have learned to use their cognitive resources in new ways and maybe have even developed special resources to cope with the new information environment.

This would explain the fact that their cognitive elaboration seems to have been stimulated more by the television news story than by the radio one. Multiple resource theory (Basil, 1994) states that different information processing tasks, such as attention, processing for meaning and memory, occur in a simultaneous rather than a sequential manner and therefore they need to compete for resources. The same is true for different sense modalities, in the case of television, especially when information conveyed auditory and visually is not redundant.

The participants in this experiment have had their perceptual skills trained in a visually loaded environment. Therefore, they may need to invest less resources in the attention stage of processing a television message and are able to shift more mental energy to the meaning processing stage, which is when the elaboration takes place through the activation of stored knowledge, scripts and past experiences (Basil, 1994). Moreover, the television message might have been very easy for them to process not only because of their familiarity with the medium but also because this particular message was typical for the public television style. The slower editing pace, closer to the real-life perceptual rhythms, and a longer space for the development of the story

than it is usually the case with commercial television have probably made both the perceptual and cognitive loads less heavy.

Not only was the television respondents' processing of the auditory information not hindered by the presence of the visuals, but some of the responses in the radio group suggested that they might have actually needed external images to help keep their attention focused. In the absence of visuals capable of orienting their attention, many of the radio respondents declared that they lost track of the message and began thinking about something else. Some complained about the length of the message (e.g. "The story was quite long and too feature-like for the radio"), or found it boring (e.g. "The feature became boring half-way through and I stopped paying close attention"). Although the difference was not statistically significant, there were more thoughts totally irrelevant to the content of the message in the radio group than in the television group (see Table 2).

In other words, the preference and familiarity of individuals in this age group for television as opposed to radio might be explained by their lack of necessary attention span for radio, especially for longer, slower-paced messages. Pediatrics and media literacy researchers point to the effects of prolonged exposure to dynamic visual stimuli on brain development. One media literacy article (DeGaetano, n.d.) cites the conclusion of a study conducted by Peter Jensen from the National Institute of Mental Health: "Extensive exposure to television and video games may promote development of brain systems that scan and shift attention at the expense of those that focus attention." Recent

research has revealed that such exposure at a very early age may be the cause of serious attention deficit disorders, every hour of television the preschoolers watch increasing by 10 percent their chances of developing these disorders later in life (Tanner, 2004, April 5).

While these attention problems are among the extreme effects of excessive visual stimulation, it is possible that the lower level of patience and elaboration that the respondents have manifested toward radio than toward television might be due to their minds being more used to work with constant change and re-orientation than with material that requires focused processing. It may be argued that the auditory modality needs more focusing because it conveys information in a sequential manner, while the visual one is non-sequential. Verbal information cannot create meaning in the absence of a context and of a logical line that needs to be followed; images, on the other hand, often create meaning through juxtapositions of shots taken from their contexts and require a different kind of response. Individuals who have inhabited a fast-paced, visually biased information environment since an early age have probably developed more resources needed for the visual modality, than for the auditory one.

As pointed out in the results section, radio listeners scored significantly higher on the variables that would point to an opposite conclusion than what was initially predicted, that is, a higher degree of cognitive elaboration with the radio message than with the television one. The radio group had significantly higher mean number of *thoughts about journalistic or production values* and *thoughts about thoughts* (see Table 2), variables indicating a peripheral route to information processing. As described

in the elaboration likelihood model (Petty & Cacioppo, 1983), this processing mode avoids spending cognitive energy to analyze the content of the message and is based more on cues such as "source credibility, the style and format of the message, the mood of the receiver, and so forth" (Severin & Tankard, 2001, p.175). Thoughts triggered by the first two types of such cues were coded as *thoughts about journalistic or production values* and those depicting the mood or behavior of the respondents while they watched or listened to the message were considered *thoughts about thoughts* (see examples in Appendix B).

It is probably safe to assume a condition of low involvement with the message, given the fact that the participants did not choose to be there or to be exposed to the information. In this case, the fact that the radio group had more peripheral and less elaborated thoughts than the television group is consistent with the findings of Buchholz and Smith (1991), who demonstrated that in a situation of low-involvement television ads were more efficient than radio ones.

There was also another incident that might be held responsible at least for the very large difference in the number of *thoughts about journalistic and production values* between the two groups (see Table 1). In the case of the radio group, a great number of such thoughts were triggered by some particular word choices made by the producer. Describing a tool that one of the interviewed scientists was using to predict the level of water that might cover New Orleans in the event of a hurricane, the producer used a few expressions that were deemed by some of the respondents as sexual innuendoes.

References to the appropriateness of these word choices in a radio feature or to the producer's taste in using them repeatedly were coded as *thoughts about journalistic or production values*. These expressions and the audience's reactions to them caused many of the participants to be distracted from the content of the message. In their responses, participants often accompanied their evaluation of the reporter's choice with an account of how their minds slipped away from the message because of that (e.g. "I believed it deterred from the story's content") or what the others' behavior was in those moments (e.g. "Everybody laughed"), all of these reactions being coded *as thoughts about thoughts*. The frequent occurrence of these two types of thoughts in the radio participants' responses tipped the balance toward this group for these two categories.

It is interesting to note that none of the respondents in the television group mentioned such reactions, which could lead to the conclusion that when a verbal cue is accompanied by an external image, the individual's cognitive resources are absorbed in processing that image and, as a consequence, the verbal cue is interpreted literally. On the contrary, when given the freedom to create their own images, some people may construct them by reading the same verbal cue in an alternative or subversive way.

One observation is worth making here. The stimulus messages used in this experiment were closer to the documentary genre than to the daily news format; while the former accepts a point of view and more evocative language, the standards for the latter are objectivity and a more neutral language. Furthermore, the predictions of this study were based partially on research on advertising, which has stressed the importance of vivid, high-imagery language in generating cognitive and affective

reactions, to the point of implying that in the presence of such words images might be unnecessary (Unnava & Burnkrant, 1991). However, a regular news piece usually avoids language that may trigger ambiguous or biased interpretations, and thus some of the medium-related differences, that is, between those who are free to imagine the reality depicted in the piece and those who can actually see it, might be eliminated.

