ATTENTION FACTORS IN TELEVISED MESSAGES: EFFECTS ON LOOKING BEHAVIOR AND RECALL

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ABSTRACT

ATTENTION FACTORS IN TELEVISED MESSAGES:
EFFECTS ON LOOKING BEHAVIOR AND RECALL

By

Sherilyn Kay Zeigler

The Problem

In the field of mass communication today, a great deal of effort is directed toward attracting the attention of consumers amidst a multitude of competing stimuli. Yet, relatively little is known about techniques of obtaining attention and of maintaining it for the duration of a message. An experiment was conducted for the purpose of examining attention factors in televised messages. The study sought answers to the following questions:

1. Given the same visual content in televised messages, how are looking behavior and recall affected by varying camera techniques?

2. Given the same visual content, how are looking behavior and recall affected by relevant and irrelevant audio?

3. How are looking behavior, recall, and content evaluations affected by simple and complex displays of the same visual content?

Method

An eye-movement camera, utilizing optical techniques developed by Dr. Norman H. Mackworth, was equipped with a 16mm reflex motion picture camera. Eye movements across televised messages were thereby recorded. Three message manipulations were employed: (1) visual hesitation (operationalized as "blank spaces" appearing between series of items on the screen); (2) audio-video interlock (operationalized as visual presentation of items and simultaneous verbal mention of them); and (3) visual simplicity and complexity (operationalized as symmetrical and nonsymmetrical arrangements of a given set of items).

Analysis of variance was used to test independent and interactive effects of the above on looking behavior and retention. In addition, the effects of visual simplicity and complexity on evaluations of visual content were examined. Subjects were forty-eight volunteers from undergraduate classes at Michigan State University.

Findings

No significant differences in looking behavior or recall were found in connection with the visual hesitation manipulation. Likewise, no differences occurred in looking behavior, recall, or content evaluations, in the case of the visual simplicity and complexity manipulation. The audio-video interlock treatment did produce a significant effect in one instance. Respondents seeing a series of items on the screen while the announcer simultaneously discussed them recalled more of the items than did respondents seeing the same objects while the announcer gave irrelevant information. The difference occurred, however, only when the recall test was administered immediately after exposure to the message. A delayed recall test (one to four weeks later) revealed no difference between groups. Also, when the same treatment was used with a different set of items (in a different scene), no significant effect was observed on either an immediate or a delayed basis.

Nineteen analysis of variance tests were run; thirteen of them produced results in the predicted direction. It seemed, therefore, that the phenomena studied did have some effect on the subjects.

Conclusions

Conclusions were that visual hesitation, audio-video interlock, and visual simplicity and complexity had little effect on looking

behavior or recall. It was recommended, however, that all three manipulations be studied in connection with subjects' tendency to follow the action occurring on the screen, and with their inclination to anticipate information not yet exposed visually.

The eye camera apparatus has just begun to be used in the area of televised messages. This study suggests that it may provide a useful tool to communication research, as more attention factors are identified and isolated for consideration of their effects on learning and evaluation of the material presented.

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I. BACKGROUND AND RELATED LITERATURE

Need for Research

In the field of mass communication today, a great deal of effort is directed toward attracting the attention of consumers amidst a multitude of competing stimuli. Yet, relatively little is known about techniques of obtaining attention and of maintaining it for the duration of a message.

Studies have suggested that attention requires focusing of the eyes and mind in such a way that a stimulus may later be recalled with a high degree of accuracy. Sperling defined attention according to the focus of a subject's eyes at a given instant, and his verbal reactions to changes in visual stimuli. As eye fixations shifted, so did attention--and so did the speed and accuracy of reported visual changes.[1]

Woodrow measured the attention value of items by noting respondents' reaction time to a change in intensity or "brightness"

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[1]George Sperling, "The Information Available in Brief Visual Presentations," Psychological Monographs, LXXIV, No. 11 (1960).

of a stimulus. Subjects reported verbally whether it was the right side or left side of a projected image which decreased in intensity at a given moment.[2]

Levy was interested in the attention-gaining advantage of various positions on outdoor billboards. Subjects were briefly exposed to a viewing screen divided into eight equal sections. In seven of the sections a black cross appeared; in the eighth there was nothing. The attention value of each position was operationalized as the number of correct judgments respondents made when asked in each case where the blank appeared.[3]

In all of the above studies, however, attention factors were examined in isolated situations. There has been little attempt to investigate the conditions under which specific stimulus properties --across a wide variety of messages--might elicit a given degree of eye-movement activity and verbal recall. Until these conditions are explored, few predictions can be made regarding attention-drawing and attention-holding elements in audio-visual messages.

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[2]Herbert Woodrow, "The Measurement of Attention," The Psychological Monographs, XVII, No. 5 (December, 1914).

[3]J. M. Levy, "Experiments on Attention and Memory, with Special Reference to the Psychology of Advertising," University of California Publications in Psychology, II, No. 2 (April 12, 1916), 157-197.

In addition, most of the research which has been conducted concerning attention to messages has utilized the printed media. Few studies have considered television communication, though television set penetration in the United States is now 95 per cent,[4] and Americans spend an average of almost six hours per day watching TV.[5] Currently, also, the country's 100 largest advertisers invest over 60 per cent of their budgets in television.[6] There is a real need today to examine what constitutes an "attention factor" in a televised message. The message must be seen and heard (somehow it must attract the attention of viewers) before it can ever be believed, be remembered, or have any influence on the acceptance of an idea or sale of a product.

Research in looking behavior indicates that eye movements are closely related to the presence of attention factors in visual stimuli.[7] Again, however, the vast majority of studies in this area

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[4] Television Factbook, 1968-69 edition, No. 38 (Washington: Television Digest, Inc.), p. 81-a.

[5] "Television Home Viewing Gains for 13 of 14 Months, TvB Analysis of A. C. Nielsen Data Reveals," TvB Report, V-67(68), New York.

[6] "Why We Use Television" (Television Bureau of Advertising, 1968). (Mimeographed.)

[7] H. K. Nixon, "Attention Value and Interest in Advertising," Archives of Psychology, No. 72 (1924); J. P. Guilford and

to date have been concerned solely with still, rather than moving, pictures. Ocular photography, with its unique potentials for analysis, can give the television communicator a clear concept of the course his viewers are following, and of the relative emphasis being placed on particular content. It may reveal what catches and holds attention, by indicating the location and duration of fixations and the direction and sequence of eye movements.[8]

Development of methods for studying eye movements began in the middle of the nineteenth century. The "after image technique," wherein eye movements were observed following exposure to a bright spot of light, provided varying degrees of reliability. The EOG (electro-oculographic) method, involving the recording of eye movements through amplification of an electric field (at the site of electrodes around subjects' eyes) was also crude, and resulted in a fair amount of subject discomfort.

In the corneal reflection technique, however, first reported by Dodge, in 1899, the front surface of a subject's eye reflected

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H. B. Hackman, "A Study of the Visual Fixation Method of Measuring Attention Value," Journal of Applied Psychology, XX (1936), 44-59; James Spier Karslake, "The Purdue Eye-Camera: A Practical Apparatus for Studying the Attention Value of Advertisements" (unpublished Ph.D. dissertation, Purdue University, 1939).

[8]Herman F. Brandt, The Psychology of Seeing (New York: Philosophical Library, 1945), pp. 54, 56.

light from a fixed source, so that as the eye rotated, the light was reflected through a corresponding angle. This particular system has been greatly refined today, and yields fairly accurate information concerning the relationship of eye movements to a visual field.[9] In addition, the corneal reflection technique may be used in the study of moving pictures as well as stills.

Numerous laboratory experiments have indicated that only one stimulus can occupy the focus of attention at any given moment.[10] Specifically, Baldwin found that subjects could acquire information, for the most part, through only one channel (either visual or aural) at a time.[11] There is a need, however, to apply these findings to the area of televised communication, and to work toward development of an audio-video "mix" which would bring optimum results in gaining and maintaining attention. Studies investigating eye movements across televised messages can easily incorporate a

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[9]Willavene Wolf and Others, "An Experimental System for Eye-Movement Studies in Dynamic Bi-Dimensional Fields," 64-157, Bureau of Educational Research and Service, The Ohio State University, pp. 1-2.

[10]Brandt, The Psychology of Seeing, pp. 54, 56.

[11]Thomas Frederick Baldwin, "Redundancy in Simultaneously Presented Audio-Video Message Elements as a Determinant of Recall" (unpublished Ph.D. dissertation, Michigan State University, 1966).

consideration of the effects of audio-video redundancy both on looking behavior and on recall.

The Problem

Given the needs stated above, an experiment was conducted at Michigan State University during the winter of 1969, for the purpose of examining attention factors in televised messages--and, specifically, in television commercials. The study sought answers to the following questions:

1. Given the same visual content in televised messages, how are looking behavior and recall affected by varying camera techniques?

2. Given the same visual content, how are looking behavior and recall affected by relevant and irrelevant audio?

3. How are looking behavior, recall, and content evaluations affected by simple and complex displays of the same visual content?

Significance of Study

The present study was, first, an attempt to relate existing knowledge of looking behavior to the important but largely untested field of television messages. Eye-movement studies were conducted in the area of reading many decades ago, and led to a revolutionary

change in the methods of teaching reading. For example, the discovery that eyes do not move in a continuous sweep across a page (but rather move in a series of quick, short movements and fixation pauses) resulted in instruction programs geared to achieving an increase in the perception span of children learning to read. Pupils learned to increase their fluency and reading speed by grouping words into phrases. Other studies revealed that the type of material read greatly influenced eye-movement patterns.

Textbook publishers found such information valuable in making decisions regarding length of lines of type and physical arrangement of the printed page.[12] Experimental work of this nature in television might well suggest new methods of presenting visual material and of combining audio and video elements so that viewers' attention could more easily be obtained.

Second, the current study may open the door to a new method of measuring the effectiveness of television messages. Quite frequently, it is assessed through tests for memorability or believability, or through viewers' stated willingness to accept the ideas advocated. In each of these cases, the message is evaluated as an entity--though writers and producers spend valuable time

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[12]Willavene Wolf and Others, "An Eye-Movement Study of Children Viewing Television," 64-157, Bureau of Educational Research and Service, The Ohio State University, p. 2.

planning and arguing over the "most effective" presentation of a single line or camera shot. It is time that analysts backed up a few steps--to determine just what it is which catches a viewer's attention in the first place, before he can ever start to "remember" or "believe" or "become interested in accepting."

Third, a study of this nature gives advertising research a chance to test some of the "accepted principles" passed from copywriter to copywriter and from textbook to textbook without any scientific support. One such maxim is "Keep it simple." Another is: "Say what you show and show what you say." In addition, this kind of study may identify and isolate creative variables not previously regarded as factors affecting advertising success, and may, thus, pave the way for future research.

Limitations

Brandt found that spatial position could be an important determinant of attention. Working with numerous black squares drawn on a 10" × 10" card, he found that subjects made considerably more eye fixations on the left side than they did on the right (and especially on the upper left portion).[13] Objectives of the current study, however, focused on general characteristics of looking

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[13]Herman F. Brandt, "Ocular Patterns and Their Psychological Implications," American Journal of Psychology, LIII (1940), 260-268.

behavior across televised messages, and on the power of various visual and aural manipulations to elicit recall. No attempt was made, therefore, to determine whether or not one area of the television screen received more fixations than another.

In photographing eye movements, Mackworth, Kaplan, and Metlay discovered that even though subjects spent about the same amount of time looking at each area of a visual stimulus, they shifted from one to another at different rates. There was some indication in this case that frequent shifting was positively related to the accuracy and amount of recall.[14] Again, however, while present objectives called for a determination of the total length of time subjects spent looking at particular items, they did not relate to a consideration of consecutive eye-fixations in any one area.

In a television message, the visual properties on which subjects may fixate are often numerous and individual items may even be subdivided for purposes of examining subjects' fixation behavior. For example, talent, props, and sets may be considered as entities for eye-movement activity, or they may be broken down into talent's hands and faces, specific props and their parts or containers, and furniture and scenery in sets. Present hypotheses, however, limited looking behavior analysis in this study to the

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[14]N. H. Mackworth, I. T. Kaplan, and W. Metlay, "Eye Movements During Vigilance," Perceptual and Motor Skills, No. 18 (1964), pp. 397-402.

items and parts of items which were specifically manipulated in each scene.

Hypotheses

Visual Pauses: Effects on Retention and Looking Behavior

In working with oral communications, Jersild found that recall was aided by the speaker's use of pauses.[15] Later, Ehrensberger read statements to groups of students and tested them for recall; he, likewise, found that pausing before a statement had definite retentive value.[16]

Little, if any, research has been done regarding the use of pauses--to aid retention--in television's visual channel. It seemed reasonable to assume, however, that if camera techniques were employed to keep viewers temporarily "in suspense," the attention value of the objects finally revealed would be increased. Since it was found that a camera pan across items in a display could permit appearance of each only after a slight "visual hesitation," it was

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[15]Arthur Jersild, "Primacy, Recency, Frequency, and Vividness," Journal of Experimental Psychology, XII (1929), 58-70.

[16]Ray Ehrensberger, "An Experimental Study of the Relative Effectiveness of Certain Forms of Emphasis in Public Speaking," Speech Monographs, XII (1945), 94-111.

proposed that recall of items would be greater in that case than it would be when the camera panned without visual hesitation. The fact that the visual time spent on each item could be controlled by spacing the items farther apart in the first case than in the second (so that for every moment spent on an item, a moment would be spent on a "blank spot") led to the following hypothesis:

H_1: In a televised message, there will be greater immediate recall of relevant visualized items when the camera pans with visual hesitation than when it pans without visual hesitation.

