

Effects of Presentation Order and Communication Modality on Recall and Attitude

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Previous consumer research has attributed differences in persuasion between communication modes (e.g., audio vs. print) to differences in the audience's control over the pace of argument presentation. It is argued in this article that communication modes also differ in the extent to which argument order is an important determinant of persuasion. The results of two studies show that, while order of argument presentation affects persuasion with audio messages, order is unimportant with print messages. These differences appear to be due to a first-in-first-out retrieval strategy employed in response to audio presentations but not in response to visual presentations. Implications of the research for understanding how consumers process messages and how to develop effective communications are discussed.

Communication modality (e.g., whether an ad is presented in audio or print) has received some but not a great deal of attention in the consumer behavior literature. In one of the earlier treatments, Wright (1974) argued that print communications may result in greater elaboration than taped communications because the opportunity to think about the message and generate arguments is much greater with print than taped messages. In accordance with this perspective, researchers have generally concluded that, by being self-paced, visual presentation provides the audience with greater opportunity to elaborate than radio. This enhanced elaboration of information leads to greater learning and more persuasion when information is presented in print than through radio (Chaiken and Eagly 1976; Gunter 1985; Pezdek, Lehrer, and Simon 1984).

However, Furnham and Gunter (1989) found that print information was recalled better than radio information even when the exposure time for each medium was equated and controlled. Jacoby, Hoyer, and Zim-

mer (1983) found that miscomprehension was lower for print media than for auditory or audiovisual media, and equating presentation times did not alter these results. Thus, modality differences appear to go beyond what can be accounted for by an opportunity to elaborate explanation.

Recent advances in psychology suggest that each input modality (e.g., print, audio) contains unique characteristics and people encode this modality-specific content when they process information. One form of information likely to be processed with an audio presentation is the order of information. As a result, a person may find it difficult to get to the third line of a song that he or she has often heard without accessing the first two lines of that song. On the other hand, people exposed visually to the Wendy's trademark may remember the font used by Wendy's restaurants, and this may contribute to the belief that they make old-fashioned hamburgers. These and other modality-specific forms of communication have received little attention in the consumer behavior literature, and yet they may affect consumer ability to recall information and form judgments based on that information.

The objective of this article is to investigate the notion that certain aspects of stimulus information are encoded differently depending on whether information is presented visually or auditorily. We focus specifically on the order of presentation and examine the persuasive effects of advertising information that is presented in different orders, as a function of the modality of presentation. Ordering of arguments in the copy of an ad

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is an important message strategy decision (Belch and Belch 1993, p. 241). Should the most important arguments be placed first or last for enhanced effectiveness? Is this decision dependent on the medium of communication? The answer to these questions depends on, among other factors, whether order of presentation affects retrieval of information and whether this effect differs for auditory and visual presentations.

LITERATURE REVIEW

Modality and Order of Presentation

While the bulk of past research has focused on the attention and information-processing effects of various media, some recent research in psychology has identified fundamental encoding differences between print and audio information processing. Specifically, it has been found that memory for the order of presentation of information is greater when the information is presented auditorily than visually. The reason for auditory superiority in memory for order of presentation is assumed to be a better representation of order information in mental codes that result from auditory than visual presentations (Glenberg and Swanson 1986).

Auditory superiority in memory for order of presentation was tested by Metcalfe, Glavanov, and Murdock (1981), who exposed subjects to three-word chunks either auditorily or visually. Subjects were later asked to recall the order of the presented information, and it was found that auditory subjects were more accurate in their temporal judgments than visual subjects. Similar results were obtained by Glenberg and Fernandez (1988). Both of these studies suggest that order is more likely to be encoded when subjects are exposed to information through an auditory mode than when they are exposed to information visually. As a result, order should also be more available for use as a retrieval cue when subjects are exposed to information auditorily than visually.

The use of information about the order of presentation in memory tasks was tested in one study by Jakimik and Glenberg (1990), who presented subjects with sets of sentences either in print or auditorily. After exposure to each set, subjects were quizzed on the contents of that set in a manner that required them to retrieve the presentation order of the sentences. For example, a sentence might describe two types of sounds a bird makes under different conditions. The question would then ask the subjects to retrieve the first-mentioned or the last-mentioned sound. Clearly, in order to answer the question, subjects would be required to retrieve the information and the order in which it was presented. Results indicated that subjects who heard the information were faster and more accurate than subjects who read the information in answering questions. Thus, it appears that auditory presentations facilitate storage and use of order information.

