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Audio-Visual Redundancy and TV News Recall

This experimental study examines the effects of audio and visual redundancy on recall and story understanding in television news. College students viewed a series of voice-over news stories that varied in the amount of redundancy between the two channels and then responded to both auditory and visual recall measures. The results show higher auditory recall and story understanding in the high-redundancy condition than in the lower redundancy conditions. Visual recall shows the reverse pattern with higher recall scores in the lower redundancy conditions than in the high-redundancy condition.

Concern about the dependence of Americans on television for public affairs knowledge and evidence of low recall from the electronic media have prompted a growing body of research in this area. Field surveys show that viewers are able to recall only a small number of stories presented in newscasts (Katz, Adoni, & Parness, 1977; Neuman, 1976; Stauffer, Frost, & Rybolt, 1983).

Although many factors including distractions in the viewing environment may help account for this, the nature of the television medium may be a major determinant. Because television presents information in two channels, there is potential for overloading the information-processing capabilities of viewers. TV news has an even greater potential for this because many of its stories are voice-over, that is, the voice track and video track are not necessarily isomorphic. This raises a number of intriguing questions about the processes involved in viewer assimilation of the auditory and visual channels.

Most cognitive psychologists accept the assumption that the human information-processing system has limited capacity, although there is

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disagreement about the nature of that bottleneck. Some have argued that a sensory filter early in processing permits only a limited amount of stimuli access to long-term memory, and that physical characteristics of the stimuli are important for directing attention (Broadbent, 1982; Treisman, 1964). Others suggest there is selection late in the process after the meaning of stimuli have been analyzed in long-term memory (Deutsch & Deutsch, 1963; Norman, 1976; McKay, 1973).

Another position holds that the filter analogy is not necessary for explaining attention. These "capacity" models suggest that there is no need to assume that the bottleneck occurs at any particular location in information processing (Kahneman, 1973; Norman & Bobrow, 1975; Shiffrin & Schneider, 1977; Wickens, 1984). These models suggest that people can share attention across channels of information up to the capacity of the system at a particular processing stage. The division of attention depends, among other things, on the nature of the stimuli and the nature of the cognitive task at hand (Wickens, 1984).

It is difficult to make the leap from theories based on tight control of simple stimuli to a complex information-processing task such as television news viewing. The attention literature clearly indicates, however, that the viewer's ability to divide attention between channels depends on a number of variables, including the nature of the stimuli presented.

This probably explains why studies of the contribution of visual information to learning from television news have produced mixed results. Some studies indicate that the use of visual elements actually inhibits recall (Edwardson, Grooms, & Pringle, 1976; Findahl, 1972; Jorgensen, 1966). Other studies find mixed results depending on variables such as length of stories and how well visual illustration fits the story narrative (Gunter, 1980).

A number of studies show that viewers are able to attend to both channels simultaneously. Findahl (1981) found that pictures and graphics helped subjects recall information from television news stories. Drew and Reese (1984) reported that children who watched a newscast with film performed much better on recall and understanding tests than those who viewed a newscast with only the anchor reading. Other television news studies suggest that the visual channel will enhance learning if it is complementary to the auditory channel (McDaniel, 1973; Reese, 1984). Pezdek and Stevens (1984) showed that the auditory and visual can be

manipulated in order to elevate children's comprehension scores of *Sesame Street*.

Key issues in all of this may be how viewers divide their attention between the auditory and visual channels and the informational relationship between the two. Some television news literature suggests viewers attend primarily to the audio when watching television news. Gunter (1983) points out that the auditory channel usually carries the dominant information in television news with the visual channel playing a subordinate role. Katz et al. (1977) also found the auditory to be the more important informational channel in a field study of television news recall. An experiment by Drew and Cadwell (1985) found viewers' attention focused on the audio in a typical voice-over television news story. As a result, they did not notice serious editing errors. When the audio was removed, the errors were spotted easily.

Clearly, then, the two channels appear to be attended to in tandem with the possibility that more attention is paid to the auditory channel than the visual when the two are complementary. The reason may be that we are accustomed to receiving factual information through that channel in television news. Baggett (1979) found that linguistic information contains a greater degree of semantic specificity or is less ambiguous than visual information. When the verbal and visual channels are in conflict, however, pictures access semantic codes more quickly than do their verbal labels (Dhawan & Pellegrino, 1977; Paivio, 1975; Pellegrino, Rosinski, Chiesi, & Siegel, 1977; Smith & Magee, 1980). In case of conflict between the auditory and visual channels then, it would seem reasonable to expect attention to be directed to the video because it more quickly and easily provides meaning. Applied to television news this would indicate that viewers, under normal circumstances, direct their attention to the auditory channel, which contains "factual" information, while leaving some processing capacity for the less semantically specific visual channel. When there is conflict between the two channels, however, ~~one~~ **would expect viewers to focus on the stimuli that most easily provide meaning.**

This article, then, looks at recall from the auditory and visual channels under various conditions of redundancy between those two channels in voice-over television news stories. It differs from a number of earlier studies of recall from television news because it measures visual recall in addition to auditory recall.