Then, since there was no available research suggesting anything to the contrary, the following was also hypothesized:

H_2: In a televised message, there will be greater delayed recall of relevant visualized items when the camera pans with visual hesitation than when it pans without visual hesitation.

Thomas examined eye-fixation behavior while subjects looked at slides of Rorschach Ink Blots. With no real cues as to where they should look, most of the subjects tended to fixate initially on the center of the display.[17] In the present study, when visual hesitation occurred, subjects momentarily faced a "blank" screen

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[17] E. Llewellyn Thomas, "Eye Movements and Fixations During Initial Viewing of Rorschach Cards," Journal of Projective Techniques and Personality Assessment, XXVII (1963), 345-353.

(with no cues as to where they should look). When visual hesitation did not occur, however, the screen contained such cues at all times --items or parts of items relevant to the sales message. Hence, the following was proposed:

H_3: In a televised message, when the camera pans with visual hesitation across relevant display items, first eye fixations will be closer to the center of the frame when a "blank screen" appears than they will be when the camera pans without visual hesitation directly onto another item.

Definitions

Visual Hesitation:	immediately after the camera pans across an item, it pans for the same amount of time across a blank space before moving to the next item
No Visual Hesitation:	the camera pans across each display item in succession; at no time does a completely blank screen appear
Relevant Visualized Items:	piano, records, drum, horn, banjo, radio (SCENE #1); pillow, thermos, flashlight, clock, case with a shoulder strap (SCENE #4)
Immediate Recall:	the number of relevant items (SCENE #1 and SCENE #4) recalled on the questionnaire administered immediately after exposure to the message
Delayed Recall:	the number of relevant items (SCENE #1 and SCENE #4) recalled on the questionnaire administered one to four weeks after exposure to the message

Redundancy in the Audio-Video Relationship: Effects on Retention and Looking Behavior

Baldwin obtained maximum recall from viewers of a motion picture film clip when there was high redundancy in the audio-video relationship.[18] Therefore, it was proposed in the current study that recall of video features would be greater, in the case of television messages, when the audio and video "interlocked" (that is, when they were redundant) than when the audio was irrelevant to the visual presentation.

H_4: In a televised message, there will be greater immediate recall of relevant visualized items when there is audio-video interlock than when there is no audio-video interlock.

Likewise, since there was, again, no research to suggest otherwise:

H_5: In a televised message, there will be greater delayed recall of relevant visualized items when there is audio-video interlock than when there is no audio-video interlock.

In one case, it was supposed that the audio would draw attention to the items appearing visually; in the other, they might

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[18] Baldwin, "Redundancy in Simultaneously Presented Audio-Video Message Elements as a Determinant of Recall."

well go unnoticed by subjects. Looking behavior would be differentially affected by the two situations.

H_6: The amount of time spent looking at relevant visualized items will be greater when there is audio-video interlock than when there is no audio-video interlock.

Definitions

Audio-Video Interlock:	when items are shown visually, they are simultaneously verbalized by the announcer
No Audio-Video Interlock:	when items are shown visually, the announcer presents irrelevant material
Relevant Visualized Items:	four batteries, cord for use with an AC outlet, holder for the cord in the radio case (SCENE #3); adjustable antenna, earphone, front button to light the dial (SCENE #5)
Immediate Recall:	number of relevant items (SCENE #3 and SCENE #5) recalled on the questionnaire administered immediately after exposure to the message
Delayed Recall:	number of relevant items (SCENE #3 and SCENE #5) recalled on the questionnaire administered one to four weeks after exposure to the message
Looking Time:	number of eye fixations appearing on any part of the relevant items (SCENE #3 and SCENE #5)

Complexity of Visual Patterns: Effects on Retention, Looking Behavior, and Evaluations

Two key tenets of Gestalt psychology are, first, that perception is organized, and second, that the organization tends to be as good as the stimulus conditions permit. An important principle of perceptual organization has been called "perceptual grouping." In this regard it is believed that there is a perceptual tendency to group elements into a "good form"--one which is "balanced" or "closed."[19]

Berlyne defined "complex" patterns as those lacking symmetry of form, or housing structural elements in a random, rather than a systematic, fashion.[20] The contrast was explained in terms of specific and diversive exploration. According to Berlyne, specific exploration was prompted by incomplete perception of a stimulus pattern, leaving subjects with uncertainty regarding its properties; such exploration was encouraged when the stimulus was "complex" and exposure to it was brief. The rating of "interesting" here was thought to indicate subjects' wishes to continue looking at the stimulus, in hopes of obtaining additional information about it; in other words, subjects were seeking closure.

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[19]Morton Deutsch and Robert M. Krauss, Theories in Social Psychology (New York: Basic Books, Inc., 1965), pp. 16-21.

[20]D. E. Berlyne, "Curiosity and Exploration," Science, CLIII (July 1, 1966), 25-33.

Diversive exploration was motivated by a desire for entertainment or diversion, and was encouraged when the stimulus was "simple." In this case, subjects found the designs "pleasing" to look at, since there was no uncertainty as to information contained; that is, closure was easily obtained.[21]

It was proposed that the same would be true for television messages which included a complex and a simple display of objects. Both displays contained nine items (three each of three different sizes), but in one case they were arranged in a random, unbalanced manner (complex), and in the other they were set up in a balanced, pyramidal form (simple).

H_7: In a televised message, subjects will rate a complex display of items more "interesting" than a simple one, when tested immediately after presentation.

H_8: In a televised message, subjects will rate a simple display of items more "pleasing" than a complex one, when tested immediately after presentation.

Once more, given no available research to the contrary, it was hypothesized that the above differences would hold over time:

H_9: In a televised message, subjects will rate a complex display of items more "interesting" than a simple one, when tested one to four weeks after presentation.

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[21] D. E. Berlyne, "Complexity and Incongruity Variables as Determinants of Exploratory Choice and Evaluative Ratings," Canadian Journal of Psychology, XVII (1963), 274-290.

H_{10}: In a televised message, subjects will rate a simple display of items more "pleasing" than a complex one, when tested one to four weeks after presentation.

Thomas found that the length of fixation on a display was a function of the difficulty of extracting information from it. The longest fixations occurred when subjects were presented with Rorschach Ink Blots; shorter fixations followed when the stimulus was a chest x-ray, and still shorter fixations occurred in the case of a simple prose passage.[22] Berlyne and Lawrence concurred that the duration of eye fixations increased with complexity of the figures presented.[23]

In the present study, it was also proposed that subjects would spend more time looking at items in the complex display than they would in the simple display, since the closure they sought would come more quickly in the latter case. In other words, it was assumed that presentation of the complex display would lead to greater duration of each eye fixation than would be true with presentation of the simple display. The random arrangement of items (in

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[22]Thomas, "Eye Movements and Fixations During Initial Viewing of Rorschach Cards," pp. 345-353.

[23]D. E. Berlyne and George H. Lawrence, "Effects of Complexity and Incongruity Variables on GSR, Investigatory Behavior, and Verbally Expressed Preference," Journal of General Psychology, LXXI (1964), 21-45.

the complex display) would make it more difficult for subjects to extract information; hence, they would not be able to look at as many different items in a given time period as would subjects seeing the simple display.

H_{11}: In a televised message, subjects will fixate on more different items given a simple display than they will given a complex display.

Definitions

Interest Rating:	the score obtained on a seven-point rating scale
Pleasantness Rating:	the score obtained on a seven-point rating scale
Simple Display:	nine radio mock-ups, three each of three different sizes, with accompanying carrying cases in plain and plaid colors--all arranged symmetrically (systematically) in SCENE #6
Complex Display:	nine radio mock-ups, three each of three different sizes, with accompanying carrying cases in plain and plaid colors--all arranged nonsymmetrically (randomly) in SCENE #6

Finally, since it was suggested that subjects would fixate on more different objects given exposure to a simple display than they would given exposure to a complex display, it was proposed that recall of features of these objects would be greater in the

former case than in the latter. In addition, it was also suggested that there would be greater recall of items appearing visually when there was audio-video interlock than when there was no audio-video interlock. It was proposed, therefore, that given exposure to the complex display, recall would be greater when there was audio-video interlock than when there was no audio-video interlock. (Audio-video interlock was also manipulated for SCENE #6.) Thus, the following interaction hypotheses emerged:

H_{12}: In a televised message, immediate recall of relevant visualized items will be lower given a complex display than it will be given a simple display, but not as much lower when there is audio-video interlock as when there is no audio-video interlock.

H_{13}: In a televised message, delayed recall of relevant visualized items will be lower given a complex display than it will be given a simple display, but not as much lower when there is audio-video interlock as when there is no audio-video interlock.

Definitions for immediate and delayed recall, audio-video interlock and no audio-video interlock, and recall of items for SCENE #6 remain the same as those stated previously.

II. METHODOLOGY

Recording Instrument

The eye-movement camera used in this experiment was equipped with a 16mm reflex motion picture camera for purposes of recording eye movements on film. (See Figure 1.) Optical techniques for the system were developed by Dr. Norman H. Mackworth. The principle of recording used corneal reflection superimposed on a film of the televised message viewed by subjects. An immediate pictorial record was obtained; subjects' eye movements were shown as a series of light spots. In addition, a rotating line, centered on the spots, indicated sequence and duration of fixations.

The field of view was twenty-two degrees, with an average registration accuracy of plus-or-minus one-half degree. The film speed of the motion picture camera used in this study was eight frames per second.

Additional Equipment

The televised message was viewed through the system of rear screen projection. A plexiglass "TV screen," 9" × 12", and

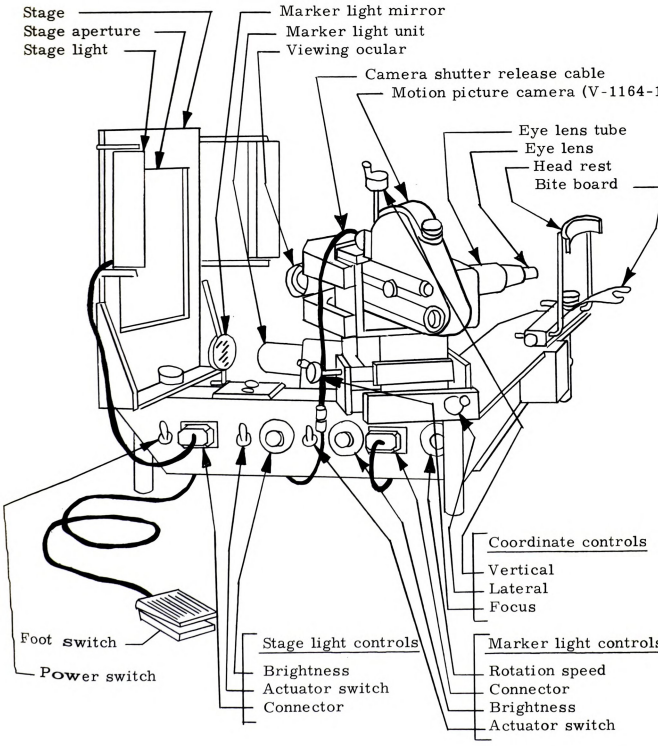

Figure 1. -- Side View: Eye Movement Recorder, Model V-1164-1

a $4\frac{1}{2}$" × $4\frac{1}{2}$" speaker were mounted in a black board, fifty-two inches from the subject.

Subjects

Subjects were students enrolled in undergraduate courses at Michigan State University. Volunteers were selected from four different classes, so that subject sensitization due to social interaction was minimized. Thirty-six men and twelve women participated; none had had any previous exposure to the eye camera apparatus. Likewise, no subjects had any knowledge of the experimental messages or variables; a five-minute standard presentation in the classroom regarding eye camera research was the only background anyone had prior to participating in the experiment.

All participants were enthusiastic about the study--both before and after they arrived at the eye camera laboratory. No one offered any complaints regarding discomfort during viewing of the test commercial or dislike of the questionnaire. All were cautioned not to reveal details of the experiment to others until the study had been completed.

Pretest

A pretest was conducted in June, 1968, using trial commercials and questionnaires. Four points proved worth noting.

First, subjects needed to be assured of the safety of the eye camera apparatus at the outset of the experiment; unless put completely at ease in this regard, they were prone to move their heads nervously during viewing of the commercials--in spite of the fact that bite bars were used. Second, subjects were aligned on the apparatus much more quickly if they were continually reassured that they were "doing just fine," than was true if the experimenter said nothing to them during alignment procedures. Third, it was important that subjects were run through the experiment as rapidly as possible, in order to prevent: (a) subject eye strain and consequent tearing, resulting in very hard-to-interpret eye fixation recordings; (b) subject mental strain and discomfort to the point where questionnaires were carelessly answered because subjects were anxious to leave; and (c) experimenter fatigue to the extent that instructions were hastily given, and, hence, experimental conditions were not tightly controlled.

With regard to the questionnaire, a fourth factor concerned the actual items which subjects were asked to recall from the commercials. Unless the objects were readily identifiable, respondents did not take the time to describe them, and, in many cases, simply left the spaces blank. In talking with subjects afterwards, however, it was determined that they did have a "mental picture" of what they had seen, but did not know what to call the objects, and, therefore, did not list them at all.

All four of the above problems were eliminated in the final experiment.

Experimental Procedure

The experiment was conducted in the eye camera laboratory of the Department of Communication, at Michigan State University, over a three-week period: January 23 to February 13, 1969. Total time per subject was approximately twenty to twenty-five minutes. The delayed recall test was administered to all subjects in their respective classrooms during the three-day period: February 19-21, a lapse of one to four weeks from the time subjects saw the test commercials. The experimental situation may be described as follows:

1. The subject was greeted by one male and one female experimenter as he entered the eye camera laboratory, and was asked to sit in front of the eye camera apparatus.

