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Though advertising repetition is a frequently used marketing strategy, its effects are not well understood. The authors report findings from a laboratory experiment in which they investigated the effects of repeating a television commercial as a function of varying the message spacing or lag (i.e., the number of intervening commercials between two presentations of the target commercial) and the delay in memory measurement. In two different samples—younger and older adults—the results show a lag by measurement delay interaction. In general, results show that in the long measurement delay condition, the recall of message contents was significantly higher with the long lag than with the short lag. However, in the short measurement delay condition, recall was significantly higher with the short lag than with the long lag. The results are explained by a variation of encoding variability theory. The implications of the findings for media planning and television advertising to older adults are discussed.

Enhancing Memory of Television Commercials Through Message Spacing

Advertising repetition is an ubiquitous strategy. Advertisers use ad repetitions to promote brand name/claim learning (Craig, Sternthal, and Leavitt 1976; Singh, Rothschild, and Churchill 1988), enhance attitudinal responses (Rethans, Swasy, and Marks 1986), and induce purchase behavior by attempting to bring the target brand into the buyers' consideration set (Hauser and Wernerfelt 1990). The issue of how repetition affects advertising effectiveness is an important one in contemporary research, and a significant body of research has examined repetition effects (Unnava and Burnkrant 1991). However, there is still considerable ambiguity about the value of advertising repetition. Further research is sorely needed for a better understanding of repetition effects (cf. Pechmann and Stewart 1988).

One important issue that has received scant research attention in marketing is the interaction between message repetition and message spacing. Years of research in cognitive psychology have demonstrated that when two occurrences of a repeated word are separated by intervening items, memory performance steadily improves as a function of the number of intervening items. This is called the *lag effect* (Crowder 1976). Moreover, an interesting interaction between message spacing and timing of measurement has been observed (Glenberg 1976).

When memory is measured at short delays (i.e., there is little time lapse between the second exposure of the item and memory measurement), items with longer spacing or lag (i.e., separated by several intervening items between the two presentations) tend to show poor memory performance in comparison with items with shorter lag. The opposite effect is obtained when memory is measured at longer delays, with items having longer lag showing superior memory in comparison with items with shorter lag. Glenberg (1976) provides a theoretical explanation of the lag by measurement delay interaction, through a variation of encoding variability theory (Madigan 1969; Melton 1967).

In advertising, the only study that examines the effect of spacing was conducted in the print medium by Zielske (1959). It showed that longer lags resulted in greater long-term message retention than shorter lags. However, Zielske did not measure memory at a short delay, thus precluding any assessment of a spacing by measurement delay interaction. Also, no theoretical explanations of this interaction effect have been offered in the advertising literature.

The primary purpose of our article is to explore the repetition effects of television advertising by using the lag effects paradigm and theoretical notions proposed by Glen-

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Journal of Marketing Research
Vol. XXXI (August 1994), 384–392

berg (1976). Most psychology studies have used words and nonsense syllables as stimuli; therefore, one cannot assume that the findings from these studies will generalize to television commercials. We report the findings from a laboratory study in which the spacing between the two presentations of a target commercial was varied within the pod and memory measures were taken after either a short or long delay. The interaction between spacing (lag) and measurement delay was tested over two samples, younger adults and older adults.

Our use of two samples is based on both theoretical and practical considerations. Theoretically, using two samples should provide stronger support for the hypothesized effects. Pragmatically, older adults are a large and growing market segment, but communicating with them through the mass media, especially television, has proven difficult due to cluttered advertising environment and the fast pace of message presentation (Ensley and Pride 1991). The inclusion of older adults in our study provides a means of exploring the use of repetition as a memory enhancement tool for this important segment.

The study enhances our understanding of how repetition affects memory by examining the lag by measurement delay interaction in an encoding variability theory framework. The study findings are also relevant for media planning. For example, if message spacing enhances memory, appropriately altering the spacing between repetitions should reduce the number of repetitions (and hence the associated media costs) necessary to attain a criterion level of learning.