Jakimik and Glenberg's (1990) findings show that when a given task requires access to presentation order,

subjects perform the task better with auditory than visual presentation. However, this finding is of limited interest to consumer researchers, because it is task specific and may not replicate under different task conditions (e.g., free recall). In other words, presentation order and modality are of consequence to an advertising researcher if they affect subjects' retrieval strategies in more general tasks such as free recall. Evidence that modality and order interact in determining the retrieval strategies that people use was provided by O'Connor and Hermelin (1972). In their study, the authors investigated whether subjects' retrieval strategies are dependent on the types of cues available to them and the presentation modality. It was found that when information was presented auditorily, subjects were more likely to use order of presentation as a retrieval cue even when other cues were available to them. Conversely, the likelihood of use of spatial cues was greater when information was presented visually.

The research reviewed above supports the position that when information is presented auditorily, order is encoded and used in retrieval tasks. However, to this point, no empirical research has shown the effect of this encoding of order on the order of recall. We propose in this research that an order effect will be forthcoming when recall and attitudes are examined. The simplest, most straightforward order is likely to be a first-in-first-out procedure. That is, when order is used as a retrieval cue, subjects may attempt to retrieve information in the order in which it was presented.¹

The idea that the order of recall is affected by the order of presentation for auditory, but not visual, modality has important implications for attitude formation in consumer settings. If the information pertains to the attributes of a product, and a person judges the product based on these attributes, then the judgment is affected by whichever attributes are retrieved from memory. Further, prior research indicates that attributes that are retrieved first have a disproportionately greater impact

¹ The bin model proposed by Wyer and Srull (1986) suggests that information about a person is stored in the form of a push-down stack such that the items encountered last will have a higher probability of recall (last-in-first-out principle). However, this type of a "recency" effect is more likely when the learning measures are administered immediately after exposure to information. The inclusion of distractor tasks between learning and testing have shown this type of a recency effect to diminish significantly (e.g., Greene 1986). Another situation in which the last-in-first-out principle may apply to long-term recall is when the individual items are encoded at different points in time. Under these conditions, the items encoded last will have less opportunity to decay and therefore may be recalled with a higher probability (e.g., Neath and Crowder 1990). In our research, subjects encountered information about several distractor products after they had been exposed to the target information all at once. Thus, both types of recency effects discussed above do not apply to this study, and, therefore, a recency effect is not expected. Finally, the bin model does not differentiate between visual and auditory presentations, while more recent research has reported reliable differences between various presentation modalities.

on judgment (see Sherman et al. 1983). Thus, order of recall is an important determinant of one's judgment.

Memory-based Judgments

Consumers make memory-based judgments when they form evaluations about products by recalling what they previously learned about the product through advertising and other sources. It is assumed that during exposure to information, consumers process it in a nonevaluative mode; that is, the information is comprehended, but no attitudes toward the product are formed. Under these circumstances, their evaluation is dependent on what they are able to retrieve from memory. In one study that examined the relationship between recall and attitudes, Lichtenstein and Srull (1987) found that when subjects processed information about a person without intending to form evaluations, their later evaluations were correlated significantly with the information they recalled about the person. It was also found that the recall-attitude correlations decreased steadily as information that was recalled in the later parts of their recall protocols was correlated with attitudes. In other words, while attitudes are dependent on the information that is recalled, they appear to be driven more by the more salient aspects of the attitude object, which are recalled at the very beginning of recall protocols.

Hypotheses

The foregoing discussion suggests that when judgments are memory based, then it is not just the contents of memory, but what occurs at the top of one's mind that has a greater impact on judgments. Thus, the judgment rendered by a person about a product can be affected by influencing what comes to the top of that person's mind regarding that product. In a prior section, we have reviewed evidence in support of the proposition that when information is presented auditorily, the order of presentation is more likely to act as a recall cue than when information is presented visually. Therefore, it should be possible to affect memory-based judgments when subjects are exposed to information auditorily by varying the order in which the information is presented. If strong arguments are presented first, and subjects follow a first-in-first-out retrieval rule, judgments should be more positive than if strong arguments are presented last. On the other hand, because temporal order is not an important determinant of recall for visually presented information, the order of presentation of arguments should not affect order of retrieval, and attitudes, under this communication modality.

H1: Order of presentation of message arguments will affect the order of recall of those arguments and attitude when the information is presented auditorily and is processed in a nonevaluative mode.

The retrieval of visually presented information should be affected less by presentation order. The research reviewed above indicated that order of presentation is less likely to be encoded and used in retrieval when information is presented visually. Instead, the use of spatial cues (e.g., font size, location on a page) in retrieving visual information has been reported by several researchers (e.g., Baum and Jonides 1979). The O'Connor and Hermelin (1972) study described earlier is a nice example of the preference people have for spatial over presentation order cues when information is presented visually. Therefore, presentation order should have minimal effect on retrieval for visual presentation of information. Thus:

H2: Order of presentation of information will not affect subsequently reported recall order or attitude when the information is presented visually and is processed in a nonevaluative mode.