2. He was assured of the safety of the instrument and advised of the nature of the experiment.

3. A bite bar was fastened to the equipment; its purpose was explained while the subject made a teeth impression in the wax and then let it harden.

4. The subject put his teeth back into the hardened impression and looked at a magazine picture while one of the experimenters

focused the corneal reflection beam to form an easily visible "eye marker." (Time: approximately one to two minutes.)

5. The subject was introduced to the sound of the 16mm camera as a film was taken of his code number.

6. The magazine picture was removed and in its place was a "target card" used to check the instrument for linearity. While the subject fixated on various parts of the card, the experimenter adjusted the focus control for optimum clarity of the eye-marker and precise alignment. (Time: approximately one to two minutes.)

7. A film was taken of the subject's eye fixations on various parts of the target card, so that a recording of the final alignment would be available when the time came to code fixations across the experimental message. (Time: approximately fifteen to twenty seconds.)

8. The stage platform was removed and stage lights turned off, while the subject's head remained steady. A film was then taken of his eye movements across the test commercial.

9. The subject was given the questionnaire and asked to fill it out in an adjoining room.

10. The subject was given a brief explanation of what had taken place during his viewing of the commercial, and was cautioned

not to reveal details of the experiment to anyone until results had been released.

11. A delayed (identical) questionnaire was administered in classrooms one to four weeks later.

During the experiment, up until the showing of the commercial, subjects were continually reassured that they were "doing a good job," and that all was "going well."

Experimental Messages

Four versions of a television commercial were prepared for experimental purposes. Since only one subject could use the eye camera apparatus at a time, the message to which each was exposed had to be short; otherwise, the experimenter would not have been able to run a sample large enough for statistical analysis. It was felt that a television commercial would best serve the purposes of this study, because a complete message could be delivered in a short time, and also because the principal investigator was experienced in both the writing and the production of television commercials.

No attempt was made to secure actual televised commercials; instead, four versions of a commercial for a Panasonic radio were created especially for this experiment--for two basic reasons. First, it was extremely important that manipulations were carefully controlled and that they met production specifications of the study

exactly, so that findings were not confounded by extraneous variables. Second, subject sensitization had to be minimized to help insure reliability of the testing procedure; hence, the experimenter had to be absolutely certain that respondents had not seen the commercials either before viewing them through the eye camera apparatus, or after viewing but before taking the delayed recall test.

Two versions of the commercial ran one minute and nineteen seconds; the other two ran one minute and seven seconds. The time differential occurred in the first and fourth scenes, due to the visual manipulation employed there. The following pages contain copies of the four scripts and detailed explanations of their contents.

COMMERCIAL VERSION A

(1:19)

	VIDEO	AUDIO
		(ANNCR OVER LIGHT MUSIC)
SCENE #1: (:21)	PAN WITH VISUAL HESITATION ACROSS DISPLAY OF MUSICAL ITEMS, HOLDING FINALLY ON ECU PANASONIC RADIO.	Look. These are the makings of listening enjoyment--a musical experience that goes where you go: it's the newly-developed, newly-styled transistor radio by Panasonic.
SCENE #2: (:12)	CUT TO MCU GIRL BEHIND TABLE. SHE LIFTS RADIO, POINTS OUT SPEAKER, AND TURNS ENTIRE RADIO AROUND.	Priced at $49.95, the Panasonic weighs just three pounds...yet, its new speaker system gives you the finest in sound reproduction.
SCENE #3: (:06)	DOLLY IN FOR CU GIRL'S HAND OPENING BACK OF RADIO AND POINTING TO BATTERIES, CORD, AND CORD HOLDER.	Four penlight batteries are all you need--or use any AC outlet. Here, the cord stays neatly out of sight.
SCENE #4: (:17)	CUT TO CU ACCESSORIES DISPLAY. PAN WITH VISUAL HESITATION.	And you can have your choice of any of these fine extras. Your dealer will make them available to you at just a slight additional cost when you buy a Panasonic radio.

	VIDEO	AUDIO
SCENE #5: (:12)	CUT TO MCU THREE BOYS AND RADIO. ONE POINTS OUT ANTENNA, ANOTHER THE EAR-PHONE, AND ANOTHER THE FRONT DIAL LIGHT.	The adjustable Panasonic antenna always brings you perfect reception. In addition, each radio comes with its own earphone... and, a press of that front button lights up the dial for easy tuning.
SCENE #6: (:11)	CUT TO CU SIMPLE RADIO DISPLAY.	Be sure you ask to see all three sizes of Panasonic radios, styled in both plain and plaid carrying cases. Remember the name: Panasonic.

COMMERCIAL VERSION B

(1:19)

	VIDEO	AUDIO
		(ANNCR OVER LIGHT MUSIC)
SCENE #1: (:21)	PAN WITH VISUAL HESITATION ACROSS DISPLAY OF MUSICAL ITEMS, HOLDING FINALLY ON ECU PANASONIC RADIO.	Look. These are the makings of listening enjoyment--a musical experience that goes where you go: it's the newly-developed, newly-styled transistor radio by Panasonic.
SCENE #2: (:12)	CUT TO MCU GIRL BEHIND TABLE. SHE LIFTS RADIO, POINTS OUT SPEAKER, AND TURNS ENTIRE RADIO AROUND.	Priced at $49.95, the Panasonic weighs just three pounds...yet, its new speaker system gives you the finest in sound reproduction.
SCENE #3: (:06)	DOLLY IN FOR CU GIRL'S HAND OPENING BACK OF RADIO AND POINTING TO BATTERIES, CORD, AND CORD HOLDER.	Take your Panasonic to the beach with you--or just about anywhere else. It's always there when you're in the mood for music.
SCENE #4: (:17)	CUT TO CU ACCESSORIES DISPLAY. PAN WITH VISUAL HESITATION.	And you can have your choice of any of these fine extras. Your dealer will make them available to you at just a slight additional cost when you buy a Panasonic radio.

	VIDEO	AUDIO
SCENE #5: (:12)	CUT TO MCU THREE BOYS AND RADIO. ONE POINTS OUT ANTENNA, ANOTHER THE EAR-PHONE, AND ANOTHER THE FRONT DIAL LIGHT.	Don't forget dances either. Your new Panasonic will be the envy of the group. And why not? It was designed to fit in with what's happening--whatever the occasion... wherever you are.
SCENE #6: (:11)	CUT TO CU SIMPLE RADIO DISPLAY.	So don't be satisfied with less than the best. Always be sure you ask for Panasonic. And don't delay: see your nearby appliance dealer--today.

COMMERCIAL VERSION C

(1:07)

	VIDEO	AUDIO
		(ANNCR OVER LIGHT MUSIC)
SCENE #1: (:14)	PAN WITHOUT VISUAL HESITATION ACROSS DISPLAY OF MUSICAL ITEMS, HOLDING FINALLY ON ECU PANASONIC RADIO.	Look. These are the makings of listening enjoyment--a musical experience that goes where you go: it's the newly-developed, newly-styled transistor radio by Panasonic.
SCENE #2: (:12)	CUT TO MCU GIRL BEHIND TABLE. SHE LIFTS RADIO, POINTS OUT SPEAKER, AND TURNS ENTIRE RADIO AROUND.	Priced at $49.95, the Panasonic weighs just three pounds...yet, its new speaker system gives you the finest in sound reproduction.
SCENE #3: (:06)	DOLLY IN FOR CU GIRL'S HAND OPENING BACK OF RADIO AND POINTING TO BATTERIES, CORD, AND CORD HOLDER.	Four penlight batteries are all you need--or use any AC outlet. Here, the cord stays neatly out of sight.
SCENE #4: (:12)	CUT TO CU ACCESSORIES DISPLAY. PAN WITHOUT VISUAL HESITATION.	And you can have your choice of any of these fine extras. Your dealer will make them available to you at just a slight additional cost when you buy a Panasonic radio.

	VIDEO	AUDIO
SCENE #5: (:12)	CUT TO MCU THREE BOYS AND RADIO. ONE POINTS OUT ANTENNA, ANOTHER THE EAR-PHONE, AND ANOTHER THE FRONT DIAL LIGHT.	The adjustable Panasonic antenna always brings you perfect reception. In addition, each radio comes with its own earphone... and, a press of that front button lights up the dial for easy tuning.
SCENE #6: (:11)	CUT TO CU COMPLEX RADIO DISPLAY.	Be sure you ask to see all three sizes of Panasonic radios, styled in both plain and plaid carrying cases. Remember the name: Panasonic.

COMMERCIAL VERSION D

(1:07)

	VIDEO	AUDIO
		(ANNCR OVER LIGHT MUSIC)
SCENE #1: (:14)	PAN WITHOUT VISUAL HESITATION ACROSS DISPLAY OF MUSICAL ITEMS, HOLDING FINALLY ON ECU PANASONIC RADIO.	Look. These are the makings of listening enjoyment--a musical experience that goes where you go: it's the newly-developed, newly-styled transistor radio by Panasonic.
SCENE #2: (:12)	CUT TO MCU GIRL BEHIND TABLE. SHE LIFTS RADIO, POINTS OUT SPEAKER, AND TURNS ENTIRE RADIO AROUND.	Priced at $49.95, the Panasonic weighs just three pounds...yet, its new speaker system gives you the finest in sound reproduction.
SCENE #3: (:06)	DOLLY IN FOR CU GIRL'S HAND OPENING BACK OF RADIO AND POINTING TO BATTERIES, CORD, AND CORD HOLDER.	Take your Panasonic to the beach with you--or just about anywhere else. It's always there when you're in the mood for music.
SCENE #4: (:12)	CUT TO CU ACCESSORIES DISPLAY. PAN WITHOUT VISUAL HESITATION.	And you can have your choice of any of these fine extras. Your dealer will make them available to you at just a slight additional cost when you buy a Panasonic radio.

	VIDEO	AUDIO
SCENE #5: (:12)	CUT TO MCU THREE BOYS AND RADIO. ONE POINTS OUT ANTENNA, ANOTHER THE EAR-PHONE, AND ANOTHER THE FRONT DIAL LIGHT.	Don't forget dances either. Your new Panasonic will be the envy of the group. And why not? It was designed to fit in with what's happening--whatever the occasion... wherever you are.
SCENE #6: (:11)	CUT TO CU COMPLEX RADIO DISPLAY.	So don't be satisfied with less than the best. Always be sure you ask for Panasonic. And don't delay: see your nearby appliance dealer--today.

Summary of Manipulations Across Commercials

COMMERCIAL VERSION A		COMMERCIAL VERSION B	
SCENE #1:	Visual Hesitation	SCENE #1:	Visual Hesitation
SCENE #2:	No Manipulation	SCENE #2:	No Manipulation
SCENE #3:	Interlock	SCENE #3:	No Interlock
SCENE #4:	Visual Hesitation	SCENE #4:	Visual Hesitation
SCENE #5:	Interlock	SCENE #5:	No Interlock
SCENE #6:	Simplicity & Interlock	SCENE #6:	Simplicity & No Interlock

COMMERCIAL VERSION C		COMMERCIAL VERSION D	
SCENE #1:	No Visual Hesitation	SCENE #1:	No Visual Hesitation
SCENE #2:	No Manipulation	SCENE #2:	No Manipulation
SCENE #3:	Interlock	SCENE #3:	No Interlock
SCENE #4:	No Visual Hesitation	SCENE #4:	No Visual Hesitation
SCENE #5:	Interlock	SCENE #5:	No Interlock
SCENE #6:	Complexity & Interlock	SCENE #6:	Complexity & No Interlock

SCENE #1 (Video Manipulation):
Visual Hesitation/No Visual Hesitation

The opening scene contained the first visual manipulation. The camera panned across five musical items (a piano, some records, a drum, a horn, and a banjo) which respondents were asked to recall at two different times: immediately after exposure to the message, and one to four weeks later. The first tests of H_1 and H_2 were thereby possible.

In two versions of the commercial, the items were spaced so far apart that a completely blank screen appeared briefly between each pair of objects. Subjects were, therefore, given the opportunity to fixate on some portion of the screen during "visual hesitations," and, hence, H_3 was tested. A sixth item in the display was the advertised product, a Panasonic radio. Respondents were not asked to recall it (since it was shown throughout the commercial), but it provided for an additional visual hesitation after the last musical item. Initial eye fixations on a blank screen were, therefore, coded five different times in the first scene--immediately preceding the records, the drum, the horn, the banjo, and the radio.

In the other two versions of the commercial, the objects were spaced close enough together that a completely blank screen never appeared between pairs. They were not so close to each other,

however, that more than one item could be seen at a time in its entirety. In this case, there was "no visual hesitation" in panning, and initial eye fixations on the five objects themselves were coded--again, the records, the drum, the horn, the banjo, and the radio.

Audio in this scene was held constant across all four versions of the commercial. The five musical items shown in the video channel, however, were never mentioned in the audio and never again appeared visually. Therefore, in the measurement of eye fixations on these items and recall of them, there was no possible way for audio or any later video to confound the findings.

SCENE #2 (No Manipulation)

Audio and video were held constant in the second scene across all four versions. The on-camera talent and off-camera announcer familiarized viewers with the Panasonic radio by indicating several of its distinguishing characteristics. No hypotheses were tested in this regard, but the scene was necessary for transition purposes between manipulation in the first and third scenes.

SCENE #3 (Audio Manipulation):
Interlock/No Interlock

The third scene contained the first aural manipulation. While video was held constant--the talent opened the back of the radio

and continued pointing out special features--in two versions of the commercial, the audio included simultaneous mention of the items. Specifically, when the talent pointed to batteries, the announcer talked about batteries. When the talent showed viewers the cord and then its holder inside the radio case, the announcer discussed them at the same time. The audio and video thereby "interlocked," so that H_4 and H_5 could be tested.