LITERATURE REVIEW AND SPECIFIC PREDICTIONS

Effect of Repetition on Memory

Research in verbal learning has shown that as the repetition of a message increases, the recall and recognition[1] of the message contents also increase (Crowder 1976). Repeating the message helps improve memory by strengthening message encoding, increasing redundancy (Lautman and Dean 1983), and providing greater opportunities to process the message (Pechmann and Stewart 1988). Numerous advertising studies have confirmed this relationship between repetition and learning (Rethans, Swasy, and Marks 1986; Singh, Rothschild, and Churchill 1988 and studies cited therein). On the basis of this evidence, we expect that increasing the number of exposures of a television commercial from one to two will improve memory for the commercial contents (as measured by recall and recognition scores).

Effect of Spacing (Lag) and Measurement Delay on Memory

When two occurrences of a repeated item are separated by at least some other items, the memory performance is better (the *distribution effect*). In addition, performance appears to improve steadily as a function of the number of intervening items (the *lag effect*; Crowder 1976). Finally, there is a crossover interaction between the message spacing and the time of memory measurement. When memory is measured at short measurement delays, message recall is higher if the spacing between the two repetitions is short than if the spacing between the two repetitions is long. The opposite effect is obtained when memory is measured at a long measurement delay—recall tends to be higher at longer spacings than at shorter spacings. This crossover interaction has considerable empirical support (Glenberg 1976; Sperber 1974).[2]

One of the most comprehensive explanations of this interaction is a variation of the encoding variability theory (Glenberg 1976). According to Glenberg, when an item (stimulus) is presented to the subject, the representation of the item in memory depends on the contextual variables present at the time of encoding. In other words, the same physical stimulus can be represented or encoded differently if it is presented in a different context. As the context changes, the subject's perception or elaboration of the stimulus changes, resulting in changes in the encoded stimulus.

Glenberg (1976) conceptualizes context as multidimensional and including aspects of the experimental situation such as other stimuli, the experimental task, the experimental surroundings, the subject's strategies, and the subject's internal physiological and psychological states. Over time, the context changes nonrandomly in such a way that similarities between contexts are an orderly function of time. That is, the context at time n + 2 is more similar to the context at time n + 1 than to the context at time n. Alternatively, what a person is thinking and feeling at time n + 2 is associated more closely with whatever that person was thinking and feeling at time n + 1 than at time n.

In Glenberg's formulation of the encoding variability theory, recall depends solely on the correspondence between the two stimuli: (1) the stimulus representation in memory at encoding, which is a function of the physical stimulus plus the encoding context, and (2) the retrieval stimulus at the time of testing, which depends on the actual retrieval cue and the context at the time of testing. The greater the correspondence between these two stimuli, the better the chances of recall. Now, to understand the lag effect and crossover interaction, consider the possibility of overlap between these two stimuli under varying conditions of message spacing and measurement delay.

When memory is measured after a short delay, the context at retrieval is more likely to overlap with the encoding context at the second presentation. In addition, if two repetitions of the stimulus item were separated by a few intervening items (i.e., in the short lag condition), the contextual information available at both presentations is presumably similar, and subjects have had two opportunities to encode this information. Thus, when memory is measured after a short

[1]The difference between recall and recognition is that in a recall test a subject is first given a set of information and is later given some minimal cue and asked to retrieve and reconstruct the original information, whereas in a recognition test the subject is confronted with the original material and asked whether it has been seen or heard before. Hence, for recall the individual must describe the stimulus when it is not present; for recognition the stimulus must be identified merely as having been previously seen or heard.

[2]The one study that failed to replicate the interaction between lag and measurement delay was by Toppino and Gracen (1985). However, the authors provide no explanation for their results aside from concluding that there may be unspecified boundary conditions in which a lag by measurement delay interaction does not occur.

delay, recall performance should be better in the short lag condition because the retrieval and encoding contexts overlap and also because the context was well encoded.

When memory is measured after a long delay, the recall performance should be better for longer lag conditions. This is because at a long delay, the retrieval context should be very different from the encoding contexts at either the first or second presentations. As Balota, Duchek, and Paullin (1989, p. 4) point out, "If sufficient time has passed for context to change before recall ... the subject will benefit from having more unique contexts available, such that one might match the new retrieval context."