In experiment 1, we investigated the effects of changes in order of presentation on subjects' attitude toward an advertised product. The effects of changes in order of presentation on the order of recall of individual elements of the advertisement, and their mediating effects on attitude formation, were tested in experiment 2.

EXPERIMENT 1

Design and Subjects

The moderating role of message modality on the effects of varying order of information presentation on attitudes was examined in a 2 (modality: auditory vs. visual presentation) \times 2 (argument strength: strong vs. weak) \times 2 (order: strong arguments first vs. weak arguments first) between-subjects design. Argument strength was varied in order to show differences in subjects' attitudes depending on whatever is retrieved first. By changing argument strength within a message, and placing strong or weak arguments first, we can affect the valence of whatever is retrieved first. If subjects recall strong arguments first, then their attitudes should be more positive than if they recall weak arguments first. Thus, subjects' attitudes should indicate which part of the message was retrieved first.

Two hundred subjects recruited from undergraduate introductory marketing classes participated in the study for extra course credit. The study was conducted in several sessions of up to four subjects in each. Subjects within a session were exposed to the target ad in either the auditory or the visual modality.

Stimulus Materials

A set of eight advertisements was used as experimental stimuli. Seven of the eight ads were fillers used to prevent subjects from paying excessive attention to the

target ad that might have caused overlearning. The ads described products that were of general interest to the student population (e.g., tennis racquet, portable radio). The target ad described a new book bag (Vanguard). This ad was placed in the fifth position in the set of eight ads.

Experimental Manipulations

Argument Strength. The target ad consisted of two parts. One part described three intrinsic attributes of Vanguard book bag (tear-proof, water resistant, three storage areas). This part remained constant across all treatment conditions. A second part that described three extrinsic attributes of the book bag was used to vary the argument quality. For the strong argument condition, the book bag was mentioned as being available exclusively at Marshall Field's (perceived as a high-quality store where the experiment was conducted), that the bag carried a warranty of 10 years, and that the price of the bag was \$29.95. For the weak arguments condition, the book bag was advertised with a warranty of one month and was described as being available at K-Mart for \$5.95. This manipulation of argument strength was based on prior research that has shown that people's perceptions of product quality are affected by variables such as price and store image (Rao and Monroe 1989).

Order. The manipulation of presentation order was accomplished by placing the extrinsic attributes either as the first half or as the second half of the target ad. The two versions of the ad that resulted from the order manipulation, combined with the argument strength manipulation, resulted in four versions of the target ad.

Modality. For the visual modality condition, the ads were typed on separate sheets of paper. The brand name was typed as a header on each page. For auditory presentation, the target ad and the seven filler ads were read into a tape in the same order as they appeared in the visual modality condition. The brand name was announced prior to the reading of the copy for each brand. There was a five-second pause between successive ads.

Procedure

To discourage subjects from forming product attitudes, the study was positioned as a pretest of the informativeness and believability of advertising claims for various products. They were asked to first read through (listen to) all the ads sequentially. They were told that their opinions about the believability and informativeness of each ad would be collected after they had completed reading (listening to) all the ads. Thus, subjects' attention was directed away from product evaluation and toward claim evaluation.

The time of exposure was controlled in the visual presentation condition to be equal to the time of auditory presentation (25 seconds per ad). This precaution

was taken so that differences in elaboration of stimulus information between auditory and visual presentation conditions would be minimized and is consistent with other studies that have controlled exposure times for visual and auditory presentations (e.g., Jacoby et al. 1983).

After exposure to the ads, subjects were given a questionnaire. The first question measured subjects' attitude toward the Vanguard book bag (four seven-point scales anchored by "very bad-very good," "very awful-very nice," "very unattractive-very attractive," "very undesirable-very desirable," $\alpha = 0.78$). Then, subjects' ratings of the informativeness, believability, and strength of the arguments presented in the Vanguard ad were measured using seven-point scales ("not at all informative-very informative," "not at all believable-very believable," and "very weak-very strong," respectively). These measures provided credibility to the cover story, and the last item permitted an assessment of the argument-strength manipulation. Finally, subjects responded to a series of manipulation checks. Depending on the experimental condition, they rated the quality of goods available at Marshall Field's or K-Mart ("very low quality-very high quality"). The perceived price-quality relationship was measured by asking subjects to indicate their agreement with the statement, "In general, expensive (less expensive) goods are also of higher quality." A seven-point scale anchored by "strongly disagree-strongly agree" was used for this purpose. A similar question was used to measure the perceived relationship between warranty and quality. Subjects were then thanked and dismissed.