In the remaining two versions of the commercial, the audio contained information completely irrelevant to the visual presentation, in an attempt to determine whether a lack of audio-video interlock would affect eye fixations on and recall of the three relevant items: the batteries, the cord, and the cord holder. Hence, H_6 was also tested here.

The three relevant objects in this scene, whether visualized and discussed by the announcer (the "interlock" situation), or merely visualized while the audio was irrelevant (the "no interlock" situation), were neither mentioned verbally nor shown on the screen before or after this exact point in the commercials. Again, therefore, findings could not be confounded by subject sensitization.

SCENE #4 (Video Manipulation):
Visual Hesitation/No Visual Hesitation

The fourth scene offered the opportunity for a second test of the visual hesitation manipulation. This time the camera panned

across five accessory items (a pillow, a thermos, a flashlight, a clock, and a case with a shoulder strap) which respondents were again asked to recall on both an immediate and a delayed basis. As before, two versions of the commercial contained visual hesitations between objects, and two did not. In this case, initial eye fixations on a blank screen (in the "visual hesitation" situation) were measured four times: immediately preceding exposure to the thermos, the flashlight, the clock, and the case with the shoulder strap. Likewise, initial eye fixations on an actual object (in the "no visual hesitation" situation) were measured four times: on the thermos, the flashlight, the clock, and the case with the shoulder strap.

Finally as was true in the first scene, audio was held constant across all four versions of the commercial. The five items shown in the video channel were never mentioned by the announcer and never <u>again</u> appeared visually, so there was no way for audio or later video to confound looking behavior and recall findings.

SCENE #5 (Audio Manipulation): Interlock/No Interlock

The fifth scene afforded the chance to test the "interlock" manipulation a second time. While video was held constant--the talent demonstrated uses of special radio features--in two versions of the commercial, the audio included simultaneous mention of the

items. Specifically, when the talent showed viewers the radio antenna, earphone, and dial light button, the announcer commented on them. In the remaining two versions, the audio contained information completely irrelevant to the visual presentation.

Once more, the three relevant objects in this scene, whether visualized and discussed by the announcer (the "interlock" situation), or merely visualized while the audio was irrelevant (the "no interlock" situation), were neither mentioned verbally nor shown on the screen before or after this exact point in the commercials. Findings were not, therefore, confounded by subject sensitization.

SCENE #6 (Video and Audio Manipulations): Simplicity/Complexity and Interlock/No Interlock

The remaining hypotheses called for presentation of a "simple" and a "complex" display of objects. Nine mock-ups of Panasonic radios were used in the sixth scene: three small ones, three medium-sized ones, and three large ones. All nine came with carrying cases; two of each size were of solid color, and one of each size was plaid. The three medium-sized ones had handles.

Terwilliger experimented with complex patterns, and used nonsymmetrical displays to represent complexity.[24] In the current

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[24]Robert F. Terwilliger, "Pattern Complexity and Affective Arousal," Perceptual and Motor Skills, No. 17 (1963), pp. 387-395.

study, likewise, a symmetrical and nonsymmetrical display of the radio mock-ups represented simplicity and complexity. Content was held constant across all versions of the commercial; the same nine items appeared in each instance. Format, however, (actual arrangement of the mock-ups in a display), differed. Two versions of the commercial contained the simple display, and two contained the complex one. In the former case, the objects were arranged in three rows, in pyramidal fashion: the three large mock-ups on the bottom row, the three medium-sized ones on the middle row, and the three small ones on the top row. In the latter instance, the mock-ups were randomly arranged in three rows: four on the bottom row (one large, one small, and two medium-sized), three on the middle row (one small, one medium-sized, and one large), and two on the top row (one large and one small).

On both an immediate and a delayed basis, respondents were asked to rate the display they saw according to how "interesting" and how "pleasing" they thought it was. Seven-point rating scales provided the test instruments for H_7, H_8, H_9, and H_{10}.

Finally, audio-video interlock was manipulated once more in this last scene. Two versions of the commercial discussed the three sizes of radios displayed, and the plain and plaid carrying cases, while the other two did not. Subjects were given immediate

and delayed recall tests for the size, carrying case, and color features.

Questionnaire

Recall questions dealt with the following items:

(a) the five musical objects in SCENE #1 (the piano, the records, the drum, the horn, and the banjo);

(b) the three features pointed out in SCENE #3 (the batteries, the cord, and the cord holder);

(c) the five accessory items in SCENE #4 (the pillow, the thermos, the flashlight, the clock, and the case with the shoulder strap);

(d) the three features demonstrated in SCENE #5 (the antenna, the earphone, and the dial light button);

(e) the three characteristics of the radio mock-ups in SCENE #6 (the three sizes, the accompanying carrying cases, and the plain and plaid colors).

In addition to recall, the experimenter was interested in respondents' ratings of the display of radio mock-ups which appeared in the sixth scene of each of the four versions of the commercial (two contained a simple display and two contained a complex one). Seven-point rating scales served as measuring instruments. Scores

obtained on "interesting/dull" and "pleasing/annoying" scales provided a comparison with Berlyne's findings regarding "interesting" and "pleasing" ratings given to simple and complex designs. Three other scales were used in addition, and the position of polar adjectives was reversed, in order to minimize halo effect.

Finally, two questions asked for recall of the weight and cost of the Panasonic radio advertised. This information was given in the audio during SCENE #2 (in all versions of the commercial), but was never repeated or shown visually.

Identical questionnaires were administered to subjects immediately following exposure to the televised message and again one to four weeks later. Each took between five and ten minutes to complete. A copy of the questionnaire may be found in the appendix.

Problems Encountered

The first problem which arose concerned the possibility of Type G error; since only one subject could be run at a time, forty-eight separate treatments had to be administered. To guard against the operation of Type G error, the two experimenters painstakingly rehearsed their instructions and actions in the eye camera laboratory, until observers on hand during the pretest agreed that successive presentations were roughly identical.

It was discovered, however, that experimenter fatigue set in after approximately two and one-half hours; at that point, instructions were hastily given and experimental controls were weakened. The experiment was scheduled, therefore, over a period of three weeks, with a two and one-half hour limit set on continuous operations.

Because of the novelty of the viewing situation, subjects were easily distracted. The frame housing the TV screen and speaker was deliberately painted black, and a black curtain was drawn halfway around the subject to help prevent temptations to look at areas away from the screen. In addition, all lights except the marker light on the eye camera were turned off before the televised message was presented. Finally, the audio track, though not so loud as to be annoying, was of sufficient volume to drown out interference from sounds outside of the laboratory.

When a subject was required to remain more than a few minutes in one position, eye strain made it impossible for him to fixate steadily, and tear secretion interfered with the securing of a well-defined spot of light. The short experimental message, however, and an experimenter who was well trained in eye camera alignment procedures, permitted completion of each eye-movement recording in a very short time. A subject was actually in an

"awkward position" (though no one deemed it uncomfortable), situated on the bite bar with the marker light shining off of his left eye, for a maximum of six minutes--and no more than four minutes at any one time.

Another problem centered around the fact that the test commercials were not produced with high-caliber equipment or professional talent, and, hence, were not regarded as commercials which might actually be seen on a home television set. Production limitations were explained to subjects, however, prior to viewing, and it was understood that the study did not call for evaluation of the messages themselves. It was strongly felt, in addition, that production quality was not an important factor in this experiment. The appropriate stimulus materials were present, and manipulations were carried out precisely; hence, looking behavior could be examined as easily as if material produced by a national network had been available.

Because of the nature of this experiment, it was not deemed advisable to "force" unwilling subjects to participate; hence, only volunteers were chosen. In addition, the participants had to be scheduled according to their own class commitments and free hours. To overcome the problem of lack of random selection of subjects, therefore, the order in which the commercials were shown (and,

thus, the order in which experimental treatments were assigned) was randomized.

Subjects had no orientation to the viewing and listening situation prior to the showing of the experimental messages. Each was, however, told specifically that a television commercial would be shown, and that it would be complete with an announcer and background music. The idea of showing some irrelevant film before the commercial in each case--to help acclimate subjects to the picture-plus-sound situation--had to be discarded for two reasons. First, time was severely limited. Class schedules and experimenter fatigue necessitated getting through each experiment in the shortest possible time; also, subjects were prone to get very uncomfortable if forced to remain in one position too long.

The second reason centered around finances. Costs prohibited obtaining additional film from production houses, and none produced by the university television station was recorded with magnetic sound (as were the experimental commercials). Projector adjustments would, therefore, have been necessary between the showing of irrelevant film and the commercial in each instance, and additional time and subject discomfort would have been involved. If just one copy of a single piece of film were shown to all subjects, a second projector would have been required (a near technical

impossibility when it came to positioning for proper rear screen projection); otherwise, considerable time would have been needed to locate the position of the randomly-selected experimental commercial on the reel after the irrelevant film had been shown.

The noise of the projector was an additional sound to which subjects were not accustomed. Leader film placed before the start of each commercial, however, gave subjects at least a brief exposure to the projector sound before the commercial actually appeared on the screen.

It was believed that subjects would be much more concerned with their "looking behavior" than they would be with their "listening behavior." Since, however, none of them had ever even seen an eye camera before, the novelty of the apparatus and conditions remained constant throughout. Differences which occurred in recall of audio, therefore, could still be attributed to the experimental manipulations.

Because the experiment had to be spread out over three weeks, as discussed previously, it was possible for subjects to talk to each other about the study before all of them had actually participated. In an attempt to minimize biases resulting therefrom, each subject was cautioned specifically against disclosing details of the experiment. In addition, participants were selected from four different classes, to help prevent extensive interaction.

Finally, again because of the duration of the experiment, it was not possible to administer the delayed recall test to all subjects at exactly the same time interval from the date they saw the experimental message. The tests were given over a three-day period, however (again, to help minimize sensitization), and were scheduled one to four weeks from the time that each subject had viewed the commercial. For delayed recall, most retention studies indicate that there is an initial period of rapid forgetting of material, followed by a gradual "leveling off" after approximately seven days.[25] It was felt, therefore, that the time differential would not have a significant effect on recall scores.

Operationalization of Looking Behavior Variables

Drift to Screen Center

The first and fourth scenes of the commercials were considered in the test of H_3. Two versions contained "visual hesitation" between items panned by the camera, and two contained "no visual hesitation." In the "visual hesitation" commercials, a blank screen appeared immediately preceding the records, the drum, the horn, the banjo, and the radio, in the first scene, and immediately

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[25] Carl I. Hovland, Irving L. Janis, and Harold H. Kelley, Communication and Persuasion (New Haven: Yale University Press, 1953), p. 245.

preceding the thermos, the flashlight, the clock, and the case with the shoulder strap, in the fourth scene. In each of these situations, the first fixation subjects made on this "blank screen" was coded.

In the "no visual hesitation" commercials, a new item appeared immediately after one item had vanished from sight. In this case, the fixation relevant to H_3 became the first one which occurred on the "new item" (again, the records, the drum, the horn, the banjo, and the radio, in the first scene, and the thermos, the flashlight, the clock, and the case with the shoulder strap, in the fourth scene).

In all instances, concern focused on the distance each of these first fixations was from center. The film coder used a ruler to measure the length of the vector extending from the center of the screen to the eye marker.

Fixation Duration

Nixon has suggested, as have Luborsky, Blinder, and Mackworth, that given two visual situations, the one eliciting the longer period of visual fixation may be considered to possess the greater attention value.[26] In the current study, H_6 called for measurement

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[26]Nixon, "Attention Value and Interest in Advertising"; Lester Luborsky, Barton Blinder, and Norman Mackworth, "Eye-Fixation and the Contents of Recall and Images as a Function of Heart Rate," Perceptual and Motor Skills, XVIII (1964), 421-436.

of the amount of time subjects spent looking at relevant items--as an indication of the attention value these items possessed in an "interlock" and a "no interlock" situation. Both location and duration of eye fixations, therefore, were considered. The third scene of the commercials contained three relevant items: the batteries, the cord, and the cord holder. Likewise, the fifth scene contained three: the antenna, the earphone, and the dial light button. The film coder's task, therefore, became determination of the length of time subjects fixated on each of these six objects.

Karslake and Brandt both measured fixation duration by assessing the distance that film in the eye camera traveled during a fixation. In other words, they counted the number of frames which subjects spent looking at a given area.[27] Similarly, in the present experiment, the film coder counted the number of frames containing fixations on the six relevant items.

A question arose concerning the number of fixations relevant to each manipulation. Audio was manipulated in the third and fifth scenes, while video remained constant. In each case, two versions of the commercial contained aural mention of the items in question

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[27]Karslake, "The Purdue Eye-Camera: A Practical Apparatus for Studying the Attention Value of Advertisements"; Brandt, "Ocular Patterns and Their Psychological Implications," pp. 260-268.

while two contained irrelevant information. In the "interlock" commercials, the only fixations on these items which were relevant to H_6 were the ones which occurred during aural mention of the items, while the talent simultaneously pointed to them.

In the "no interlock" commercials, the relevant fixations were those which occurred at the same point as in the "interlock" commercials--while the talent pointed to the items--though the audio made no mention of them. In the third scene, therefore, when the talent pointed to the batteries, eye fixations on the batteries were counted. When she pointed to the cord and cord holder, however, fixations on the batteries were not counted--only those on the cord and holder were then relevant. Likewise, in the fifth scene, when the talent demonstrated the antenna, eye fixations on the antenna were counted; but when the demonstration moved to the earphone and dial light button, only fixations on those items became relevant.