Based on the rationale cited above, this study poses three hypotheses.

- H1: The greater the redundancy between the audio and video channels, the lower the visual recall.
- H2: The greater the redundancy between the audio and video in a television news story, the greater the auditory recall.
- H3: The greater the redundancy between the audio and video channels, the greater the understanding.

U. If sound picture are redundant, people forget the picture remembering the sound and understanding the story better.

Reese (1984) found that a lack of audio and video redundancy reduced auditory recall, but he did not find a similar effect for story understanding. We would expect understanding to require more processing capacity than recall and therefore expect to find the effect produced by Hypothesis 3 magnified here.

Methods

Subjects

A total of 82 undergraduate journalism majors, most of them either second-semester freshmen or sophomores, participated in the study. They were enrolled in five sections of a beginning news writing course that is required of all majors. The number of subjects per condition ranged from 13 to 18.

Materials

Because this study focuses on the process of learning from television news and the relationship between the auditory and visual channels, a series of 15-sec-long voice-over stories was used to operationalize the study. The short length of the stories permitted a closer relationship between the information in the two channels than would have been possible with longer stories. Fifteen seconds is about half the length of typical voice-over stories aired in local newscasts (Wulfmeyer, 1980).

The video used in the experiment was recorded from evening newscasts aired by the networks. Scripts were written in typical broadcast style, and video was edited to the auditory to produce the strongest possible match between the two channels. An effort was made to use stories equivalent in importance and in attractiveness of the video. Also, stories that did not receive a great deal of national publicity were chosen (i.e., a Pentagon decision to increase the crew size on nuclear submarines). The stories had

validity of journalism students to judging general audience recall?

Samband when the audio is ignored.

visual channels

hypothesis

*understanding label = viewers
variables = into the study*

operationalizing

understanding labels

audio and video

distinctive video, but subjects were not likely to bring a great deal of information about them into the experimental setting.

Five short newscasts were produced, each containing 14 stories placed in random order. In one condition (high redundancy) all stories had redundant audio and video. In the second newscast (medium redundancy) half of the stories were covered by video that did not match the audio. This condition was included because it represents the situation sometimes found within stories and newscasts: Some of the auditory and visual information is redundant, and some is not. The third condition (low redundancy) had video that did not match audio in any of the stories. The content and order of the audio were the same in all three of these conditions. The nonredundant video used clearly did not belong with the audio but did not present dramatic contrasts with it. For example, a story about the problems of disposing of nuclear power plants was covered with a seashore scene in the nonredundant condition. Also, in the medium-redundancy condition, the stories that had nonredundant video were chosen by random selection, so that subjects would not be able to recognize a pattern and anticipate the placement of stories.

Two other conditions were created to provide baseline measures for single-channel recall. The audio from the high-redundancy condition was played to one group and the video from the high-redundancy condition was shown to another.

Three dependent variables were used in the study. Visual recall was measured by videotaping a series of freeze frames and asking the subjects to identify any pictures that they remembered seeing in the newscast. The freeze frames were mostly medium shots that clearly represented the video, both redundant and nonredundant, used in each of the newscasts. Subjects in each condition had to select from a series of 26 freeze-frames the 14 that were taken from the newscast they had watched. The other video (distracting material) came from stories not used in any of the newscasts.

The second dependent variable, auditory recall, was similar in design. Subjects were given a list of 26 slug lines that described the audio content of news stories (i.e., the Colombian coffee crop) and were instructed to identify any that they recalled from the newscast. Again, 14 of the descriptions were actually taken from the newscasts, and the rest came from stories not used in the experiment.

A third dependent variable measured understanding by asking multiple-choice questions about the central points of the stories. The central

Variable 1
Variable 2
Variable 3
Variable 4
Variable 5
1 (1) = Visual Recall
1 (2) = Auditory Recall
1 (3) = Understanding

0. Variable = Redundancy
5 x 3 values (10, 2, high)

point was defined as knowledge about the main actor of the story and action taken. For example, subjects were given credit for understanding the California Wildlife story if they knew that geese in central California were endangered because they had been drinking poisoned water. This test was comparable to open-ended-type measures of story understanding used in several other television news recall studies (Drew & Reese, 1984; Reese, 1984).

The experiment was pretested using the medium-redundancy condition with subjects similar to those used later in the actual experiment. As a result of the pretest, a number of changes were made. Analysis of the understanding test indicated that some questions were too difficult; so they were rewritten. Also the decision was made to change the nature of the video used on nonredundant stories. In the pretest, video was simply exchanged among stories within the newscast to create nonredundant stories. However, discussion with subjects after the pretest indicated that they had attempted to remember the video and connect it with the correct audio. They began using this strategy once they became aware of the pattern. For this reason, video that did not appear in the newscast was used to create nonredundant stories in the actual experiment.

Procedure

The five newswriting classes used in the study were randomly assigned to experimental conditions. This was done because there was no reason to suspect any systematic differences among the classes. The course is required of all journalism students early in the program, and it is tightly structured so the content of all sections is the same. Thus there was no reason for students to prefer one section over any other.