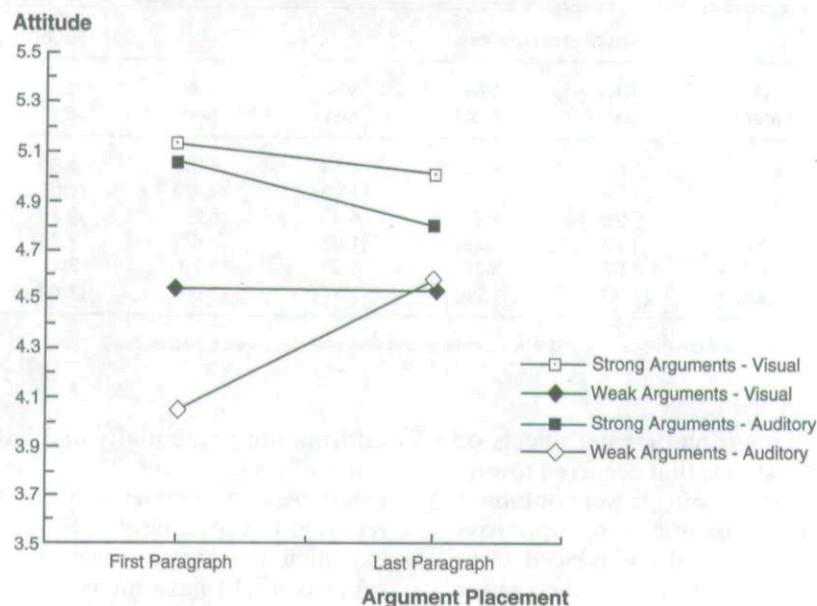
Results

Manipulation Checks. Subjects' evaluation of the claims in the Vanguard book bag advertisement on the "very weak-very strong" scale were analyzed using a one-way ANOVA with argument strength as the independent variable. The analysis revealed a significant effect of the argument-strength manipulation ($F(1,198) = 30.01, p < .0001$). Subjects perceived the strong-argument message to be stronger ($\bar{X} = 5.5$) than the weak-argument message ($\bar{X} = 4.1$).

A further assessment of subjects' responses to other manipulation check measures indicated that they perceived the quality of goods available at Marshall Field's to be superior ($\bar{X} = 5.5$) to the quality of goods available at K-Mart ($\bar{X} = 4.1, p < .05$). Higher-priced goods were seen as higher in quality ($\bar{X} = 5.0$) compared to lower-priced goods ($\bar{X} = 4.2, p < .05$). Finally, higher warranty was associated with higher product quality ($\bar{X} = 6.1$) than was lower warranty ($\bar{X} = 4.6, p < .05$). Thus, it was concluded that the extrinsic cue manipulation was successful in creating perceived quality differences between subjects in different treatment conditions.

Attitude. The mean attitude score for each subject was computed by averaging the scores of the four atti-

FIGURE 1
ATTITUDE SCORES AS A FUNCTION OF PRESENTATION ORDER AND MODALITY



tude scales. The first hypothesis called for an interaction between order of presentation and argument quality when information was presented in the auditory modality. That is, variations in argument strength were expected to affect attitudes differently depending on the position of strong and weak arguments in the message. Hypothesis 2, which addressed visual presentation conditions, predicted the absence of an interaction between order of presentation and argument quality. That is, argument strength variation was expected to affect attitudes similarly irrespective of the position of those arguments in the message. The mean attitude scores for each of the experimental conditions are plotted in Figure 1 and reported in Table 1.

The hypothesized effects were tested by conducting an ANOVA. Given the nature of the hypotheses, only the argument-strength/main effect terms and the argument-strength/presentation order interaction terms for each modality were included in the model (see Miniard, Bhatla, and Rose [1990] for similar analysis procedures). As expected, the analysis revealed a significant main effect of argument strength on attitudes for both visual ($F(1,192) = 7.37, p < .01$) and auditory condition subjects ($F(1,192) = 7.11, p < .01$). Longer warranty, higher price, and prestigious outlet combined to enhance subjects' attitudes toward the product.

The analysis also revealed a significant interaction ($F(1,192) = 4.8, p < .05$) between presentation order and argument strength for the auditory modality. This interaction did not even approach significance for the visual presentation subjects ($F(1,192) = 0.09, p > .5$,

Table 2 and Fig. 1). Subjects' attitudes remained the same whether strong arguments appeared at the beginning or the end of the message ($\bar{X} = 5.13$ and 5.02 , respectively). Similarly, while weak arguments led to a lower attitude score, their appearance at the beginning or end of the message did not alter attitudes when subjects read them ($\bar{X} = 4.55$ and 4.54 , respectively). The significant interaction for auditory presentation subjects, and the absence of an interaction for visual presentation subjects, supported Hypotheses 1 and 2.