Scope of Looking Behavior

In order to test H_{11}, the film coder had to count the number of different items on which subjects fixated during the sixth scene of the commercials. A display of nine radio mock-ups remained on the screen for eleven seconds; in two versions of the commercial it was a "simple" (symmetrical) display, and in two versions it was a "complex" (nonsymmetrical) display. Each subject had the

opportunity to fixate on as many as nine different items during the time the display was shown. No count was made of the actual number of fixations spent on each item, because such information was not relevant to the hypothesis. Subjects who looked at eight or nine items necessarily had to spend less time, on the average, on each item than subjects who looked at only two or three; how much less time was spent in each individual case was not deemed important in this study.

Statistical Design

The statistical analysis focused on the independent and interactive effects of three independent variables: visual hesitation, audio-video interlock, and visual complexity, on two dependent variables: looking behavior and recall. All subjects were randomly assigned to treatments, and homogeneity of variance was confirmed in each case. One-way analysis of variance was used to test H_1 through H_{11}. The following is a summary of the tests which were run:

	Independent Variable	Dependent Variable
H_1:	Visual Hesitation/ No Visual Hesitation	Number of relevant items in immediate recall: SCENE #1 and SCENE #4.

	Independent Variable	Dependent Variable
H_2:	Visual Hesitation/ No Visual Hesitation	Number of relevant items in delayed recall: SCENE #1 and SCENE #4.
H_3:	Visual Hesitation/ No Visual Hesitation	Distance of first fixations from center: SCENE #1 and SCENE #4.
H_4:	Interlock/No Interlock	Number of relevant items in immediate recall: SCENE #3 and SCENE #5.
H_5:	Interlock/No Interlock	Number of relevant items in delayed recall: SCENE #3 and SCENE #5.
H_6:	Interlock/No Interlock	Number of fixations on relevant items: SCENE #3 and SCENE #5.
H_7:	Simplicity/Complexity	Immediate "interesting" rating: SCENE #6.
H_8:	Simplicity/Complexity	Immediate "pleasing" rating: SCENE #6.
H_9:	Simplicity/Complexity	Delayed "interesting" rating: SCENE #6.
H_{10}:	Simplicity/Complexity	Delayed "pleasing" rating: SCENE #6.
H_{11}:	Simplicity/Complexity	Number of items fixated: SCENE #6.

In all instances involving the "visual hesitation" and "interlock" manipulations, separate analyses were run for each of the

scenes concerned. The differing nature of the items in these cases made independent analyses appropriate.

Two-way analysis of variance was used to test H_{12} and H_{13}, both of which were concerned with the conjunctive effects of two of the independent variables: audio-video interlock, and visual complexity, in the sixth scene of the commercials. Here, the following 2×2 tables were used in the analysis:

	Visual Hesitation	No Visual Hesitation
Audio-Video Interlock	# OF ITEMS, IMMEDIATE RECALL: SCENE #6	
No Audio-Video Interlock		

	Visual Hesitation	No Visual Hesitation
Audio-Video Interlock	# OF ITEMS, DELAYED RECALL: SCENE #6	
No Audio-Video Interlock		

III. FINDINGS

Given a televised message, it was predicted that visual pauses, redundancy in the audio-video relationship, and complexity of visual patterns would affect viewers' looking behavior and recall. Since previous studies had found that aural hesitations increased recall, it was proposed that visual hesitations would do likewise. Also, visual hesitation was operationalized as "blank spaces" on the TV screen; since earlier research had found that subjects made initial fixations on the center of a display when given no "cues" as to where they should look, it was hypothesized that the same would be true in the current study (blank screens held no cues).

Research had indicated a positive relationship between recall and audio-video redundancy; it was predicted, therefore, that recall of relevant visualized items in the present study would be higher when the audio and video tracks "interlocked" than when they did not. Looking behavior was expected to be differentially affected by the two situations also.

Finally, earlier investigations had suggested that the length of fixation on a pattern, and subjects' evaluations of it, were

influenced by the difficulty of information extraction from the pattern. It was currently hypothesized, therefore, that subjects' fixation time would be longer given a complex display than it would be given a simple display, and that their recall and evaluations of the two displays would differ.

Simple, randomized analysis of variance was used to test H_1 through H_{11}; two-way analysis of variance was used for H_{12} and H_{13}.

Reliability Check

The film coder coded eye fixations in five scenes in each commercial, for purposes of analysis. Across the forty-eight subjects, therefore, a total of 240 scenes were coded. A second coder coded forty-eight scenes (20 per cent) for purposes of determining interjudge reliability. These forty-eight scenes were randomly selected, but were chosen as evenly as possible across all scenes (one scene per subject). Hence, SCENE #1 was coded by a second judge in ten different commercials. SCENE #3 was coded nine times; SCENE #4, nine times; SCENE #5, ten times; and SCENE #6, ten times. (SCENE #2 was not coded at all since it contained no manipulations relevant to the hypotheses.) Results of the reliability check were as follows:

	Number of Items for Which Fixation Totals Agreed	Frequency of Agreement
SCENE #1:	5 out of 5	6
	4 out of 5	3
	3 out of 5	1
SCENE #3:	3 out of 3	8
	2 out of 3	1
SCENE #4:	4 out of 4	7
	3 out of 4	2
SCENE #5:	3 out of 3	10
SCENE #6:	9 out of 9	7
	8 out of 9	3

Based on the above, the experimenter concluded that reliability was good.

Visual Hesitation

Recall Under Conditions of Visual Hesitation

H_1: In a televised message, there will be greater immediate recall of relevant visualized items when the camera pans with visual hesitation than when it pans without visual hesitation.

Twenty-four subjects viewed a commercial which included visual hesitation in the first and fourth scenes; twenty-four viewed one which included no visual hesitation in the same two scenes. Immediately after exposure to the message, each of the forty-eight subjects was asked to recall five visualized items from the first scene and five from the fourth scene. The above hypothesis was, therefore, tested twice. It was expected that the visual hesitation group would remember more of the items in both scenes than would the no visual hesitation group.

For the first scene, the average number of items recalled by the visual hesitation group was 2.17. For the no visual hesitation group the average was 1.88. An analysis of variance test, however, showed no significant difference between the two means; the difference was so small that it could easily have occurred merely because of sampling error.[28] H_1, therefore, was rejected.

Though the difference between the means was small, it was in the predicted direction; the visual hesitation group did remember a slightly higher number of items than did the no visual hesitation group.

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[28] $F = 0.90$, with degrees of freedom 1 and 46. An F Test also confirmed the homogeneity of variances between the two samples.

For the fourth scene, the average number of items recalled by the visual hesitation group was 1.21, and for the no visual hesitation group, 1.17. Analysis of variance again showed no significant difference between the two means; again, the difference was small enough to have occurred merely because of sampling error.[29] Hence, H_1 was rejected here also.

As before, though, the small difference between the means was in the predicted direction; the visual hesitation subjects again remembered a slightly higher number of items than did the no visual hesitation subjects.

H_2: In a televised message, there will be greater delayed recall of relevant visualized items when the camera pans with visual hesitation than when it pans without visual hesitation.

One to four weeks after they had seen the commercials, all forty-eight subjects were again asked to recall the five items from the first scene and the five from the fourth scene. Hence, H_2 was also tested twice. As before, it was expected that the visual hesitation group would remember more of the items in both scenes than would the no visual hesitation group.

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[29] $F = 0.02$, with degrees of freedom 1 and 46. An F Test also confirmed the homogeneity of variances between the two samples.

For the first scene, the average number of items recalled by the visual hesitation group was 1.92, while for the no visual hesitation group it was 1.50. Analysis of variance showed that the difference between the means was not significant, and, hence, could have occurred because of sampling error.[30] H_2 was, therefore, rejected.

Again the small difference between means was in the expected direction. The visual hesitation group recalled more items, on the average, than did the no visual hesitation group.

Finally, an analysis of variance test was also run to determine whether or not the change in scores between the immediate and delayed recall tests differed between the visual hesitation and the no visual hesitation groups. No difference was found.[31]

For the fourth scene, the average number of items recalled by the visual hesitation group was 0.67. For the no visual hesitation group it was 0.79. Analysis of variance revealed only a sampling error difference between the two means.[32] Hence, H_2 was also rejected here.

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[30] $F = 1.50$, with degrees of freedom 1 and 46. An F Test also confirmed the homogeneity of variances between the two samples.

[31] Means: -0.25 and -0.38. $F = 0.31$, with degrees of freedom 1 and 46.

[32] $F = 0.23$, with degrees of freedom 1 and 46. An F Test also confirmed the homogeneity of variances between the two samples.

This time the existing difference between means was not in the expected direction. The visual hesitation group recalled fewer items, on the average, than did the no visual hesitation group.

Again, an analysis of variance test was run to determine whether or not the change scores were significantly different. As before, no difference was found.[33]

Looking Behavior Under Conditions of Visual Hesitation

H_3: In a televised message, when the camera pans with visual hesitation across relevant display items, first eye fixations will be closer to the center of the frame when a "blank screen" appears than they will be when the camera pans without visual hesitation directly onto another item.

Twenty-four subjects who viewed a commercial which included visual hesitation in the first and fourth scenes had the opportunity to fixate on a "blank screen" five different times in each scene. The remaining twenty-four subjects, in the no visual hesitation group, had the chance, instead, to fixate on five different objects in each scene. H_3 was thereby tested twice. It was expected that the visual hesitation group would make their first fixations closer to the center of the frame than would the no visual hesitation group.

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[33]Means: -0.54 and -0.38. $F = 0.28$, with degrees of freedom 1 and 46.

For the first scene, the average distance from center that eye fixations appeared for the visual hesitation group was 3.12 units (each unit measured one-quarter inch). For the no visual hesitation group it was 3.28 units. Analysis of variance revealed that the difference between these two means could be attributed merely to sampling error.[34] Hence, H_3 was rejected.

Although the difference was small, however, it was in the direction expected; the visual hesitation group did make their initial eye fixations closer to the center of the frame than did the no visual hesitation group.

For the fourth scene, the average distance from center that first eye fixations appeared for the visual hesitation group was 3.34 units, and for the no visual hesitation group, 3.70 units. Analysis of variance showed only a sampling error difference between the two means.[35] H_3 was, therefore, also rejected here.

Again, although the difference was small, it was in the predicted direction; the visual hesitation subjects again made their first

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[34] $F = 0.32$, with degrees of freedom 1 and 46. An F Test also confirmed the homogeneity of variances between the two samples.

[35] $F = 1.42$, with degrees of freedom 1 and 46. An F Test also confirmed the homogeneity of variances between the two samples.

eye fixations closer to the center of the frame than did the no visual hesitation subjects.

Interlock

Recall Under Conditions of Interlock

H_4: In a televised message, there will be greater immediate recall of relevant visualized items when there is audio-video interlock than when there is no audio-video interlock.

Twenty-four subjects viewed a commercial which included an audio-video interlock treatment in the third and fifth scenes; twenty-four viewed one which included no interlock in the same two scenes. Immediately after exposure to the message, each of the forty-eight subjects was asked to recall three visualized features from the third scene, and three from the fifth scene. In this way, the above hypothesis was tested twice. It was expected that the interlock group would remember more of the features in both scenes than would the no interlock group.

For the third scene, the average number of features recalled by the interlock group was 1.62. For the no interlock group the average was 1.08. An analysis of variance test revealed a significant difference between the two means; in other words, the difference

was too large to have been attributed merely to sampling error.[36] H_4, therefore, was confirmed under these conditions.

For the fifth scene, the average number of features recalled by the interlock group was 1.00 and for the no interlock group, 1.17. Analysis of variance here showed a difference between the two means which was small enough to have been caused by sampling error.[37] Hence, this time, H_4 had to be rejected.

The difference which did occur between the means was not in the direction predicted. The interlock group remembered slightly fewer of the features than did the no interlock group.

H_5: In a televised message, there will be greater delayed recall of relevant visualized items when there is audio-video interlock than when there is no audio-video interlock.

One to four weeks after they had seen the commercials, all forty-eight subjects were again asked to recall the three features from the third scene and the three from the fifth scene. Hence, H_5 was also tested twice. As before, it was expected that the interlock

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[36] $F = 4.32$, with degrees of freedom 1 and 46. $P < .05$. An F Test confirmed the homogeneity of variances between the two samples.

[37] $F = 0.56$, with degrees of freedom 1 and 46. An F Test also confirmed the homogeneity of variances between the two samples.

group would remember more of the features in both scenes than would the no interlock group.

For the third scene, the average number of features recalled by the interlock group was 1.17, while for the no interlock group it was 0.79. Analysis of variance showed that the difference between the means could be attributed to sampling error.[38] H_5 was, therefore, rejected.

The small difference between the means was in the expected direction, however. The interlock group recalled more features, on the average, than did the no interlock group.

An analysis of variance was run to detect recall changes from "immediate" recall to "delayed" recall, for the interlock and no interlock groups. There were no significant differences.[39]

For the fifth scene, the average number of features recalled by the interlock and no interlock groups was 1.00; there was virtually no difference between the means.[40] H_5 was also rejected here.

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[38] $F = 2.20$, with degrees of freedom 1 and 46. An F Test also confirmed the homogeneity of variances between the two samples.

[39] Means: -0.46 and -0.29. $F = 0.50$, with degrees of freedom 1 and 46.

[40] $F = 0.00$, with degrees of freedom 1 and 46. An F Test also confirmed the homogeneity of variances between the two samples.

As before, an analysis of variance was run between group change scores. Again, no significant findings occurred.[41]

Looking Behavior Under Conditions of Interlock

H_6: The amount of time spent looking at relevant visualized items will be greater when there is audio-video interlock than when there is no audio-video interlock.

Twenty-four subjects who viewed a commercial which included interlock in the third and fifth scenes had the opportunity to fixate on three items which were simultaneously mentioned in the audio. The remaining twenty-four subjects, in the no interlock group, had the chance to fixate on the same three items (in both scenes) while the audio carried irrelevant material. In this way, H_6 was tested twice. It was expected that the interlock group would spend more time looking at the relevant items than would the no interlock group.