Applying Glenberg's theoretical predictions to television advertising, one would expect that when memory is measured at short retention intervals, message recall will be significantly higher if the number of intervening items between the two presentations is small than if the number of intervening items between the two presentations is large. In contrast, when memory is measured at longer retention intervals, the recall will be higher with many intervening items between the two repetitions compared with when the repetitions are separated by just a few intervening items. It is noteworthy that the context for an ad presented twice in a pod of ads may vary because of not only the number of intervening ads and the passage of time, but also the nature of the ad preceding the second exposure. The mood created by the ad preceding the second exposure of the test ad may be a critical variable in inducing contextual change.

The preceding discussion leads to the following prediction: On the basis of the encoding variability theory, we predict that if a television commercial is repeated within a pod of commercials, the memory for the commercial contents will depend on the lag between the two repetitions and the delay in memory measurement after the second exposure. More specifically:

H_1: The lag between the two repetitions of a stimulus commercial will interact with the measurement delay such that when memory of the commercial is measured after a short delay, the short lag condition will lead to significantly higher memory than the long lag condition. However, when the memory is measured after a longer delay, the long lag condition will generate significantly higher memory than the short lag condition.

As mentioned previously, we wanted to test this hypothesis in both younger and older adults. Many studies suggest that older adults do not use encoding and retrieval contexts in memory tasks efficiently (Rabinowitz and Ackerman 1982). For example, older adults benefit less from a cue compatibility effect—that is, their recall performance does not improve as much as younger adults' does when encoding and retrieval contexts are similar (Duchek 1984). Thus, the poor memory performance among the older adults is attributed to both the use of less distinctive or elaborate encoding and their less effective retrieval processes (Burke and Light 1981; Rabinowitz 1989).

To make matters worse, the mnemonic devices that work with younger adults do not always work with the older adults (Cole and Houston 1987; Simon et al. 1982). For example, on the basis of the levels-of-processing research, Cole and Houston expected that emphasizing semantic encoding (i.e., encoding involving meaning-oriented, in-depth processing) would help older as well as younger adults remember the contents of a television commercial. Their results suggest that though the semantic encoding instructions improved memory performance of younger subjects, they had no effect on older subjects.

It is no wonder then that several marketing scholars have recommended that marketers primarily use self-paced media (print, direct mail) to communicate with older adults (Meadow, Cosmas, and Plotkin 1980; Phillips and Sternthal 1977; Ross 1981). It would be ironic to follow this suggestion, especially because Stephens's (1981) study shows "that television is an important and trusted media source among the elderly" (Ensley and Pride 1991, p. 2).

One way to overcome this memory deficit in older adults may be to repeat the messages more often. Repeating the message could help improve memory by strengthening message encoding through increasing redundancy (Lautman and Dean 1983), as well as by increasing the probability that the older adults would use effective encoding strategies on at least some exposure occasions. Unlike other mnemonic manipulations such as semantic encoding instructions or instructions to form mental images, which have been shown to be ineffective with older adults (Canestrari 1968), recent evidence from verbal learning research suggests that repeated exposure to an ad might increase the memory effectiveness of the message (Balota, Duchek, and Paullin 1989).

METHOD

Design

To test our predictions, we used a factorial design: 2 (age groups: younger adults versus older adults) × 2 (measurement delays: short versus long, the day after) × 2 (lags: short lag, with one filler commercial intervening between the two presentations of the experimental commercial, versus long lag, with four intervening commercials). In addition, to test the effect of repetition, we used four groups of control subjects (older and younger adults with dependent measures taken at a short measurement delay or the day after), resulting in a total of 12 cells. Control subjects were exposed only once to the experimental commercial.

Subjects

A total of 413 subjects participated in the study, of whom 268 were younger adults and 145 were older adults. The mean age of the younger adults was 22.2 years, with a range of 20 to 35 years. The mean age of the older adults was 72.16 years, with a range of 62 to 83 years.[3] Men and women were 47.4% and 52.6% of the younger adults and 33.3% and 66.7% of the older adults.