The significant interaction obtained in the auditory condition was examined in greater detail using planned contrasts. Multiple t -tests were employed for this purpose. The t -tests revealed that subjects' attitudes toward the book bag were more positive in the strong-argument condition ($\bar{X} = 5.06$) than in the weak-argument condition ($\bar{X} = 4.05; t(45) = 3.5, p < .05$) only when the strong and weak arguments appeared at the beginning of the ad. When these arguments appeared at the end, strong ($\bar{X} = 4.8$) and weak ($\bar{X} = 4.57$) arguments did not produce different attitudes ($t(47) < 1, p > .2$). Thus, a strong *primacy* effect was obtained.

Discussion

The findings of experiment 1 were supportive of our expectations. When different groups of subjects were visually exposed to information about a book bag in different orders, there were no differences in the attitudes reported by them. Within the auditory presentation condition, the message claims presented at the

TABLE 1
GROUP MEANS FOR EXPERIMENTS 1 AND 2

Dependent measure	Visual presentation				Auditory presentation			
	SA first	SA last	WA first	WA last	SA first	SA last	WA first	WA last
Attitude (experiment 1)	5.13 (.81)	5.02 (.99)	4.55 (1.33)	4.54 (1.23)	5.06 (.45)	4.80 (1.03)	4.05 (.96)	4.57 (.48)
Attitude (experiment 2)	5.22 (.87)	5.25 (.73)	4.22 (.96)	4.38 (1.08)	5.26 (.68)	5.20 (.73)	3.83 (1.15)	4.68 (.87)
Recall (experiment 2)	3.62 (1.24)	3.67 (1.32)	3.16 (1.26)	4.35 (1.17)	3.28 (1.41)	3.14 (1.42)	2.80 (1.37)	2.76 (1.34)

NOTE.—Figures in parentheses are standard deviations; SA and WA indicate strong and weak arguments, respectively.

beginning of the advertisement had greater effects on subjects' attitudes than the claims that occurred toward the end of the ad. Thus, primacy effects were obtained.

While the findings of experiment 1 were supportive of our hypotheses, three additional issues need to be addressed. First, while primacy effects were detected in experiment 1, these are attitudinal effects that are expected to be driven by the first few recalled attributes. In order for us to conclude in favor of memory mediation of these effects, we need to demonstrate similar effects for both attitudes and recall. Specifically, subjects' recall protocols should show patterns that are similar to their attitude scores, especially when the first few items of subjects' protocols are considered. Thus, we would expect the first few items of recall protocols to reflect what was presented first auditorily. With visual presentation, recall order should exhibit no reliable pattern with respect to presentation order. Thus:

- H3:** The attributes presented at the beginning of a message will be recalled first when information is presented auditorily.
- H4:** The attributes presented at the beginning of a message will not be recalled first when information is presented visually.

Second, the primacy effect that was obtained in experiment 1 should be replicated in order for us to conclude with greater confidence that auditory presentations do seem to promote a first-in-first-out type of retrieval strategy. Given the dearth of research in this area, the value of replication is significantly higher in terms of theory development.

Finally, even though the time available to subjects to read the ad information was limited to 25 seconds in experiment 1, one can still argue that they had more time than they needed. Further, subjects in the visual condition had all of the ad information available to them at once, so they could go back and forth as they read through it. This behavior of going back and forth would have contaminated the order of presentation. In contrast, the auditory condition subjects received the

information sequentially and had no control over the order of presentation. Thus, one can argue that differential use of order cues may not have caused the effects reported in experiment 1. Rather, it could be the order in which they were processed. The visual condition subjects might have mixed up the order of arguments as they went back and forth in a relatively random manner. This would have minimized the predictiveness of the order cue. For auditory condition subjects, however, the order cue might have been more predictive of the order of presentation because they had no option but to process in the order in which the arguments were presented. Thus, our effects may be attributable to presentational differences rather than to differences in the encoding of order information for each modality. These concerns are addressed in the study that is reported next.