Resuming the present analysis, it is also worth mentioning that moments like the one just described caused some of the radio respondents to interpret some parts of the documentary in a humorous key, which again, did not happen with the television respondents. Some also thought it was good that the humor prevented the story from being too alarming (e.g. "The humor lightened things up"; "The story had enough humor to keep it from getting morbid"; "On the flip side, the story was somewhat comical"). It is unclear whether what some respondents saw as attempts to lighten up the mood of the story was indeed intentional. However, by acknowledging these cues in a news story that raised the disturbing possibility of an entire city being completely lost, the radio respondents resisted involvement with the story, and in general preferred to relate to it in a more detached way than the television viewers.

This attitude toward news was more present in the radio group because radio as a medium fails to involve individuals of this age in general. They probably use it more for music and entertainment and are less likely to see it as a serious news source. In fact, listeners in general prefer to get their radio news from music stations, rather than from stations that offer more in-depth coverage, as found by a survey conducted in 2000: "Among news followers who listen to radio, the highest average number of listening

minutes [per weekday] was recorded for news on music stations (248), followed by all-news stations (101), talk radio (81) and news on NPR (64)" (Radio and Television News Directors Association, n.d.).

But on the other hand, this expectation of entertainment from news that the radio participants suggested in their responses, might have been cultivated precisely by their exposure to television news, which strive to be entertaining, using spectacular and dramatizing effects and a dynamic mix of fragmented images and sound bites, introduced by glamorous anchors and juxtaposed with commercials.

This brings to mind Neil Postman's criticism of entertainment as news value (1985), a trend that he blames on television, not as content but as a medium that has brought about dramatic changes in our ways of thinking and representing the world. The problem, he argues, is not that television offers entertainment, but that "it has made entertainment itself the natural format for the representation of all experience" (p.87).

Judging by the examples taken from this experiment, one of the consequences might be that we expect news to be entertaining, and we value news stories that are so, even when the topic is a serious one. This might be symptomatic of a mood of detachment toward the events presented by the media, which are perceived in a fragmentary manner, rather than as parts of networks of causes and consequences. It might be symptomatic of a blurred distinction between reality and spectacle and of a disconnect between news as commodity, valuable in itself, and news as a functional tool, serving to help people make decisions, solve problems and bring about changes. As Postman (1985) points out, television news, guided by the standards of spectacle and

entertainment, has taken to extremes what began with the telegraph: it has dramatically altered our "information-action ratio" (p.68).

One of the requirements for a healthy democracy is the ability of the media to engage citizens in action or at least in debate. Instead, what the mainstream electronic media seems to be doing is turn people into passive spectators; they turn the *public* into *audience*, as contrasted by Whillock (1999): "Audiences are talked *to*; publics are talked *with.* Audiences are entertained; publics are engaged. Audiences live in the moment; publics have both memory and dreams. Audiences have opinions; publics have thoughts" (p. 7).

However limited in scope, this study has provided some evidence that the more we watch television, the more we blend into the passive audiences and the less we feel like expressing our thoughts: as shown in Appendix E, there was a negative correlation between the number of days in a week the participants reported watching the news on TV and both the number of original thoughts and the total number of thought they listed.

Furthermore, the initial prediction that the radio message would generate more elaborate thoughts was based in part on the expectation that the activation of a hurricane or disaster script in the respondents' minds would generate mental images, which in turn will activate other memory links. It was predicted that for the radio listeners the formation of mental images would not be impeded by the processing of externally provided images, some of which were irrelevant to the verbal content.

However, most of the participants have probably acquired such a disaster script from the media rather than from a personal encounter with a natural disaster situation. It

is thus helpful to look at how the news media, particularly television, construct such events. They are typically framed and subsequently stored in the collective memory as battles between heroic or victimized humans and nature as an evil, unpredictable, unexplainable, uncontrollable, almost mythical entity (Fry, 2002). Rarely does the focus expand to the larger background, to the economic or environmental causes of the disasters. Rather, the blame is left outside the human element and placed on the nature itself. Again, this is seen by Fry (2002) as a consequence of the inherent features of television as a medium that offers the best performance when exploited for its dramatic visual power and emotional appeal, and not when used for complex, objective and in-depth analyses. Yet, if this is the script that we have for disasters, maybe when faced with news about such events our natural reaction is not to elaborate on the issues, but rather to accept them passively as something we have no power to prevent or control.

Limitations and Suggestions for Further Research

The purpose of this study has been to examine which of the two broadcast media, radio or television, would elicit more elaborate information processing, in terms of cognitive and affective responses to a news message.

The most notable limitation of this study was the small sample of respondents and the fact that it consisted of students only. Moreover, they were all journalism students, who might have a different predisposition toward media messages than individuals outside this group. Future research should investigate the same effects on a

more diverse sample, and should attempt comparisons based on different demographic variables.

Some of the limitations pertaining to the ecological validity of this study are in fact common to most experiments. Experimental environments and circumstances are different than real life situations, at least in some aspects, and this might limit the extent to which results can be generalized. In this case, first of all, the classroom setting was very different from the one in which people normally watch TV or listen to the radio. Especially for radio, which is usually an individual rather than a group experience, the environment was quite unnatural. Secondly, before the experiment, participants were given only a limited amount of details about the purpose of the study in order to prevent their responses from being influenced by what they perceived was expected from them. Consequently, during the listening or viewing session, some of them probably wondered about the purpose of the experiment, which could have distracted them form processing the message.

Also, some valuable information might have been lost during the thought-listing procedure, because it occurred retrospectively rather than concurrently with respect to the exposure to the message. Although concurrent reporting may be cumbersome and may add to the unnaturalness of the communication situation, it is considered by some researchers to be more accurate and complete than retrospective thought-listing (Shapiro, 1994). However, given the fact that the purpose of this procedure in the present study was not to measure retention of information, but rather to explore the

thoughts triggered by the message and how they are influenced by medium-related characteristics, the effect of its timing was probably less critical.

The fact that the stimulus message represented a particular case, more typical for public than commercial broadcasting and closer to the documentary genre than to daily news stories, also limits the generalizability of the findings. Further research would be needed with stimulus messages from different news genres and different production styles.