For the third scene, the average amount of time spent by the interlock group in looking at the three relevant items was 11.67 frames (as recorded by the eye camera film), or 1.46 seconds. The no interlock group spent an average of 8.42 frames, or 1.05 seconds

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[41]Means: 0.00 and -0.17. $F = 0.88$, with degrees of freedom 1 and 46.

in looking at the same three items. An analysis of variance test revealed a difference between the means which was so small that it could be due solely to sampling error.[42] Hence, H_6 was rejected.

For the fifth scene, the average amount of time spent by the interlock group in looking at the three relevant items was 7.17 frames, or 0.90 seconds. The no interlock group spent an average of 5.29 frames, or 0.66 seconds, in looking at the same three items. An analysis of variance test here again revealed a difference between the means which was so small that it could be due solely to sampling error.[43] H_6, therefore, was also rejected in this case.

Visual Complexity

"Interesting" Ratings Under Conditions of Visual Complexity

H_7: In a televised message, subjects will rate a complex display of items more "interesting" than a simple one, when tested immediately after presentation.

Twenty-four subjects saw a version of the experimental message which included the complex display of radio mock-ups, and

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[42] $F = 1.08$, with degrees of freedom 1 and 46 An F Test also confirmed the homogeneity of variances between the two samples.

[43] $F = 0.46$, with degrees of freedom 1 and 46. An F Test also confirmed the homogeneity of variances between the two samples.

twenty-four saw one which included the simple display. The rating scale for the displays ran from 7 (very interesting) to 1 (very dull) It was expected that the complex group would rate the display more interesting than would the simple group.

On scales administered immediately after presentation of the message, the mean score for the complex group was 3.21, while that for the simple group was 3.17. Analysis of variance showed that the difference between the two means was small enough to have occurred because of sampling error.[44] Hence, H_7 was rejected.

The existing difference, however, though extremely small, was in the predicted direction. The complex group did rate the display slightly more interesting than did the simple group.

H_9: In a televised message, subjects will rate a complex display of items more "interesting" than a simple one, when tested one to four weeks after presentation.

One to four weeks after exposure to the message, each subject re-rated the display he saw on the seven-point "interesting/dull" scale. All forty-eight subjects participated in the delayed test. It was again expected that the complex group would rate the display more interesting than would the simple group.

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[44] $F = 0.01$, with degrees of freedom 1 and 46. An F Test also confirmed the homogeneity of variances between the two samples.

This time the mean score for the complex group was 3.46; for the simple group it was 2.88. Analysis of variance showed no significant difference between them, so that H_9 was rejected.[45]

Again, the small existing difference between the two means was in the predicted direction. The complex group did rate the display slightly more interesting than did the simple group.

An analysis of variance run between change scores for both groups on immediate and delayed tests produced nonsignificant findings.[46]

"Pleasing" Ratings Under Conditions of Visual Complexity

H_8: In a televised message, subjects will rate a simple display of items more "pleasing" than a complex one, when tested immediately after presentation.

Again, twenty-four subjects saw a version of the test commercials which included the simple display of radio mock-ups, while twenty-four saw one which included the complex display. This time the rating scale for the displays ran from 7 (very pleasing) to 1 (very

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[45] $F = 1.80$, with degrees of freedom 1 and 46. An F Test also confirmed the homogeneity of variances between the two samples.

[46] Means: -0.29 and 0.25. $F = 2.82$, with degrees of freedom 1 and 46.

annoying). It was expected that the simple group would rate the display more pleasing than would the complex group.

On scales administered immediately after presentation of the message, the mean score for the simple group was 3.83, while that for the complex group was 3.50. Analysis of variance showed that the difference between the two was not significant; again, it was small enough to have occurred because of sampling error.[47] Hence, H_8 was also rejected.

As before, however, the difference was in the expected direction. The simple group did rate the display slightly more pleasing than did the complex group.

H_{10}: In a televised message, subjects will rate a simple display of items more "pleasing" than a complex one, when tested one to four weeks after presentation.

One to four weeks after exposure to the message, each subject was also asked to re-rate the display he saw on the seven-point "pleasing/annoying" scale. It was again expected that the simple group would rate the display more pleasing than would the complex group.

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[47] $F = 0.62$, with degrees of freedom 1 and 46. An F Test also confirmed the homogeneity of variances between the two samples.

In this case, the mean score for the twenty-four subjects in the simple group was 3.67, and for the complex group it was 3.83. Analysis of variance revealed no significant difference between the means.[48] H_{10} was rejected.

This time, the existing difference was not in the direction predicted; the simple group rated the display slightly less pleasing than did the complex group.

The analysis of variance test run between change scores in this case also produced nonsignificant findings.[49]

Looking Behavior Under Conditions of Visual Complexity

H_{11}: In a televised message, subjects will fixate on more different items given a simple display than they will given a complex display.

All forty-eight subjects saw a display of nine radio mock-ups. Twenty-four saw the mock-ups arranged in a simple display and twenty-four saw them in a complex display. In each case, though, subjects had the opportunity to fixate on nine different items

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[48] $F = 0.16$, with degrees of freedom 1 and 46. An F Test also confirmed the homogeneity of variances between the two samples.

[49] Means: -0.17 and 0.33. $F = 1.95$, with degrees of freedom 1 and 46.

during the eleven seconds the display was exposed. It was expected that the simple group would fixate on more different items, on the average, than would the complex group.

The average number of fixated items for the simple group was 3.42, and for the complex group, 2.62. Analysis of variance showed no significant difference between the two means.[50] H_{11} was, therefore, rejected.

The difference which occurred, however, was in the expected direction. The simple group did fixate on a slightly higher number of items than did the complex group.

Visual Complexity and Interlock

Recall Under Conditions of Visual Complexity and Interlock

H_{12}: In a televised message, immediate recall of relevant visualized items will be lower given a complex display than it will be given a simple display, but not as much lower when there is audio-video interlock as when there is no audio-video interlock.

Twelve subjects saw a commercial which included the complex display of radio mock-ups and the audio-video interlock

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[50] $F = 1.04$, with degrees of freedom 1 and 46. An F Test also confirmed the homogeneity of variances between the two samples.

treatment. Twelve saw the complex display with no interlock, twelve saw the simple display with interlock, and twelve saw the simple display with no interlock. Immediately after exposure to the commercial, each of the forty-eight subjects was asked to recall three visualized features of the mock-ups (the same three appeared in all versions of the commercial). It was expected that the highest recall would occur in the simple/interlock group, the second-highest in the simple/no interlock group, the third-highest in the complex/interlock group, and the lowest in the complex/no interlock group.

The average number of features recalled by the simple/interlock group was 1.17. For the simple/no interlock group it was 0.58. The complex/interlock group recalled an average of 1.17 features, and the complex/no interlock group, 1.08. (See Table 1.)

TABLE 1

MEANS FOR IMMEDIATE RECALL
UNDER CONDITIONS OF
FORMAT COMPLEXITY AND INTERLOCK

	Simple	Complex
Interlock	1.17	1.17
No Interlock	0.58	1.08

Analysis of variance showed that neither the main effects nor the interaction was significant; in other words, the differences between the four means were small enough to have occurred because of sampling error.[51] H_{12} was rejected.

The highest degree of recall occurred in the simple/interlock and complex/interlock groups. The next highest occurred in the complex/no interlock group, and the lowest in the simple/no interlock group. Overall, therefore, the findings were not in the predicted directions.

H_{13}: In a televised message, delayed recall of relevant visualized items will be lower given a complex display than it will be given a simple display, but not as much lower when there is audio-video interlock as when there is no audio-video interlock.

One to four weeks after exposure to the commercials, all forty-eight subjects were asked to recall the same three visualized features as they had immediately after viewing. The four groups of twelve subjects each, therefore, remained the same. It was again expected that the highest amount of recall would occur in the simple/interlock group, the second-highest in the simple/no interlock group,

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[51] $F = 0.94$, with degrees of freedom 1 and 44. An F_{max} Test also confirmed the homogeneity of variances between the two samples.

the third-highest in the complex/interlock group, and the lowest in the complex/no interlock group.

The average number of features recalled by the simple/interlock group was 0.58. For the simple/no interlock group it was 0.33. The complex/interlock group recalled an average of 0.58 features, and the complex/no interlock group, 0.67. (See Table 2.)

TABLE 2

MEANS FOR DELAYED RECALL
UNDER CONDITIONS OF
FORMAT COMPLEXITY AND INTERLOCK

	Simple	Complex
Interlock	0.58	0.58
No Interlock	0.33	0.67

Analysis of variance showed that neither the main effects nor the interaction was significant; once more, the differences between the four means were small enough to have occurred because of sampling error.[52] Hence, H_{13} was also rejected.

[52] $F = 0.63$, with degrees of freedom 1 and 44. An F_{max} Test also confirmed the homogeneity of variances between the two samples.

The highest degree of recall occurred in the complex/no interlock group. The second-highest occurred in the simple/interlock and complex/interlock groups, and the lowest in the simple/no interlock group. None of the findings, therefore, were in the predicted directions.

An analysis of variance was again run between change scores for the four groups, and no significant differences were found.[53]

Summary

Of the nineteen analysis of variance tests which were run, though only one showed a significant difference between means, thirteen of them produced results in the predicted direction. It appears, therefore, that the manipulations in this study did have some effect on subjects.

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[53] Means: -0.58, -0.25, -0.58, and -0.42. $F = 0.12$, with degrees of freedom 1 and 44.

IV. CONCLUSIONS

The current study examined various attention factors in televised messages. Findings indicate that none of the manipulated variables had much effect on viewers' looking behavior or recall. Visual hesitations, operationalized as blank spaces between items appearing on the screen, had no influence on the number of items viewers could remember or on the location of their eye fixations on the screen. Likewise, audio-video interlock (redundancy in the audio-video relationship) did not affect either recall of relevant visualized items or eye fixations on them. Finally, visual complexity (in the format of displays) had no effect on retention of display features, fixation time on the items, or interest and pleasantness evaluations of the displays.

Conclusions Based on Findings

Recall Under Conditions of Visual Hesitation

Recall was measured first in situations where the TV camera panned across a series of objects in two different ways. It either revealed all of the items in immediate succession, or exposed

a blank screen before each one. Hypothesis 1, suggesting that the choice of panning technique would influence immediate recall of the items, was tested twice and not supported. The first scene of the commercial contained five memory items: a piano, some records, a drum, a horn, and a banjo; the fourth scene also contained five: a pillow, a thermos, a flashlight, a clock, and a case with a shoulder strap. Regardless of whether the camera showed viewers every item in succession or whether it revealed a blank space between each pair, immediate recall of the objects involved in both scenes was the same.

Hypothesis 2, claiming that delayed recall would be similarly affected, also failed to receive support in the present study. Even after a period of one to four weeks had elapsed, the difference in retention between the two groups of viewers was negligible. Hence, the experimenter concluded that visual hesitation had no effect on recall.

Looking Behavior Under Conditions of Visual Hesitation

One of the looking behavior variables examined in the current study was operationalized as "drift to screen center." Hypothesis 3, suggesting that TV camera movement across the aforementioned "blank spaces" would have an effect on the tendency of viewers'

eyes to move toward the center of the screen, was also tested twice and not supported. Again, SCENE #1 of the commercial included blank spaces preceding exposure of the records, the drum, the horn, the banjo, and the radio. In SCENE #4, the blank spaces preceded the thermos, the flashlight, the clock, and the case with the shoulder strap. Initial fixations on blank spaces preceding items were not significantly closer to the center of the frame in either scene than were initial fixations on the items themselves. Here the experimenter concluded that visual hesitation did not affect drift to screen center.

Recall Under Conditions of Interlock

Recall was also measured in situations where the off-camera announcer either made mention of the visualized memory items or merely presented irrelevant information. Hypothesis 4, maintaining that immediate retention of the objects in question would be affected by such aural conditions, was supported in one case and not supported in a second. For the third scene of the commercial, viewers receiving the message containing aural support for the visualized items (the batteries, the cord, and the cord holder) recalled more of those items on an immediate basis than did viewers seeing the same objects while the announcer delivered irrelevant

material. For the fifth scene, where items were the antenna, the earphone, and the dial light button, immediate recall for both sets of viewers was the same.

Hypothesis 5, holding that delayed retention would, likewise, be influenced, was not supported in either case. After a one- to four-week time lapse, retention of items appearing in both scenes was the same for both viewing groups. It was thus concluded that audio-video interlock may affect recall in some cases but not in others.

Looking Behavior Under Conditions of Interlock

A second looking behavior variable was operationalized as "fixation duration." Hypothesis 6, which proposed that an announcer's mention of visualized items would affect the length of time viewers looked at the relevant objects, was again tested twice and not supported. As before, the items concerned were those in the third scene (the batteries, the cord, and the cord holder), and those in the fifth scene (the antenna, the earphone, and the dial light button). Fixations on the items in question lasted just as long when the dialog was directly relevant as when it was completely irrelevant. Hence, the experimenter concluded that audio-video interlock did not influence the length of fixation time.

"Interesting" Ratings Under Conditions of Visual Complexity

Given one of two different visual arrangements of nine radio mock-ups, viewers were asked to rate the display according to how interesting it was to them. Hypothesis 7, claiming that the complex (nonsymmetrical) format would receive immediate ratings of higher interest, was not supported. On a seven-point "interesting/dull" scale, viewers gave the same interest ratings to the display, whether they saw the complex one or the simple (symmetrical) one.

Hypothesis 9, which maintained that the effect would hold over time, was, likewise, not supported. Time had no effect on the comparison of ratings across the two groups. In this case, the conclusion was that visual complexity had no influence on viewers' interest ratings.