The experimenter told subjects he was working on a study involving television news and he wanted to show them a newscast to get their reactions. When the newscast ended, the experimenter handed out a questionnaire and played the freeze-frame tape. Visual recall, auditory recall, and story understanding were tested in that order.

Results

One-way analysis of variance (ANOVA) using visual recall as a dependent measure showed significant differences among the video-only and three

redundancy conditions $F(3, 59) = 3.29, p < .03$. Scheffé's post hoc tests show a significant difference ($p < .05$) between the mean recall scores for the high-redundancy condition (8.82) and the medium-redundancy condition (10.78), but no significant differences involving mean scores of the low-redundancy condition (10.00) and video-only condition (10.64). The mean scores for all dependent variables are illustrated in Figure 1.

The same analysis using auditory recall as a dependent variable also indicated significant differences among the audio-only and three redundant conditions $F(3, 64) = 7.04, p < .0004$. When the post hoc Scheffé test is applied here significant differences ($p < .05$) appear between the mean scores for the low-redundancy condition (7.79) and the medium-redundancy condition (10.61). The low-redundancy group is significantly different from high group (11.41) also. The mean score of the audio-only condition (8.61) differs significantly from the high-redundancy condition.

Also, a significant difference is obtained using one-way ANOVA with the third dependent variable, story understanding $F(3, 63) = 4.71, p < .005$. The mean understanding scores show the same pattern as auditory recall scores. Scheffé's post hoc test ($p < .05$) shows a significant difference between the low-redundancy condition (5.31) and the high-redundancy group (8.76).

In addition the medium-redundancy condition group was analyzed separately using a repeated-measure ANOVA to compare the mean recall and understanding scores for the redundant and nonredundant stories. The results show significant differences for auditory recall $F(1, 17) = 77.64, p < .0001$ and story understanding $F(1, 17) = 43.07, p < .0001$. Visual recall did not produce significant results.

Discussion

The data for the visual recall measure do not follow the predictions of Hypothesis 1 exactly. The high-redundancy group recorded the lowest scores on visual recall and the means of the low-redundancy and video-only group are ranked as predicted. However, the medium-redundancy group is out of order.

The results support the second hypothesis that greater redundancy in the newscast would produce higher auditory recall. This hypothesis also receives support from the repeated measures analysis of the medium

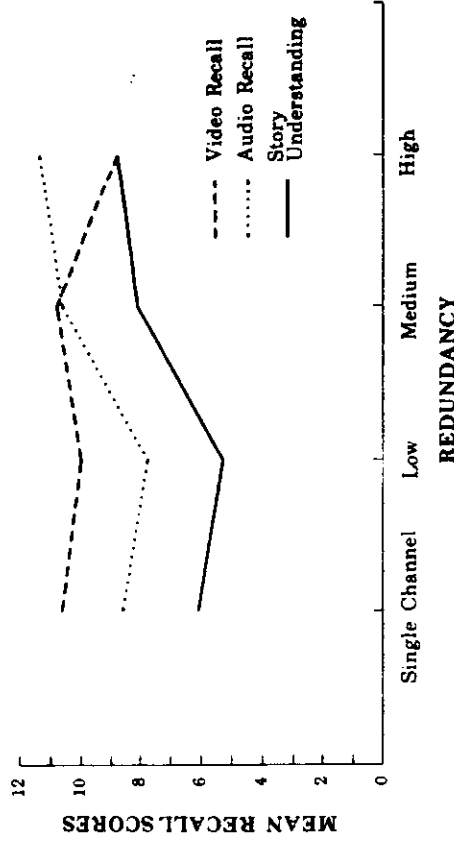


Figure 1. Recall scores by redundancy.

condition, which showed that individuals remembered the audio from redundant stories better than audio from the nonredundant stories.

The data support the third hypothesis, also. The groups that saw the redundant newscast displayed greater understanding of the story, and the repeated measures analysis of the medium-redundancy condition confirmed that pattern.

The data indicate that when watching redundant television news stories, viewers focused most attention on the audio while still attending to the video. When there is conflict between the audio and video, however, viewers attend to the video at the expense of the audio. This is consistent with the rationale outlined at the beginning of this article.

The experiment raises a number of unresolved issues, however. One is why subjects in the medium-redundancy condition performed nearly as well (auditory recall and story understanding) or better (visual recall) than those in the high-redundancy condition. We suspect that subjects in that condition simply put more effort into the task. Because the two channels intermittently provided coherent messages, subjects may have made a greater effort to attend to both channels. In the low-redundancy condition, however, none of the combined messages was coherent; so they simply focused on the easier channel to process. In the high-redundancy condition,

subjects may simply have fallen into their habitual method of processing TV news, looking for the factual information in the auditory channel.

Another interesting issue is why redundant video enhances auditory recall in this study. It may be that the video helps focus attention on the auditory "facts" when the two are complementary. On the other hand, one could argue that this finding is a function of memory rather than attention, and that a combination of visual and auditory cues make it easier to access information in long-term memory. If this were the case, then one would not expect visual recall to be significantly lower than the auditory recall.

These questions suggest a promising area for further research, with greater effort to disentangle effects resulting from attention and memory.

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