Finally, one more detail must be reported in relation to the analysis. One of the questionnaire items asked the participants to what extent they agreed with the fact that the story reminded them of similar experiences from their past. As illustrated by Table F2 in Appendix F, which depicts the frequency distributions for the questionnaire responses, for this item a fairly large number of respondents - 33 out of 82 (40.2 %) - marked the zero value on the response scale, which was defined as *strongly disagree*. The limitation that needs to be acknowledged here is that it is impossible to know whether their strong disagreement with that statement means that the story did not activate any personal memories or simply that the respondents have not had such experiences in their lives. Given their age, the latter might be a very likely possibility.

As previously reported, this variable was one for which a *t*-test revealed a statistically significant difference in mean values between the two experimental groups, with a mean of 1.61 for television and one of 0.96 for radio (see Table 2). However, when the participants who reported a zero value were ignored in the analysis, because of the ambiguity in interpreting that value, the mean values of the two groups were very

close (2.15 for television and 2.00 for radio) and the difference between them was not statistically significant anymore (t = -.437, p = .664).

Conclusions

The results of this study suggest that cognitive elaboration is influenced in a certain degree by the characteristics of the medium in which the information is conveyed. The results, however, were not in the direction predicted. Two versions of the same message created for radio and television generated different responses in terms of the preferred routes for elaboration: the television group engaged in a more central route, while the radio group took a more peripheral route.

The results indicate that at least individuals from the same age group and with the same media use patterns and educational background as the participants in this study are more impatient with radio and less inclined to relate to it as a source of information, but might be more prepared to deal with the information overload, because they are able to elaborate more with the dual-modality medium of television than the single-modality medium of radio.

Their unequal exposure to visual media as compared to radio was held to be largely responsible for these results. The question remains, however, whether their ability to process television more efficiently than radio leads to a real informational gain. Does learning really take place with television, or just the illusion of it? Does television news help us see the larger background, the implications and connections necessary in understanding the world and making better decisions? As mentioned earlier, this study

has not proposed to answer these questions and previous studies have provided inconsistent findings, some probably due to methodological differences: learning from the news has been conceptualized in different ways, as comprehension, recognition or recall.

But even beyond the ability to retain in long-term memory particular pieces of information from the news, the next question is how well television news helps us put all these pieces together and to what use we put the information thus gained. Cultural scholars in the line of Marshall McLuhan, Walter Ong and Neil Postman argue that analytical thinking and in-depth processing can only be achieved through language, whose ultimate manifestation is the printed word. Images may supplement language but should not take precedence over it. Too often, though, in the present information environment, "Visuals set the pace, create the tone and draw us into a whole sensory environment - a place without history, without a future, and without material consequences" (Fry, 2002, p.114).

Although "particularly well suited to the transmission of rational, complex language" (Postman, 1985, p.112), more so than television, radio also seems to have failed to engage people in real conversations. Many people confuse being informed by radio with listening to political talk-shows, which have become a major source of political information (Lee & Cappella, 2001), but which have polarized the social and political discourse so much that any real dialogue among groups who have different views is almost impossible. Talk radio messages are usually "attitudinally-consistent"

(Lee & Cappella, 2001, p. 374), and the hosts usually preach to the converted, who tune in to have their ideas confirmed rather than challenged.

Radio as a medium could be conducive to deep elaboration, yet individuals exercising their right to be "cognitive misers" (Conover & Feldman, as cited in Graber, 1984, p.24) might not have the patience and the willingness to work with the medium. As this study suggests, some of them might get caught somewhere in the peripheral processing zone when it comes to radio, because it is perceptually and cognitively difficult to follow. And thus, as a consequence of an increasingly complex and fragmented information environment, more people will probably turn to those radio genres that provide either escape, such as music, or reassurance for their already-held beliefs and biases, such as talk-shows.

This seems to be consistent with the findings of the Radio and Television News Directors Association survey (n.d.). Compared with 1982, in 2000 less people reported "news" as the reason for selecting a radio station - 21 % in 2000 versus 39 % in 1982 - but more reported "personalities" as the reason - 12 % in 2000 versus 7 % in 1982. Moreover, radio's credibility is low, in some aspects even lower than the credibility of the Internet, because it is often assimilated with the partisan discourse of talk radio: "listener impressions of radio news have been colored by the strong voices and on-air personalities inherent in talk radio and niche programming of different music formats" (Radio and Television News Directors Association, n.d.).

However, where television have failed to promote an efficient democratic debate and participation, and in this era of "secondary orality" (Ong, 1982), where new generations might prefer the immediacy and involvement of electronic media to the coldness and separation of print, radio might still be important as creator of serious discourse. Several factors could work to its advantage: although people consistently list television as their main source of information, radio is still the most widely available news source and it is the medium most easily present in our lives throughout the day (Radio and Television News Directors Association, n.d.). Furthermore, radio is local and so is politics: "We must first recognize that territory matters. As long as we have voting districts that are geographically determined, we must find ways of communicating with those people who physically reside in our communities" (Whillock, 1999, p. 26).

However, as this study suggests, the first condition that would allow radio to re-gain its status as a space of democratic dialogue is for the audiences to learn how to engage in a dialogue with the medium itself; in this visual age, this could start perhaps with learning how to listen.

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Appendix A. Questionnaire

A. Please read carefully the following questions and circle the number you find the most appropriate. "0" means you "strongly disagree" with the statement above, while "4" means that you "strongly agree" with it.

When you mark your answer, please follow this example.

EXAMPLE:
Red is a more beautiful color than blue.
0 1 2 3 4

While I was watching/ listening to the story,

I was reminded of similar experiences from my past.
0 1 2 3 4

I imagined myself in a similar disaster scenario.
0 1 2 3 4

The story worried me.
0 1 2 3 4

A devastating flood in New Orleans is very likely to happen.
0 1 2 3 4

B. Please circle the answer that best describes your use of broadcast news media:

How many days during a typical week do you watch TV *news* programs?
0 1 2 3 4 5 6 7

How many days during a typical week do you listen to radio *news* programs?
0 1 2 3 4 5 6 7

Appendix B. Examples from the Thought-Listing Protocols

Message-Supplied Thoughts

Radio Group

- A category 5 hurricane would have the power to completely destroy the city, leaving it completely underwater.
- We also learned that the evacuation process was a fiasco.
- There are many levees on the Mississippi River.
- 150 mph winds.
- The radio segment focused on the effects of category 5 hurricanes on Southern cities, particularly New Orleans.
- There have been threats of such a disaster beginning in 1969 with Hurricane Camille, and since then hurricane Andrews and most recently hurricane Georges.
- There is a stick that measures how big a hurricane will be.
- The evacuation routes weren't good.
- There would be up to 20 ft. of water in New Orleans if a hurricane hit.
- New Orleans is under sea level.
- Blue signs on highways to mark the evacuation route.
- Most people were in the cars on the road when they found out about evacuation.