EXPERIMENT 2

The design and procedures used in this study were identical to those of experiment 1 with a few changes to address the issues raised earlier. First, for the visual modality manipulation, rather than typing an entire ad on one page, we presented only one sentence per page and instructed subjects to not turn back to a previous page. The first page contained the brand name and each subsequent page contained one sentence about the product. A blank page separated one ad from the other. This type of presentation was employed to ensure that subjects in the visual presentation conditions processed arguments in the same manner as subjects in the auditory conditions. Because the subjects could not turn back to previous pages, the order of presentation was maintained. Thus, it cannot be argued that the differences obtained between visual and auditory conditions are due to the visual condition subjects' processing the arguments out of order. A similar manipulation has been employed to eliminate differences between visual and auditory presentations by Eddy and Glass (1981).

One hundred fifty-four subjects recruited from undergraduate marketing classes participated in the study for extra course credit. The study was conducted in sev-

TABLE 2
ANOVA SUMMARIES FOR EXPERIMENTS 1 AND 2:
ATTITUDE MEASURE

Source	Sum of squares	df	\bar{X}	F	p
Experiment 1:					
Within cells	186.04	192	.97		
S (V)	7.14	1	7.14	7.37	.007
S (A)	6.89	1	6.89	7.11	.008
S × O (V)	.09	1	.09	.09	.762
S × O (A)	4.61	1	4.61	4.76	.030
Experiment 2:					
Within cells	114.71	145	.79		
S (V)	5.23	1	5.23	6.61	.011
S (A)	6.44	1	6.44	8.15	.005
S × O (V)	.10	1	.10	.12	.726
S × O (A)	3.75	1	3.71	4.69	.032

NOTE.—S (V) and S (A) represent the effect of argument strength in the visual and auditory presentation conditions, respectively; S × O (V) and S × O (A) represent the interaction between argument strength and presentation order in the visual and auditory conditions, respectively.

eral sessions of up to four subjects per session. Subjects within a session were exposed to the stimulus materials either auditorily or visually; instructions and other procedures were identical to those used in experiment 1.

After exposure to the ads, subjects were given a questionnaire. The first question measured subjects' attitude toward the Vanguard book bag (four seven-point scales anchored by "very bad-very good," "very awful-very nice," "very unattractive-very attractive," "very undesirable-very desirable," $\alpha = 0.92$). Then, subjects' ratings of the informativeness, believability, and the strength of the arguments presented in the Vanguard ad were measured using seven-point scales ("not at all informative-very informative," "not at all believable-very believable," and "very weak-very strong," respectively). These measures provided credibility to the cover story, and the last item permitted an assessment of the argument-strength manipulation. A message recall measure followed these measures. Subjects were then thanked and dismissed.

Results

Attitude. Analysis procedures similar to those in experiment 1 were followed. As expected, the analysis revealed a significant main effect of argument quality on attitudes for both visual ($F(1,145) = 6.6, p < .01$) and auditory condition subjects ($F(1,145) = 8.15, p < .01$). Thus, the manipulation of argument quality through the use of extrinsic cues affected subjects' attitudes significantly (Tables 1 and 2).

The analysis also revealed a significant interaction ($F(1,145) = 4.69, p < .05$) between presentation order and argument quality for the auditory modality. This interaction did not even approach significance for the

visual presentation subjects ($F(1,145) < 1, p > .5$). Visual condition subjects had equally positive attitudes when the strong arguments were presented first or last (5.22 vs. 5.25) and lower but equal attitudes when weak arguments were presented first or last (4.22 vs. 4.38). The significant interaction for auditory presentation subjects, and the absence of an interaction for visual presentation subjects, resembled the interaction obtained in experiment 1 and supported Hypotheses 1 and 2.

The significant interaction obtained in the auditory condition was examined in greater detail using planned contrasts. Multiple *t*-tests were employed for this purpose. First, the attitude score when strong arguments were presented first ($\bar{X} = 5.26$) was contrasted with the attitude score when weak arguments were presented first ($\bar{X} = 3.83$). This contrast was significant ($t(36) = 4.8, p < .01$). The difference in attitude scores when strong or weak arguments were presented in the latter part of the message ($\bar{X} = 5.2$ and 4.68, respectively) was not significant ($t(38) < 1.5, p > .1$). Thus, consistent with the findings of experiment 1, a significant primacy effect was obtained when information was presented auditorily. No such effects were obtained for visual presentation.

Recall. The claims made in the book bag advertisement were parsed into nine idea units. Each idea unit reflected an individual meaningful phrase that a subject could recall from the message. Subjects' recall was then coded based on whether they recalled each of these idea units. A score of one was given for every idea unit recalled by a subject. Two judges coded the recall protocols and exhibited agreement on 93 percent of the coded protocols. The disagreements on the remaining 7 percent pertained only to which of the idea units was recalled, and not to the number of idea units recalled. These disagreements were resolved by mutual discussion, and the final score was used for the analyses.