"Pleasing" Ratings Under Conditions of Visual Complexity

Viewers were also asked to rate the radio mock-ups display they saw according to how pleasing it was to them. Hypothesis 8, which suggested that the simple (symmetrical) arrangement would receive more pleasing ratings on an immediate basis, was not supported. On a seven-point "pleasing/annoying" scale, viewers gave the same pleasantness ratings to the display, whether they saw the simple one or the complex (nonsymmetrical) one.

Similarly, Hypothesis 10, proposing that this same effect would hold over time, was not supported. Time had no effect on the comparison of ratings across the two groups. Again, the experimenter had to conclude that visual complexity had no effect on viewers' pleasantness ratings.

Looking Behavior Under Conditions of Visual Complexity

The last variable concerned with eye movement was operationalized as "scope of looking behavior." Hypothesis 11, contending that a difference in format complexity of the display of radio mock-ups would affect the number of different mock-ups on which viewers chose to fixate, was not supported. Viewers presented with a complex (nonsymmetrical) arrangement looked at just as many of the nine mock-ups as did viewers presented with a simple (symmetrical) arrangement of the same objects. In conclusion, visual complexity did not influence the scope of looking behavior.

Recall Under Conditions of Visual Complexity and Interlock

The last assessment of retention came, again, in the situation involving differing visual arrangements of the nine radio mock-ups, coupled with the varied aural conditions mentioned previously (relevant and irrelevant information in the audio track).

Hypothesis 12, which suggested that immediate recall of features of the display would be influenced both by the complexity of the visual arrangement and by the relevancy of the aural presentation, was not supported. Even though two manipulations were allowed to interact, viewers' immediate recall of the features in question was not affected. Retention was the same whether they saw the simple display supported by the announcer, the simple display not supported by the announcer, the complex display with aural support, or the complex display without aural support.

Hypothesis 13, proposing that delayed recall would be similarly affected, also failed to receive support. One to four weeks later, the difference in recall between the four groups was, likewise, negligible. The interaction of visual complexity and interlock did not, hence, affect recall.

Summary of Findings

Nineteen separate analyses were made on the data obtained in this study; there were thirteen different hypotheses and six of them were tested twice. One test produced significant results; however, given a .05 level of significance, one test in twenty may be expected to be significant simply by chance.

Thirteen of the nineteen tests did show results in the predicted direction. It seems, therefore, that the phenomena studied

did have some effect on the subjects.

In addition, if greater precision had been built into the current experiment, greater differences would probably have occurred between treatments. Two of the manipulated scenes in the commercials yielded recall and looking behavior data on only five items apiece. The other three manipulated scenes produced recall data on three items apiece and looking behavior information on three items in two cases and nine items in the third. Replications of this experiment might contain longer messages with a larger number of items included for the study of retention and eye-fixations.

Discussion

Visual Hesitation: Effects on Recall

Contrary to the hypotheses, visual hesitation had no effect on recall. Jersild and Ehrensberger both found that pausing before a verbal statement had definite retentive value. The "rehearsal" which apparently took place in subjects' minds during the delay interval proved even more effective for recall purposes than an immediate repetition of the statement.[54] It may well be, however,

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[54] Jersild, "Primacy, Recency, Frequency, and Vividness," pp. 58-70; Ehrensberger, "An Experimental Study of the Relative Effectiveness of Certain Forms of Emphasis in Public Speaking," pp. 94-111.

that verbal hesitation has an entirely different effect than does visual hesitation. Perhaps a much longer pause is needed in the visual channel before viewers can mentally rehearse what they have seen. Also, in the above studies, subjects were forewarned by the experimenter that a recall test would follow presentation of the verbal message. In the present experiment, no forewarning was given. Subjects knew nothing about the recall test in this case until after they had viewed the experimental message. Quite possibly, therefore, effects of the visual hesitation manipulation were not given the same chance to operate here as were effects of the verbal hesitation manipulation above.

It is interesting to note that in both the immediate and delayed recall situations, subjects in both treatment groups recalled approximately one whole item more from the first scene of the commercial than they did from the fourth scene. In the first scene, the objects included were all musical items: a piano, some records, a drum, a horn, and a banjo. In the fourth scene, however, the objects did not belong to any particular class: a pillow, a thermos, a flashlight, a clock, and a case with a shoulder strap. Perhaps the actual nature of the objects affected retention of them as well as looking behavior.

Visual Hesitation: Effects on Looking Behavior

Also contrary to the situation hypothesized, visual hesitation had no effect on the tendency of viewers' fixations to drift toward the center of the screen.

Thomas' work indicated that, given no cues as to where they should look, subjects would tend to fixate initially on the center of the scene before them. The stimulus material in this case, however, was a set of Rorschach Ink Blots; Thomas did not present subjects with any "blank" cards.[55] In the current study, given a completely blank scene in between scenes containing actual objects, subjects' eyes tended to drift to the area of the screen in which they expected the next item would eventually appear. In other words, they anticipated the appearance of a new item. While they were presented with no visual cues as to where they should look, they at least had a mental idea of where such cues would next appear; hence, their eyes did not tend to drift toward the center of the screen.

Subjects who saw one item after another in immediate succession had their anticipation satisfied almost instantaneously. When a new object came into view, they merely transferred their gaze to it--thereby also tending to fixate away from the center of the

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[55] Thomas, "Eye Movements and Fixations During Initial Viewing of Rorschach Cards," pp. 345-353.

screen. The finding that both groups of subjects made initial scene fixations which were between three and four units from center (each unit measured one-quarter inch) is, therefore, understandable.

The actual items over which the camera panned may have had some effect on fixation location. As pointed out previously, the series of items in the first scene was somewhat homogeneous (musical items), while the series in the fourth scene was more heterogeneous. Given the former set of items, all subjects (regardless of which treatment group they were in) tended to make initial scene fixations closer to the center of the screen than they did given the latter set of items (overall averages were 3.20 units away from center and 3.52 units away, respectively). Perhaps presentation of the more heterogeneous array led to a greater sense of anticipation (and curiosity) on the part of viewers. If such were true, they might well be expected to make initial scene fixations farther from screen center (in anticipation of new items) than would be the case given a homogeneous array.

Interlock: Effects on Recall

Although hypotheses proposed that audio-video interlock would increase recall of visualized items, only weak support for them was obtained. Baldwin received maximum recall from viewers

of a motion picture film clip when there was high redundancy in the audio-video relationship.[56] In one instance in the current study, his findings were supported (immediate recall of features in SCENE #3: the batteries, the cord, and the cord holder). In the others (immediate recall of features in SCENE #5: the antenna, the earphone, and the dial light button, and delayed recall of features in both SCENE #3 and SCENE #5), they were not. It is very probable, however, that the actual subject matter involved and the context within which it appears may have a good deal of influence on retentive value. Perhaps viewers' familiarity with the items in question must be considered.

In the present experiment, it is quite possible that subjects were more familiar with external features of the radio advertised in the test commercials (the antenna, the earphone, and the dial light button in SCENE #5) than they were with internal features (the batteries, the cord, and the cord holder in SCENE #3). If that were the case, in SCENE #3, aural support for the visualized internal features may well have led to significantly more recall of the features on the part of subjects in the interlock treatment group (as opposed to subjects in the no interlock group). On the other hand,

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[56]Baldwin, "Redundancy in Simultaneously Presented Audio-Vidto Message Elements as a Determinant of Recall."

if the external features presented in SCENE #5 were very familiar to all subjects, aural support for the visual presentation (or lack of it) would not have affected recall.

Over time, the above difference did not hold. Because there were only three memory items, however, even a slight rate of forgetting on the part of subjects could easily have washed out the effect obtained previously.

Interlock: Effects on Looking Behavior

It was also hypothesized that relevant audio (the audio-video interlock treatment) in SCENE #3 and SCENE #5 would draw attention to the items appearing visually; in the irrelevant audio situation (the no interlock treatment), the objects could well have gone unnoticed by subjects. Looking behavior was, hence, supposed to have been differentially affected. In the current study, however, it is reasonable to assume that subjects were geared much more toward looking behavior than they were toward listening behavior. Even though the experimenter explained that audio would be included in the test commercials, it is not difficult to imagine that each subject was highly conscious of the light reflecting off his eye, and, hence, of the experimenter's interest in the visual aspects of the message. The finding that all subjects were drawn to examine the

visual objects for roughly the same amount of time in each scene is, therefore, quite conceivable.

The setting in which the "relevant visualized items" appeared in the two scenes, however, could have affected the amount of time subjects spent looking at them. The third scene of the commercial included one female presenter (her hands only); the fifth scene featured three male presenters (visible from the waist up). A fair number of fixations occurred on talent's hands, faces, and clothing; it is suggested, therefore, that varying talent situations should be explored with regard to effects on looking behavior.

Visual Complexity: Effects on "Interesting" Evaluations

Contrary to expectation, viewers of the complex (nonsymmetrical) arrangement of radio mock-ups did not rate the display more interesting than did viewers of the simple (symmetrical) arrangement of the same items. Berlyne found that a complex pattern left subjects with uncertainty regarding its properties. Interest ratings of such patterns were higher than were those of simple patterns, because subjects wished to continue looking at the complex designs, in hopes of obtaining additional information

about them. In other words, they were seeking closure.[57] In the current study, however, the nine items comprising the simple and complex displays were all easily identifiable as radio mock-ups--set in the context of a commercial for a Panasonic radio. The difficulty of information extraction may be a function both of the format and of the content of the display. Berlyne used meaningless designs, while the current experiment used familiar items. It is quite possible, therefore, that the eleven-second duration of the displays was long enough for subjects to obtain all of the information which they felt necessary. Hence, interest ratings made by subjects seeing the complex display would not have been necessarily higher than those made by subjects seeing the simple display.

Visual Complexity: Effects on "Pleasing" Evaluations

Also contrary to prediction, viewers of the simple (symmetrical) arrangement of radio mock-ups did not rate the display more pleasing than did viewers of the complex (nonsymmetrical) arrangement of the same items. Berlyne found that a simple pattern left subjects with a desire for entertainment or diversion. They rated the designs "pleasing" to look at, since there was no

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[57] Berlyne, "Complexity and Incongruity Variables as Determinants of Exploratory Choice and Evaluative Ratings," pp. 274-290.

uncertainty as to information contained; in this case, closure was easily obtained.[58] Once more, however, if, as suggested above, neither of the displays in the current study left viewers with uncertainty, it would be expected that pleasantness ratings would be similar across groups.

It was not believed that the discrepancy in display ratings found between the present experiment and previous studies could have been influenced either by the definition of a complex format or by the test instrument employed. As was true in the current study, both Berlyne and Terwilliger used nonsymmetrical displays as complex presentations, and both had subjects rate them on seven-point scales.[59]

One unfortunate condition in the final scene of the commercial--the one containing the display of radio mock-ups--was poor lighting. The set was lighted in such a way that it was only with some difficulty that viewers were able to distinguish between edges of the objects and the platforms on which they were resting. It was not too easy, either, to distinguish between light and dark colors. Overall ratings, therefore, may have been lowered for all

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[58] Ibid.

[59] Ibid.; Terwilliger, "Pattern Complexity and Affective Arousal," pp. 387-395.

treatment groups on both the "interesting" and "pleasing" scales, so that differences between groups would have been very difficult to obtain.

Visual Complexity: Effects on Looking Behavior

In spite of the hypothesis to the contrary, viewers of the simple (symmetrical) display of nine radio mock-ups did not look at more of the mock-ups during the eleven seconds the display was exposed than did viewers of the complex (nonsymmetrical) display.

Previous research suggested that the length of fixation on a display was a function of the difficulty of extracting information from it.[60] In addition, complex figures were found to make information retrieval more difficult than were simple figures.[61] In past studies, however, stimuli consisted of materials not readily familiar to subjects. Thomas used Rorschach Ink Blots, and Berlyne and Lawrence used nonsense patterns.[62] As pointed out

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[60] Thomas, "Eye Movements and Fixations During Initial Viewing of Rorschach Cards," pp. 345-353.

[61] Berlyne and Lawrence, "Effects of Complexity and Incongruity Variables on GSR, Investigatory Behavior, and Verbally Expressed Preference," pp. 21-45.

[62] Thomas, "Eye Movements and Fixations During Initial Viewing of Rorschach Cards," pp. 345-353; Berlyne and Lawrence, Effects of Complexity and Incongruity Variables on GSR, Investigatory Behavior, and Verbally Expressed Preference," pp. 21-45.

earlier, in the current study, the nine items comprising the displays were all easily identifiable as radio mock-ups--set in the context of a commercial for a Panasonic radio. It is quite possible, again, that the difficulty of information extraction is not a function solely of the format of the display, but also of the content. Since content was held constant across both simple and complex displays, the finding that one group of subjects fixated on just as many different items as the other becomes readily acceptable. Time of exposure of the display (eleven seconds in all cases) was not considered important in this regard, since Berlyne and Lawrence found no differences in looking behavior between simple and complex displays at exposure times ranging from ten seconds to two minutes.[63]

Visual Complexity and Interlock: Effects on Recall

It was suggested earlier that subjects would fixate on more different radio mock-ups given a simple arrangement of them than they would given a complex arrangement. The rationale was based on previous studies which found that the length of fixation on a display was a function of the difficulty of information extraction

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[63] Berlyne and Lawrence, "Effects of Complexity and Incongruity Variables on GSR, Investigatory Behavior, and Verbally Expressed Preference," pp. 21-45.

therefrom. It was assumed, therefore, that recall of features of the objects would be greater in the case of the simple arrangement.