TV Group

- A level 5 hurricane is the worst.
- Levees built are now not enough to protect the city.
- New Orleans is a place where a natural disaster is very possible.
- New Orleans is below sea level.
- The officials ran an experiment to see how much would be destroyed from a level 5 hurricane.
- Then he looked at the history of storms in the area.
- They have gone this long without seeing a level 5 hurricane.
- Bleak prospects for survival in case of a big hurricane.
- Did not realize how much of a chance New Orleans has of going under.
- The emergency route implemented doesn't work.
- They showed the traffic jams that resulted from the attempted use of the evacuation routes.

Receiver-Originated Thoughts

Radio Group

- Is this a major concern of our government?
- We need to do as much as we possibly can with the technology that we have available.
- Officials should not assume that they will not see a horrific storm, flood, fire, earthquake, tornado, etc., during their lifetime.
- It is always good to be prepared no matter what.
- The only time I've worried about hurricanes was when my sister lived in North Carolina several years ago.
- I thought of the movie Twister.
- My family and I were evacuated from our vacation spot in Myrtle Beach, S.C. to avoid the storm (Andrew).
- What would happen to Mardi Gras.
- I thought that the earth really isn't ours to take.
- If New Orleans was hit by a hurricane and thousands died, will people wish the city was not even allowed to be lived in?
- I pictured people trying to escape through evacuation routes.
- Ohio will never see that kind of storm.
- Where does the Mississippi River come into New Orleans?
- Would people really wait too long to get out of the city?

TV Group

- I'm not sure how New Orleans can defend itself other than condemning the city and forcing everyone to relocate.
- There is no safe place to live.
- What do they do to notify tourists of problem?
- This is why insurance exists.
- I remembered how I visited New Orleans in the Fall of 2003.
- I wonder whether residents of New Orleans who saw this would think twice about remaining there.
- That part of the piece reminded me of the helplessness/ hopelessness of the people in that movie (i.e. *Deep Impact*), who were just waiting to die.
- Is there anything being researched structurally to alleviate the problem?
- All of new Orleans' cemeteries have above ground mausoleums because the ground is too wet to bury people.
- I thought about my friend Mary Ellen whose family lives there and she wants to go there this summer for an internship.
- I was curious why this city was not like Venice or Amsterdam, with canals instead.
- What will people who live in New Orleans actually be able to do to survive such a catastrophe?

- Natural disasters are something humans have little power over.
- I thought that we really were being foolish as a species.
- I wouldn't have considered the likelihood of a natural disaster when choosing a city to live in but now I might.
- There is no way people can just get up and move now.
- I go there every year in the spring with my dad, just to get some great food, listen to wonderful music and enjoy all the great people.
- I have seen the gigantic pump stations that they have located around the city.
- If I only had a half-hour to get my stuff and leave, knowing that when I return everything would be gone, what the hell would I pack?
- The inadequacy of human efforts to protect humans from natural disasters.
- The protection may really be necessary, especially as I'm getting older and possibly starting a family.

Receiver Reactions to Message Content

Radio Group

- It really alarmed me the devastation that could be brought due to weather.
- It was troubling how quickly a hurricane could kill 40,000 people if it hit New Orleans.
- I'm glad I don't live around water and have to worry about this.
- It's almost unbelievable to me that in the next 50 years there is a one in six chances I could see New Orleans under water.
- I am extremely afraid of drowning.

TV Group

- Amazement that people still risk being washed away by living there.
- Sad to think about the citizens who would be affected.
- It made me glad my sister was not still living in New Orleans.
- Made me feel powerless.
- Shocked at how high water level could get.
- I felt sympathy for the people in the footage who had been affected by the hurricanes.
- The fact that people would be stuck in the case of an evacuation scenario is really terrifying.
- It is literally scary that a whole city can be washed away by a hurricane.

Thoughts about Journalistic/Production Values

Radio Group

- The New Orleans storm story seemed very much like a typical piece from NPR's "All things considered".
- I liked the use of natural sounds in the story.
- The reporter may have dramatized the story a little bit.
- In the beginning there was music in the background and children at play, too.
- The reporter or narrator had an entertaining voice, humorous in a way.
- The broadcast gave good details and specific info regarding the topic.
- When he referred to the "scientist with a big stick", it seemed in poor taste.
- It's things like "KYAGB," the good balance of seriousness and levity that made it memorable and kept it from being just another Saturday morning NPR piece.

TV Group

- Doomsday-ish tone to the coverage.
- I wish more facts were presented.
- Why do they always show a mobile home or trailer in natural disaster stories?
- When did the story air?
- Was it aired nationally or locally?
- The coverage of this story was very complete and showed all aspects of the story.
- Showing all the cars stuck in traffic was good visual representation of what would happen if people tried to flee from any city all at the same time.
- I didn't particularly like the reporter style.
- Some of the sources weren't cited.

Thoughts about Thoughts

Radio Group

- Minor details have slipped my mind.
- (But) by the end of the story I found my thoughts drifting to other things on my mind.
- Every time the narrator said "extending his stick" the boy and girls in front of me laughed.
- I heard half of the class chuckle at that statement.
- At first, I really paid attention to what was being said on the audio tape.
- I started looking around at people.
- My mind would occasionally drift back to the tape.

TV Group

- I want to be able to finish the segment.

Thoughts Irrelevant to the Message

Radio Group

- Work - what times I'll work next week.
- What I have to do this afternoon.
- My com law paper.

TV Group

- What I have to do for tomorrow's class.