The success of our cover story was examined first. The cover story instructed subjects to rate the experimental ads on their believability and informativeness to ensure that attitudes were memory based. Under these conditions, we would expect a significant correlation between recall and attitude because attitudes are computed from the information that is recalled about the target product. To test this expectation, subjects' recall protocols had to be recoded. This need arose because a subject may recall only negative information about the target product, which will cause his or her attitude to be negative. In this situation, it is inappropriate to just count the number of claims the subject had recalled without considering the valence of what is recalled. Therefore, subjects in the weak-argument condition were awarded a -1 for every weak argument that they recalled. The resulting valenced recall scores were then correlated with subjects' attitude scores. This procedure is similar to the one employed by Chatto-

padhyay and Alba (1988), although their research made use of the weights given by subjects to each recalled piece of information.

A significant correlation ($r = 0.43, p < .001$) between subjects' recall and their attitudes confirmed our expectation and supported the appropriateness of our cover story manipulation to achieve memory-based judgments. This high correlation compares favorably with that of Lichtenstein and Srull (1987), who obtained a recall-attitude correlation of 0.34 under memory-based judgment conditions.

As discussed earlier, Lichtenstein and Srull (1987) found that correlations between attitude and recall declined progressively as the later parts of subjects' recall protocols were correlated with attitudes. That is, spontaneous recall that is gauged by the first few items of a recall protocol is a stronger indicator of memory-based attitude than overall recall. Similar analyses were done separately for auditory and visual condition subjects in this study. Valenced recall scores based on the first and second (N), the second and third ($N - 1$), the third and fourth ($N - 2$), and the fourth and fifth ($N - 3$) items recalled by subjects were correlated with attitudes. Consistent with Lichtenstein and Srull (1987), the correlations exhibited a declining trend for both auditory (r 's = 0.65, 0.54, 0.26, and 0.03) and visual condition subjects (r 's = 0.46, 0.46, 0.34, 0.21 for $N, N - 1, N - 2$, and $N - 3$ respectively).

Hypotheses 3 and 4 were tested next by examining the differences in recall between visual and auditory conditions for the N recall scores. The N recall scores reflected the first two attributes recalled by subjects. If the attributes that appeared at the top of a subject's mind were determinant of his or her attitudes, then we would expect these recall scores to exhibit a pattern similar to the attitude data.

Consistent with the attitude data, the interaction between presentation order and argument strength for the N recall scores was not significant for visual presentation condition ($F(1,141) = 2.08, p > .15$). The difference between subjects' valenced recall scores for strong and weak argument conditions was the same whether the arguments appeared at the beginning or the end of the message (0 and 0.17). For the auditory condition, however, there was a significant interaction between presentation order and argument strength ($F(1,141) = 4.74, p < .05$). The difference between the valenced recall scores for strong and weak arguments was significantly greater when they were presented at the beginning of the message than at the end of the message (0 and 0.51; $t(36) = 2.6, p < .05$). These findings mirrored the attitude data and provided support for Hypotheses 3 and 4.

One final set of analyses was conducted to argue against a potential alternative explanation for our findings. It is possible that despite the limit on ad exposure time in experiment 1 and due to the absence of time limits in experiment 2, subjects in the visual presen-

tation condition may have had more time to elaborate on the information. In contrast, auditory presentation might have loaded up the working memory of subjects who disregarded the later parts of the message because they could not process it. This greater elaboration in the visual condition, coupled with the inattention to later parts of the message in the auditory condition, might have resulted in main effects in the former and interactive effects in the latter conditions. That is, because of greater elaboration, visual condition subjects had all of the ad information available when they made their judgments. On the other hand, the later parts of the message were unavailable for the auditory condition subjects, which might have caused the observed primacy effects. This alternative explanation gains credibility because the total recall in the visual condition was significantly greater ($\bar{X} = 3.68$) than in the auditory condition ($\bar{X} = 2.9, p < .05$).

However, the alternative explanation for the primacy effect observed in this study should predict that the differences in elaboration of the later parts of the stimulus information by the visual and auditory condition subjects should result in differences in recall of that information. That is, if the individual items recalled by subjects are analyzed in terms of the position of each item in the stimulus, we should find no differences between auditory and visual conditions for the first few items. For the last few items, however, we should observe visual dominance. To test for this possibility, the individual items recalled by each subject were coded in terms of the position of that item in the message. For example, a subject recalling the first and last sentences in the message would have a positive score (one) for the first and last positions and zero scores for all other positions. Because the message was parsed into nine recallable units, there were nine scores for each subject. Thus, for any given position, each subject would have a one or a zero indicating whether the subject recalled that item or not.