In addition, it was proposed that an aural presentation in support of the visual scene would lead to greater recall than would irrelevant audio. Since, however, the current study failed to support the first contention, and only weakly supported the second, it is not surprising that the two in combination failed to produce significant results. It must also be remembered that in this "combination" situation, the overall sample was split into four groups instead of the two used in testing all of the other hypotheses. The total number of subjects per group in this case was only twelve, making significant findings extremely difficult to obtain.

Summary

Only one significant finding was made in the current experiment, and even that was weakly supported. Thirteen out of the nineteen analyses made, however, did produce findings in the expected directions. There is a good indication, therefore, that if the same mean differences had occurred with a larger sample of subjects, more significant findings would have been obtained. Also, as pointed out earlier, an increase in precision would have been valuable, particularly in the case of recall, where no more than five (and sometimes fewer) memory items were considered in any one test.

Other possible reasons for the lack of significant looking behavior findings must be explored, however. Most of the research which has been conducted in the area of eye movements has been concerned with still pictures. It may be that the variables examined in this context cannot be lifted therefrom and studied directly in a motion-picture framework. Movement of the camera across a scene may give viewers an entirely different orientation than the one held by viewers of a still picture. Eye fixations on the center of the frame may be very rare (regardless of the content manipulation) if the camera is moving either horizontally or vertically over the screen. The inclination of viewers to follow this movement with their eyes may make consideration of "anticipation" tendencies much more valuable than consideration of fixations on the exact center of the screen. Then, too, different methods of moving the camera might also be explored for their effects on eye movements.

Movement on the set might be another important consideration in this area. If physical action by the performing talent attracted viewers' attention, actual content manipulations within scenes might, again, have little relevance to variations in looking behavior. Perhaps ideal combinations of talent movement and camera movement could be determined also--if situations were discovered in which a certain amount of movement was distracting to viewers (to the point

where shifts in direction of eye movements became too numerous for any "learning" to take place).

Looking at a different side of the motion-picture medium, it may well be that different visual variables become important when an audio track is present (regardless of its content) than when it is absent (in the case of still pictures). Studies of the effects of audio-video interlock on eye fixations on relevant objects may not yield significant findings; but studies of effects of the audio-video combination on eye-movement patterns might be very beneficial. Perhaps the number of shifts in eye fixations is influenced by the presence of audio--or, the amount of eye regression over parts of the televised scenes might be affected.

One other consideration might be the size of the items on the screen (regardless of what their properties are). Does size affect the amount of time viewers spend looking at a given object--and if so, are there particular conditions under which use should be made of extreme camera close-ups, as opposed to more inclusive medium-shots? Again, the effects of <u>movement</u> on the screen should be considered here.

The present study was, first, an attempt to relate existing knowledge of looking behavior to the important but largely untested field of televised messages. It was discovered that previous findings

in this area may not always be directly applied to the television medium, where both audio and moving video are present. Different considerations may be important where movement is involved--since viewers may well have an entirely different orientation to the message than they would have in the case of still pictures.

Second, the current study may be the door-opener to a new method of measuring the effectiveness of television messages. It is time for message analysts to back up a few steps--from the evaluation of television presentations as entities, to consideration of the attention factors of each. It is the latter which are responsible in some way for inducing viewers to watch the messages in the first place--before they ever have a chance to "remember" or "believe" or become interested in accepting them as whole messages. Three attention factors were examined in the present experiment: visual hesitation, audio-video interlock, and visual complexity, and their effects on looking behavior and recall assessed. It is strongly recommended that the same variables be studied with a larger sample of subjects, and also that the other suggested manipulations be employed in future experiments.

The eye camera apparatus has just begun to be used in the area of televised messages. It may provide a useful tool to communication research as more and more factors are isolated for

consideration of their effects on learning and evaluation of the scenes presented. In addition, other criterion variables may be explored. How does looking behavior affect memorability, believability, and willingness to accept ideas advocated (or, in the case of commercials, products advertised)? Criterion measures which have been used with varying degrees of success in field studies may also be applied to laboratory investigations utilizing instruments such as the eye camera.

Third, a study like the present one gives advertising research a chance to test some of the "accepted principles" passed from copywriter to copywriter and from textbook to textbook without any scientific support. One such principle: "Keep it simple," was examined in the current experiment with the visual complexity manipulation. Another: "Say what you show and show what you say," was explored under conditions of audio-video interlock. A number of additional maxims may be worthy of future study: "Put one major selling point in each commercial"; "Keep the product, and hands and face of talent prominent in commercials"; "Use personal language--the 'YOU' approach."

Suggestions for Future Research

Eye-Movement and Scene Movement

In the current study, regardless of the manipulations in a given scene, the experimenter noticed a definite tendency on the

part of subjects to follow the action occurring on the screen. Eye movements seemed to follow the movements of either the TV camera across a set or the hands and faces of talent within it. Future experiments might include various kinds of movement simultaneously in a given scene to determine which attracted the attention of viewers.

Eye-Movement and Talent vs. Objects

Some indication was noted in the present study that the presence of talent (male and female) and the visualization of hands, as opposed to faces, or hands and faces, might affect the attention viewers gave to memory objects. Other studies could well focus on looking behavior in scenes emphasizing differing combinations of talent and items pointed out or demonstrated by the talent. In addition, familiar and unfamiliar talent (celebrities and "unknowns"), as well as familiar and unfamiliar objects (well-known items and new products) might be included to test the effects of familiarity on both looking behavior and recall.

Eye-Movement Patterns

Future experiments might also examine consecutive eye fixations as opposed to shifting movements on arrangements involving

more than one item. If the frequency of each were studied across selected scenes, both the attention-drawing and the attention-holding powers of various objects could be assessed. It would also be interesting to note whether or not repetition of certain scenes had any effect on eye-movement patterns.

Looking Behavior and Recall

Luborsky, Blinder, and Mackworth suggested that recall of items is not necessarily related to the amount of time a subject spends looking at them.[64] Similarly, in the current study, correlations between retention scores and looking behavior were very low.[65] Further support is needed in this area, however, especially when consideration is given to the other variables mentioned here.

Recall from Audio or Video Only

Experimental messages in the current study included two memory items which were mentioned only once by the announcer and never appeared visually on the screen: the weight and the cost of the Panasonic radio advertised in the commercials. Recall of both

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[64] Luborsky, Blinder, and Mackworth, "Eye-Fixation and the Contents of Recall and Images as a Function of Heart Rate," pp. 421-436.

[65] Twenty-four point-biserial correlations ranged from -.36 to +.32 with no appreciable differences between treatment groups.

points, across all subjects, was extremely low. On an immediate basis, only six subjects out of forty-eight remembered the weight of the radio; on a delayed basis, seven recalled weight. Looking at the cost feature, on an immediate basis, only three subjects out of forty-eight could remember it; delayed recall in this case found six who remembered cost.

In addition, the experimental messages contained one memory item which was visualized only once and never mentioned by the announcer: the fact that the three medium-sized radio mock-ups (in the display appearing in the last scene of the commercials) had handles. Only five subjects out of forty-eight recalled the handles on an immediate basis, and only one remembered them when the delayed recall test was given. Much more experimentation is needed in this regard to determine the conditions under which "interlock" (as used in the current study) may be required for purposes of achieving any substantial degree of retention. It would also be possible to test the relative effectiveness of the aural and visual channels when used in varying contexts.

Primacy/Recency

Finally, while primacy/recency effects have been studied both in printed and aural situations for decades, little, if any,

research has been conducted in this regard using television's visual channel. In the present experiment, subjects saw two different series of items (in two different scenes of the commercial), as the TV camera panned across them--either in immediate succession or with blank spaces between each pair. Interestingly enough, while there were no differences in recall of items for the group seeing blank spaces between items, there was a definite recency effect for the group seeing all items in succession. Considerably more subjects in this group recalled the last item shown in both scenes than recalled any of the other four items in either scene. Again, further research is needed in this area before any definite conclusions can be drawn.

LITERATURE CITED

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Books

Brandt, Herman F. The Psychology of Seeing. New York: Philosophical Library, 1945.

Deutsch, Morton, and Krauss, Robert M. Theories in Social Psychology. New York: Basic Books, Inc., 1965.

Hovland, Carl I., Janis, Irving L., and Kelley, Harold H. Communication and Persuasion. New Haven: Yale University Press, 1953.

Articles and Periodicals

Berlyne, D. E. "Complexity and Incongruity Variables as Determinants of Exploratory Choice and Evaluative Ratings." Canadian Journal of Psychology, XVII (1963), 274-290.

Berlyne, D. E. "Curiosity and Exploration." Science, CLIII (July 1, 1966), 25-33.

Berlyne, D. E., and Lawrence, George H. "Effects of Complexity and Incongruity Variables on GSR, Investigatory Behavior, and Verbally Expressed Preference." Journal of General Psychology, LXXI (1964), 21-45.

Brandt, Herman F. "Ocular Patterns and Their Psychological Implications." American Journal of Psychology, LIII (1940), 260-268.

Ehrensberger, Ray. "An Experimental Study of the Relative Effectiveness of Certain Forms of Emphasis in Public Speaking." Speech Monographs, XII (1945), 94-111.

Guilford, J. P., and Hackman, H. B. "A Study of the Visual Fixation Method of Measuring Attention Value." Journal of Applied Psychology, XX (1936), 44-59.

Jersild, Arthur. "Primacy, Recency, Frequency, and Vividness." Journal of Experimental Psychology, XII (1929), 58-70.

Levy, J. M. "Experiments on Attention and Memory, with Special Reference to the Psychology of Advertising." University of California Publications in Psychology, II, No. 2 (April 12, 1916), 157-197.

Mackworth, N. H., Kaplan, I. T., and Metlay, W. "Eye Movements During Vigilance." Perceptual and Motor Skills, No. 18 (1964), 397-402.

Nixon, H. K. "Attention Value and Interest in Advertising." Archives of Psychology, No. 72 (1924).

Sperling, George. "The Information Available in Brief Visual Presentations," Psychological Monographs, LXXIV, No. 11 (1960).

Television Factbook. 1968-69 edition, No. 38. Washington: Television Digest, Inc., p. 81-a.

Terwilliger, Robert F. "Pattern Complexity and Affective Arousal." Perceptual and Motor Skills, No. 17 (1963), pp. 387-395.

Thomas, E. Llewellyn. "Eye Movements and Fixations During Initial Viewing of Rorschach Cards." Journal of Projective Techniques and Personality Assessment, XXVII (1963), 345-353.

Woodrow, Herbert. "The Measurement of Attention." The Psychological Monographs, XVII, No. 5 (December, 1914).

Reports

"Television Home Viewing Gains for 13 of 14 Months, TvB Analysis of A. C. Nielsen Data Reveals," TvB Report, V-67(68). New York.

Unpublished Material

Baldwin, Thomas Frederick. "Redundancy in Simultaneously Presented Audio-Video Message Elements as a Determinant of Recall." Unpublished Ph.D. dissertation, Michigan State University, 1966.

Karslake, James Spier. "The Purdue Eye-Camera: A Practical Apparatus for Studying the Attention Value of Advertisements. Unpublished Ph.D. dissertation, Purdue University, 1939.

Television Bureau of Advertising. "Why We Use Television." Paper from TvB, 1968. (Mimeographed.)

Wolf, Willavene, and Others. "An Experimental System for Eye-Movement Studies in Dynamic Bi-Dimensional Fields," 64-157. Paper from the Bureau of Educational Research and Service, The Ohio State University.

Wolf, Willavene, and Others. "An Eye-Movement Study of Children Viewing Television," 64-157. Paper from the Bureau of Educational Research and Service, The Ohio State University.

APPENDIX

QUESTIONNAIRE

TV COMMERCIAL STUDY

January-February, 1969

Now take just a minute to answer the following questions concerning the commercial you just saw. Please read each question carefully before responding.

1. At the beginning of the commercial, several musical items were shown suggesting different types of music heard on a Panasonic radio. List as many of these items as you can remember.

2. Later on, a girl opened the back of the Panasonic radio and indicated several important aspects of radio construction and operation. List as many of these features as you can remember.

3. At one point, some radio accessories were shown -- some "extras" which may be purchased at a slight additional cost with the purchase of a Panasonic, but which are not essential to radio operation. List as many of these accessories as you can remember.

4. In addition, the three boys pointed out some special features which come with all Panasonic radios -- at no additional cost. List as many of these special features as you can remember.

5. At the end of the commercial, a display of Panasonic radios was presented. List as many things as you can remember about the items you saw in that display.

6. Now look at the scale below. It has seven intervals to give you an opportunity to show the intensity of your judgment. For example, if you think FORD is a Very Fast car, place an "X" in the space next to Fast. If you think FORD is Quite Fast, place your "X" in the second space. If only Slightly Fast, place it in the third space. If you feel FORD is neither Fast nor Slow, or if you have no judgment one way or the other, place your "X" in the center space. Likewise, if you think FORD is Very Slow, put your "X" next to Slow; Quite Slow, second space; Slightly Slow, the third space from Slow. Fill in the scale below for practice.

FORD CAR

SLOW:___:___:___:___:___:___:___:FAST
3 2 1 0 1 2 3

Got the idea? Now think again about the display of Panasonic radios you saw at the end of the commercial, and rate that display on each of the following scales:

PANASONIC RADIO DISPLAY

LARGE:___:___:___:___:___:___:___:SMALL

DULL:___:___:___:___:___:___:___:INTERESTING

STRONG:___:___:___:___:___:___:___:WEAK

ANNOYING:___:___:___:___:___:___:___:PLEASING

BELIEVABLE:___:___:___:___:___:___:___:UNBELIEVABLE

7. As you recall from the commercial, how much did the Panasonic radio weigh?

8. How much did the Panasonic radio cost?

THANK YOU VERY MUCH FOR YOUR HELP.