Appendix C. Story Transcripts

Transcript TV Story: Hurricane Risk for New Orleans

AUDIO	VIDEO
DANIEL ZWERDLING: When travelers rate their favorite cities around the world, they put New Orleans near the top of the list... Cajun culture... The Mississippi...The French Quarter.	New Orleans skyline, man playing saxophone on a terrace, boat on the Mississippi, street in French Quarter
But a scientist named Joe Suhayda sees a more troubling vision of this city.	Street in the French Quarter.
JOE SUHAYDA: What we have here is a surveying rod and it has the lengths marked along the length of the rod. So what I'm going to do is go ahead and extend this.	Suhayda shows Zwerdling the rod.
DANIEL ZWERDLING: Can I help you here?	
JOE SUHAYDA: Yes. Go ahead and hold that.	He extents it to illustrate how high the water would be.
DANIEL ZWERDLING: Suhayda studies hurricanes. And he's brought me to the French Quarter to show what could happen if the most powerful kind of hurricane hits New Orleans.	
JOE SUHAYDA: So this indicates the depth of water that would occur above this ground in a category five hurricane.	
DANIEL ZWERDLING: It's hard to comprehend, really.	
JOE SUHAYDA: It is really, to think that that much water would occur during this catastrophic storm.	
DANIEL ZWERDLING: So basically the part of New Orleans that most people in the United States and around the world think of as New Orleans would disappear under water.	Image of the rod - high as the buildings.
JOE SUHAYDA:: That's right. During the worst of the storm, most of this area would be	

covered by 15 to 20 feet of water.

DANIEL ZWERDLING: Do you expect this kind of hurricane and this kind of flooding to hit New Orleans in our lifetime?

JOE SUHAYDA:
Well, there... I would say the probability is yes.
In terms of past experience, we've had three storms that were near-misses that could've done at least something close to this.

DANIEL ZWERDLING:
So emergency management officials are trying to get ready... they're playing a hurricane version of war games.

Maestri's office

WALTER MAESTRI:
A couple of days ago we actually had an exercise where we brought a fictitious Category Five hurricane into the metropolitan area

Maestri and Zwedling talk

DANIEL ZWERDLING: The worst.

WALTER MAESTRI: the absolute worst,

DANIEL ZWERDLING:
Walter Maestri is basically the czar of public emergencies in Jefferson Parish.
It's the biggest suburb in the region.

Maestri points at the map

WALTER MAESTRI:
Well, when the exercise was completed
it was evident that we were going to lose a lot of people
we changed the name of the storm from Delaney to K-Y-A-G-B... kiss your ass goodbye...
because anybody who was here as that Category Five storm came across... was gone.

Close-up of the map with KYAGB written in blue.

DANIEL ZWERDLING:
The American Red Cross lists the worst natural disasters that might strike America.

Shots of storm sky with lightning,
hail
river - flooding

They worry about earthquakes in California,
and tropical storms in Florida.
But they say the biggest catastrophe could be a hurricane hitting New Orleans.

highway broken in two by earthquake
houses destroyed by tropical storm

People have known for centuries that they picked a risky spot to build this city.
In fact, some of the first French settlers wanted to abandon it.

still shot - drawing of old New Orleans flooded

The biggest river on the continent snakes around it.
Most of the land here is below sea level.
And every time people tried to expand the city, the Mississippi promptly flooded it.

still shot - drawing of Mississippi River

Archival image - people in boats on flooded streets

DANIEL ZWERDLING:
Why did people stay here?
it became obvious very, very quickly after the French came that this was a really lousy place to live.

OLIVER HOUCK:
They made a lot of money.
Because they were the transfer point for all the shipping that came out of the belly of the country and went to France and went to South America and went to England
and all of the ships coming in, you had to pass by New Orleans.

Houck talking in his office

DANIEL ZWERDLING:
So they launched what's become one of the biggest construction projects in history.
To protect their investments.
As of today, the us arm has built 2000 miles of levees to stop the Mississippi from flooding.
And until recently, scientists thought that these walls of soil and concrete and steel had made New Orleans safe.
They never dreamed that the levees would come back to haunt them.

Still shots drawings and - photos of people building the levees

OLIVER HOUCK:
So the irony of history and the evolution of the problem has been that we've been defended ourselves against the enemy that we knew,

Houck talking in his office

which was the river.
Like one of those old citadels in an adventure story,
But to the rear and to the flank was this other threat
that we're only beginning now to appreciate,
and it may be too late to prevent.

WALTER CRONKITE (FROM TAPE): The remnants of killer Hurricane Camille continued to spread death and destruction...	Black and white image of Walter Cronkite
DANIEL ZWERDLING: In 1969, Hurricane Camille rattled the country… it was a rare Category 5. Here's the problem: when government officials built the levees to protect New Orleans, they designed them to hold off much smaller kinds of storms. They didn't expect that a hurricane as big as Camille would show up in our lifetimes...or our grandchildren's lifetimes.	Archival images of Camille: wind, storm shot taken from a car with a cow in the middle of the road
WALTER CRONKITE: Hurricane Camille was by any yardstick the greatest storm of any kind ever to hit the nation...	Black and white image of Walter Cronkite
DANIEL ZWERDLING: Camille missed New Orleans, but not by much. And it suggested that maybe officials had been short sighted.	Archival image of Camille destruction: houses man hugging crying woman
Then nature shook the nation again in 1992. Remember Hurricane Andrew? That was another Category Five storm — Andrew was the most expensive natural disaster in America's history. And the center of the storm didn't even hit a city. Well after Andrew, officials in Louisiana began to worry more about New Orleans. They came up with elaborate evacuation plans:	Images from Andrew: flooded streets destroyed mobile homes destroyed houses Image of a street in New Orleans with a blue sign that reads “Evacuation route”.
PROMOTIONAL VIDEO: "If the warning goes out, by all means, evacuate!"	Images with storm and flooded highway from the public service

	announcement
DANIEL ZWERDLING: And then another storm came that a lot of those plans wouldn't work:	Image of “furious” ocean, waves, flooded beach
JOE SUHAYDA: Well, Hurricane Georges was one for which the track was to the East of the City and had the potential of flooding the City.	Suhayda talks while driving
DANIEL ZWERDLING: At the last minute, Georges faded and veered away from the city... And that was lucky.	Two night shots of streets in New Orleans
JOE SUHAYDA: What happened to the people that did evacuate is that they got into massive traffic jams and many of them spent the worst part of the hurricane either on a-- on the highway, stopped, or had pulled off to the side of the road.	Suhayda talks while driving Images of traffic jams
DANIEL ZWERDLING: I'm trying to picture tens of thousands, hundreds of thousands of people trapped in these traffic jams as the hurricane is hitting the City and the water level is starting to rise. What would happen to them?	Images of traffic jams Image of a pond - storm is coming, water agitated
JOE SUHAYDA: They would be washed away and there would be really no way for public help emergency services people to get to them to help them.	Suhayda talks while driving

Transcript Radio Story: Hurricane Risk for New Orleans

SOUNDS: Music

DANIEL ZWERDLING:
Think about the great cities in this country…
and one of them would be New Orleans.
On a recent evening a scientist pulls up in the French quarter.
Joe Suhayda takes a plastic rod out of his truck
and proceeds to show us what could happen the next time a hurricane hits New Orleans.