The dichotomous recall scores for each position were then examined for differences as a function of presentation modality. The results of chi-square analyses did not support the alternative explanation of differential elaboration. In general, the visual condition subjects exhibited a slight superiority in the recall of each of the first eight items in the message. For the last item, however, the auditory condition subjects exhibited a small, but nonsignificant, superiority in recall over the visual condition subjects. Thus, coupled with the recall data and these additional analyses, the alternative explanation of differential elaboration of the later part of the message by auditory and visual condition subjects can be ruled out.

DISCUSSION

The availability of more than one medium for mass communication has caused several researchers to in-

quire into the differential effectiveness of, and the causes for differences between, various media. The present research demonstrated that the order of presentation of information affects recall and memory-based attitudes when people encounter information auditorily more than when they are exposed to it visually. Thus, with the message content remaining constant, differences in presentation order were reflected in what was retrieved first by auditory-presentation-condition subjects but not for visual-presentation-condition subjects. The recall order differences between subjects caused their attitudes toward the target product to be different too.

The modality-specific order effects occurred even after we attempted to control for exogenous differences between visual and auditory presentations. One of the major differences between visual and auditory information presentation is that the information that is presented auditorily is lost immediately upon presentation. In the visual condition, it is still available to the reader who may go back to that information and comprehend the difficult-to-understand parts of it. We reduced this visual presentation advantage significantly by limiting the exposure time or by presenting visual information one sentence per page and instructing subjects not to go back to previous sentences. Despite this procedure, differences emerged between visual and auditory presentation conditions.

A major theoretical contribution of this study derives from our demonstration of modality effects when subjects *use* the information that they retrieve from memory to form judgments. Consumer researchers have often focused on either memory effects or attitudinal effects of several variables of interest. Very few researchers have attempted to study the effects of variables on memory and how the resulting memory affects judgments (e.g., Chattopadhyay and Alba 1988). The importance of this distinction becomes clear when one observes that it is not the entire contents of the recall protocol, but the first few items of what is recalled, that determine attitudes. Thus, it is possible to have subjects recall equal amounts in two experimental conditions but differ in what they recall at the beginning. A researcher focusing only on memory might conclude in favor of absence of differences due to order changes because absolute recall scores show no differences. However, when the recalled information is used in computing attitudes, the order of recall becomes important and affects attitudes.

A second contribution of this research is the introduction of a new dependent variable to consumer researchers. Despite the knowledge that memory-based attitudes are determined more by what is retrieved first, consumer researchers have not examined order of recall as a dependent measure of interest. By demonstrating attitude effects that are determined by the order of recall (in certain cases; e.g., auditory messages), and not by the amount of recall, we have been able to highlight the importance of this measure.

A third major theoretical contribution stems from the relatively long-term nature of our findings. Modality has generally been viewed as a surface characteristic of information that has no reliable long-term effects (Roediger, Srinivas, and Weldon 1989). The focus of consumer researchers has also been on surface differences such as control over the pace of presentation for radio versus print. Our study, in contrast, shows that certain properties of input modality, by being represented in long-term memory, have effects on performance of tasks even in the long term. This is especially important in view of the controls that we have imposed on other differences between visual and auditory modalities (e.g., ability to reread information for visual presentations). Past research that has detected differences between media had generally confounded presentational differences with possible representational differences. By limiting time of exposure and by sequencing presentation in visual condition to mimic the auditory condition, we believe we have eliminated such confounds to a large extent.

Our findings have important implications not only for advertising copy writers but also for presenters of information such as teachers and salespersons. When the presentation modality is predominantly auditory, as is the case in radio advertising, or in a typical sales presentation, our findings suggest that one should "put the best foot forward." That is, under conditions where the information receivers are relatively low in their level of involvement, and therefore would evaluate the information at a later point in time based on what they can retrieve, it is advantageous to present the most favorable arguments in the beginning. These arguments have a higher likelihood of being retrieved and used in judgments.

The normal limitations of a laboratory experiment should preclude one from enthusiastically generalizing the results of this study to situations confronted by a practitioner. First, only one message was used as the target message. While there is no reason to suspect message-specific characteristics to have influenced our results, especially given that they are interactive, replication of our results with other messages that vary in length and complexity should bolster confidence in our findings. Second, only one exposure of the target ad was given to subjects. In reality, consumers are repeatedly exposed to advertisements. Whether modality effects are sustained even under repetition is not known. Third, recall and attitude were measured in close contiguity in experiment 2; subjects' expression of attitude before recall might have affected what was recalled first and inflated the reported correlations. Future research should examine the effects of modality and presentation order on just recall, without measuring attitudes earlier, to test for the robustness of our findings.

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