JOE SUHAYDA:
OK, this is a tool I have, a range rod,
it will show us how high the water would be if the city was hit by a category 5 hurricane.

DANIEL ZWERDLING: This would mean what, how many feet?

JOE SUHAYDA: About 20 feet above the ground that we're standing on right now.

DANIEL ZWERDLING: 20?

JOE SUHAYDA: 20 feet. So I'll extend this up…

SOUNDS: STREET AND CLICKS

DANIEL ZWERDLING:
A category 5 hurricane is the most powerful storm on a scientific scale.
Suhayda plants the rod on the sidewalk,
next to a 200 year old building that's all rod iron balconies and faded brick and wooden shutters.
Every click marks another foot that the water will rise up this building.

SOUNDS: CLICKS

DANIEL ZWERDLING: I can't believe you're still going.

JOE SUHAYDA: Yeah, I know it's kind of shocking.

DANIEL ZWERDLING: Until a couple of months ago, Suhayda ran a prominent research center at Louisiana State University.
They've developed the most detailed computer models that anybody's ever used to predict how hurricanes could affect this region.

Studies suggest that there's roughly a 1 in 6 chance that a killer hurricane will strike New Orleans within the over 50 years.
Suhayda is still extending his stick.

JOE SUHAYDA:
It's well above the second floor there
and it's just about to the roof top

DANIEL ZWERDLING: It's hard to comprehend, really.

JOE SUHAYDA: It is, really, to think that so much water could occur in the city during this catastrophic storm

DANIEL ZWERDLING: Do you expect this kind of hurricane and this kind of flooding to hit N.O. in our lifetime?

JOE SUHAYDA:
Well, I would say the probability is yes,
in terms of past experiences, we've had three storms that were near misses
that could have done at least something close to this.

DANIEL ZWERDLING: So, basically, the part of New Orleans that most Americans of most people around the world think as New Orleans would disappear under water.

JOE SUHAYDA: It would, that's right.

SOUNDS: HORSE CARRIAGE IN THE STREET

DANIEL ZWERDLING:
And just across the Mississippi River, Walter Maestri is struggling to help New Orleans prepare.
Maestri is the czar of public emergencies in Jefferson Parish,
that's the country that spurs across the third of the metropolitan area.
He points to a map of the region on the wall of his command post.

WALTER MAESTRI:
Couple of days ago, we actually had an exercise
where we brought a fictitious category 5 hurricane into the metropolitan area

DANIEL ZWERDLING:
The map is covered with arrows and swirls in erasable marker.
They show how the fictitious hurricane crossed key West and then smacked into New Orleans.

When the computer model showed Maestri what would happen next, he wrote big letters on the map, all in capitals:

WALTER MAESTRI:
KYAGB – Kiss your ass goodbye…
because anybody who was here as that storm came across was gone.
It was body bag time.
We think 40,000 people could lose their lives in the metropolitan area.

DANIEL ZWERDLING:
And some researchers say that figure is conservative.
People have known for centuries that New Orleans is a risky spot.
and most of the region is bellow sea level.
That's why they built 2000 miles of levees along the Mississippi River to keep the water out.
But researchers say they've been learning just how serious the threat is only in the last few years
and they say the nation isn't prepared to handle it.
The first warning shots came in 1969.
To begin to understand why, we clamber up the levees along the Mississippi River.

OLIVER HOUCK:
There is no place in the world that has a levee system as extensive as this one.
It's a monstrous system.

DANIEL ZWERDLING: Our guide is Oliver Houck.
He runs the environment program at Tulane University Law School.
The US army built this monstrous system we're standing on.
Since the late 1800, the Army Corps of Engineers has built more that 2000 miles of high grassy embankments along the Mississippi and its branches.

OLIVER HOUCK:
It was always thought that the big threat of flooding in New Orleans was from the river and it was cause it flooded regularly.
And so we beat flooding by taming the river.
The irony of this is that like one of these old citadels in the stories, we defended ourselves against the enemy that we knew it was the river,
but to the rear and to the flank was this other threat
that we were only beginning now to appreciate
and it may be too late to prevent.

DANIEL ZWERDLING: The first warning shots came in 1969.

WALTER CRONKITE (FROM TAPE): The remnants of hurricane Camille continue to spread death and destruction today…

DANIEL ZWERDLING:
Hurricane Camille shocked the country.
It was one of those rare category five storms.
And here's the problem: When the government built the levees to protect New Orleans, they designed them to hold off much smaller storms.
Government officials didn't expect that such a massive hurricane could hit the city in our lifetimes or in our grandchildren's lifetimes.

WALTER CRONKITE (FROM TAPE): the country's chief hurricane experts declared today that hurricane Camille was the greatest storm of any kind ever to hit the nation.

DANIEL ZWERDLING:
Camille missed New Orleans, but only by a hundred miles,
which suggested that maybe government officials had been short-sighted.
Then another category five storm hit the country in the early 1990's.
Remember Hurricane Andrew?
Now officials in Louisiana started to worry more about New Orleans
and they got another warning just a few years ago.

ANNOUNCER (FROM TAPE):
Forecasters say Georges could strike New Orleans with 115 mile/ an hour winds.
Thousands packed up and moved out, clogging evacuation routes.

DANIEL ZWERDLING:
And that taught everybody a troubling lesson.
Joe Suhayda, the scientist with a big stick drives me through the city to explain.

JOE SUHAYDA:
Hurricane Georges was one for which the track had the potential to flood the city.
So the people were given a mandatory evacuation order: "Evacuate the city".

DANIEL ZWERDLING:
Government officials had made elaborate plans so the population could evacuate smoothly.
We keep passing blue street signs marked "hurricane evacuation routes".
The government had organized fleets of buses to rescue tens of thousands of people who didn't have cars.
At the last moment hurricane Georges faded into a smaller storm and veered away, which was… lucky,
because the evacuation was a fiasco.

JOE SUHAYDA:
What happened to the people that did evacuate is that they got into massive traffic jams and many of them spent the worst part of the hurricane either on the highway, stopped or had pulled off to the side of the road.

DANIEL ZWERDLING:
Now supposing the hurricane had really walloped New Orleans
here are all these thousands and thousands of people trapped on the road,
what would happen to them?

JOE SUHAYDA:
Many of our evacuation routes are subject to flooding.
They would be washed away
and there would be really no way for the public help emergency services people to get to them to help them.

Appendix D. Coding Instructions

1. Case Number
2. Group
1 = radio
2 = television

For the following categories, please count how many thoughts belong to each category and write down the number on the coding sheet. Each bullet represents a separate thought.

3. Message-supplied thoughts
Please include in this category the thoughts that **directly reproduce factual information presented in the stimuli,** verbally in the radio version and both verbally and visually in the television version. In order to decide whether a thought belongs to this category, please check the transcripts of the stories.
Examples:

- New Orleans is below sea level.
- New Orleans is a place where a natural disaster is very possible.
- A level 5 hurricane is the worst.
- I didn't know that New Orleans was at such risk from hurricanes.
- I never thought about the damage a hurricane could do.
- They showed the traffic jams that resulted from the attempted use of the evacuation routes.

NOTES:

- These thoughts may be introduced by phrases like **"They said that…," "They showed that…," "We learned that…," "We know that…"**
- They can also be introduced by: **"I didn't know…," "I didn't think…," "I've neglected to think…," "I didn't realize…," "I was unaware…," "I never considered that…"** (these phrases are equivalent with *"I have just found out from the message that New Orleans was at great risk from hurricanes")*
- On the other hand, if they are introduced by **"I cannot believe/It's unbelievable/ It is shocking/It is interesting that…,"** they denote a reaction (disbelief, shock, interest) from the receiver, and therefore should belong to the **receiver-reaction** category.

4. Receiver-originated thoughts

Please include in this category thoughts that were **triggered by the *content* of the message but do not reflect directly or exclusively the assertions made in the message**. These thoughts illustrate an expansion of thinking beyond the factual information contained in the stimulus. They elaborate on the information provided by the stimulus but **take it a step further**. They denote associations with general knowledge or personal experiences previously stored in respondents' minds.

Examples:

- Natural disasters are something humans have little power over.
- Evacuation routes never work.
- In Ohio, you don't really think about earthquakes and hurricanes.
- If I want to go to New Orleans, I should do it sooner than later.

NOTES:

➢ Please also include here thoughts that reflect an **opinion, evaluation or judgment** regarding a situation presented in the message.

Examples:

- Officials need to come up with better plans for what to do if a hurricane hits.
- They should just focus on developing a sure fire emergency plan now.

➢ Many of the respondents expressed their thoughts **as questions (direct or indirect)**. If they refer to the *content* of the message, please include them in this category, because they show that the respondents used the information in the piece to elaborate on the issues presented.

Examples:

- How most of the people of New Orleans feel?
- Who would want to move there?
- What more or else can be done to find an alternate solution?
- Is it a problem in any other cities?
- I wondered what else they could do to protect the city.

➢ Some respondents, especially in the radio group, have mentioned **images that the message has evoked in their minds**. They should also be included in this category because they are based on knowledge and experience previously stored in the respondent's memory.

Examples:

- I imagined the building in the beginning.
- I pictured the reporter and the scientist with the 20 ft extendible stick.
- As the man was describing the effects a level 5 might have on a city such as New Orleans, I pictured how scared I was of such a small hurricane *(before this she has mentioned a smaller storm that she experienced as a child).*

5. Receiver reactions to message content

Please include in this category **expressions of feelings and attitudes generated by the *content* of the message**. Most of these statements contain **key words** expressing

emotional or attitudinal responses to the message, such as: “scary”, “frightening”, “terrifying”, “interesting”, “funny”, “crazy”, “hard to believe”, “can’t believe”, “hope”, “glad”, “skeptical,” “disappointed”, “concerned”, etc.

Examples:

- I couldn’t believe that New Orleans could be washed away.
- It is scary/ shocking/crazy/unbelievable that New Orleans could be washed away.
- The acronym for the hurricane (KYAGB) was funny.
- I’m glad I don’t live there.
- I wanted to move there, but now I’m not so sure.
- I hope New Orleans doesn’t get hit by a hurricane.
- I was concerned for the safety of the relatives that I have in the South.

6. Thoughts about journalistic/production values

Please include in this category thoughts that express an **evaluation of the message from the point of view of the journalistic or production values or context (including references to the pronunciation or speaking style of the people in the story)**.

Examples:

- The New Orleans storm story seemed very much like a typical piece from NPR.
- The coverage of this story was very complete and showed all aspects of the story.
- The visuals really showed how dangerous a situation this really is.
- The narrator’s voice was annoying.
- What news source / station is this from?
- When did this air?
- The fear element in the piece kept my interest.
- I really liked the piece.
- It was funny how the reporter kept referring to the scientist as “the man with the big stick”.

NOTE:

➢ There are a lot of thoughts about the “big stick” ☺!

If they sound *like “The scientist had a big stick”* or *“There is a stick that measures how high the water would be in a hurricane,”* please place them with the **message-supplied thoughts.**

If they evaluate the phrase (“funny”) or judge the reporter’s taste in using it, please include them in the **thoughts about the journalistic/production values.**

7. Thoughts about thoughts

Please include in this category thoughts that show the respondents **analyzing their own thinking or behavior or the behavior of other respondents** during the listening/ watching session. These thoughts could not have occurred simultaneously with the listening/watching activity, but are the result of subsequently analyzing it.

Examples:

- I can remember bits and pieces of the story.
- Minor details have slipped my mind.
- By the end of the story I found my thoughts drifting to other things on my mind.
- The laughter stopped.
- I couldn't help but think of a similar situation.
- I pictured each event that was discussed in the radio broadcast.
- Lots of feelings were evoked.
- I can't really even summarize the story because it was so hard for me to pay attention.
- That caught my attention.
- I tried to picture the whole scene I was hearing unfold in my mind.

NOTE:

➢ Think what the **actual thought** was and try to isolate it from the way the respondent has verbalized it:

"*All kinds of thoughts kept running through my head*" is **thoughts about thoughts.**

"(The though of) ***getting drowned*** (*kept running through my head)"* is **receiver originated**.

"(The thought of) ***the big stick*** *(kept running through my head)"* is **message-supplied**.

8. Thoughts irrelevant to the message

Please include in this category those thoughts that **have no connection whatsoever with the message**. These thoughts should signal the fact that at that point the attention of the receiver shifted away completely from the message.

Examples:

- I thought about my communication law paper.
- I thought about when I have to work next week.
- I have a tanning appointment in half an hour.

9. Total number of thoughts

Please count the bullets.

Appendix E. Intercorrelations between Types of Thoughts, Questionnaire Items and Media Use

	1	2	3	4	5	6	7
1. Message-supplied	1	-.336**	-.122	-.235**	-.141	-.069	.005
2. Receiver thoughts & reactions	-.336**	1	.347**	-.356**	-.109	-.108	.673**
3. Receiver reactions	-.122	.347**	1	-.194	-.147	-.151	.127
4. Journ./prod.values	-.235**	-.356**	-.194	1	.046	-.108	.138
5 About thoughts	-.141	-.109	-.147	.046	1	.468**	.230*
6. Irrelevant	-.069	-.108	-.151	-.108	.468**	1	.085
7. Total thoughts	.005	.673**	.127	.138	.230*	.085	1
8. Reminded of similar exper.	-.009	.110	.076	-.105	-.120	-.160	-.021
9. Imagined in similar scenario	-.181	.152	.203	-.052	-.172	-.129	-.045
10. Worried	-.033	.213	.363**	-.028	-.272*	-.157	.106
11. Flood very likely	-.120	-.029	.000	-.008	-.132	-.044	-.132
12. Days/week watch news TV?	-.166	-.222*	-.045	.230*	-.147	-.171	-.286**
13. Days/week listen to news radio?	-.202	.081	-.029	.253*	.058	-.090	.144

(continued)

Note. *Correlation is significant at $p < .05$; **Correlation is significant at $p < .01$

Appendix E: continued

	8	9	10	11	12	13
1. Message-supplied	-.009	-.181	-.033	-.120	-.166	-.202
2. Receiver thoughts & reactions	.110	.152	.213	-.029	-.222*	.081
3. Receiver reactions	.076	.203	.363**	.000	-.045	-.029
4. Journ./prod.values	-.105	-.052	-.028	-.008	.230*	.253*
5 About thoughts	-.120	-.172	-.272*	-.132	-.147	.058
6. Irrelevant	-.160	-.129	-.157	-.044	-.171	-.090
7. Total thoughts	-.021	-.045	.106	-.132	-.286**	.144
8. Reminded of similar exper.	1	.067	.105	.052	.074	-.073
9. Imagined in similar scenario	.067	1	.500**	.394**	.099	-.026
10. Worried	.105	.500**	1	.537**	-.087	.041
11. Flood very likely	.052	.394**	.537**	1	.074	.126
12. Days/week watch news TV?	.074	.099	-.087	.074	1	.163
13. Days/week listen to news radio?	-.073	-.026	.041	.126	.163	1

Note. *Correlation is significant at $p < .05$; **Correlation is significant at $p < .01$

Appendix F. Frequency Distributions

Table F1

Frequency Distributions for Media Use

Score	N. of cases (each group)		N. of cases (both groups)	Percent (both groups)	Cumulative percent (both groups)
	Radio	TV			
	How many days/ week do you watch news television?				
0	2	3	5	6.1	6.1
1	7	3	10	12.2	18.3
2	7	4	11	13.4	31.7
3	6	6	12	14.6	46.3
4	4	10	14	17.1	63.4
5	6	8	14	17.1	80.5
6	5	1	6	7.3	87.8
7	9	1	10	12.2	100.0
Total cases	46	36	82	100.0	

(continued)

Table F1: continued

Score	N. of cases (each group)		N. of cases (both groups)	Percent (both groups)	Cumulative percent (both groups)
	Radio	TV			
How many days/ week do you listen to news radio?					
0	16	12	28	34.1	34.1
1	9	12	21	25.6	59.8
2	6	4	10	12.2	72.0
3	3	3	6	7.3	79.3
4	3	2	5	6.1	85.4
5	2	2	4	4.9	90.2
6	2	1	3	3.7	93.3
7	5	0	5	6.1	100.0
Total cases	46	36	82	100.0	

Table F2

Frequency Distributions for Questionnaire Responses

Score	N. of cases (each group)		N. of cases (both groups)	Percent (both groups)	Cumulative percent (both groups)
	Radio	TV			
	I was reminded of similar experiences from my past				
0	24	9	33	40.2	40.2
1	10	12	22	26.6	67.1
2	5	5	10	12.2	79.3
3	4	4	8	9.8	89.0
4	3	6	9	11.0	100.0
Total cases	46	36	82	100.0	
	I imagined myself in a similar disaster scenario				
0	7	6	13	15.9	15.9
1	8	4	12	14.6	30.5
2	11	6	17	20.7	51.2
3	10	12	22	26.8	78.0
4	10	8	18	22.0	100.0
Total cases	46	36	82	100.0	

(continued)

Table F2: continued

Score	N. of cases (each group)		N. of cases (both groups)	Percent (both groups)	Cumulative percent (both groups)
	Radio	TV			
			The story worried me		
0	8	3	11	13.4	13.4
1	12	4	16	19.5	32.9
2	5	10	15	18.3	51.2
3	14	15	29	35.4	86.6
4	7	4	11	13.4	100.0
Total cases	46	36	82	100.0	
			A devastating flood in New Orleans is very likely to happen		
0	1	2	3	3.7	3.7
1	10	4	14	17.1	20.7
2	15	16	31	37.8	58.5
3	14	10	24	29.2	87.8
4	6	4	10	12.2	100.0
Total cases	46	36	82	100.0	

Note. 0 = *strongly disagree*; 1 = *disagree*; 2 = *neither agree, nor disagree*; 3 = *agree*; 4 = *strongly agree.*