Procedure

Subjects were invited to view news shows in two half-hour sessions. The purpose of the study was withheld from them. Tape-recorded instructions, similar to the ones used by Singh, Rothschild, and Churchill (1988), informed sub-

[3]Most studies define older adults as the individuals 60 years of age or older, with mean age being in the high 60s to low 70s (see, e.g., Cole and Houston 1987; Lumpkin and Festervand 1988).

jects that they were about to see a late night news show taken from a network affiliate station outside their own viewing area and that we were interested in knowing their opinions about the news show. Before the actual news broadcast, the volume of the broadcast and the lighting in the room were adjusted until all subjects reported that they could see and hear the news comfortably. Subjects then viewed the news show in groups of 5 to 15. All subjects filled out a news evaluation form immediately after the news show. In addition, subjects in the short measurement delay condition were measured on several dependent variables related to the commercials. Subjects in the long measurement delay condition were asked to come the next day for a second viewing. When they arrived, they did not view the news show but filled out the same questionnaire as the short measurement delay group. All subjects were debriefed after data collection.

Stimulus Material

Commercials. One experimental and six 30-second filler commercials were selected from a pool of 200 regional commercials. The experimental commercial was a predominantly informational one (promoting a hamburger substitute) selected on the basis of a pretest using Puto and Wells' (1984) scales[4] ($\alpha = .75$) measuring informational and transformational dimensions in ads; we used it because it gave subjects information (e.g., no animal fat, no cholesterol) that could be recalled in the memory tests. All the commercials were novel to the subjects and were for different product categories. None of the brands advertised in the commercials were sold in the test city.

Videotapes. Three videotapes were prepared with commercials embedded in portions of a late night news show taken from a network affiliate station on the East Coast. The news show was edited to run about 13 minutes, and commercials were embedded in two places between various news segments.

On all three tapes, the first pod of commercials contained four fillers (i.e., nonexperimental commercials). The second pod had both experimental and filler commercials. On tapes 1 and 2, there were five filler commercials (F1 to F5) and one experimental commercial (X1) that was run twice with either one or four intervening commercials to create the short and long lag conditions. The order of commercial presentations in the short lag and long lag conditions was F1, F2, F3, F4, X1, F5, X1 and F4, X1, F1, F2, F3, F5, X1, respectively. On the third tape, the experimental commercial was shown only once with six filler ads (F4, F6, F1, F2, F3, F5, X1). On all three tapes, the stimulus commercial was the last commercial and was preceded by the same filler commercial, F5. On the first two tapes, the first exposure to the stimulus commercial was preceded by filler commercial F4.

Dependent Variables

Each subject received a recall measure followed by a recognition measure. In the recall measure, subjects were provided the product categories of the various commercials they had seen and were asked to recall the brand name and claim(s)/promise(s) made by the respective commercials. In the recognition measure, subjects performed sequential two-alternative forced-choice tests of brand names and claim(s) for several commercials.[5] For each test, subjects were told about the product category represented in the respective commercial and were asked to recognize the brand name from the two alternatives. Next, they were asked to select the correct claim from a set of two claims.

In addition to recall and recognition measures, subjects provided background information about such variables as their age, sex, education, health, and media usage.

RESULTS

Background Variables

All the older adults were noninstitutionalized, 62 years of age or older, responsible for making their own purchases, and able to arrange their own transportation to the study sites. In addition, a check on background variables was included to identify potential moderating variables not otherwise accounted for (Cole and Houston 1987). The variables were years of formal education and hours of television viewing per day. Following Cole and Houston's (1987) study, we combined self-reported measures of quality of eyesight, hearing, and mobility into an overall health index to test whether lower physical ability levels affected the memory of the older subjects. The younger and older adults did not differ significantly on the health index ($t = 1.10$, $p > .10$). As in the Cole and Houston findings, significant differences between younger and older adults emerged on only two variables, education and television viewing habits. The younger adults reported having more years of formal education than the older adults. However, as Cole and Houston point out, any moderating effects of formal education on memory should have been substantially offset by the significantly greater time ($t = 6.69$, $p < .001$) that the older adults reported spending watching television and reading newspapers and magazines relative to the younger adults.

Analysis

We analyzed the data by using the analysis of variance model. The means of recall scores are reported in Table 1. Brand recall was scored as 0 or 1 for incorrect or correct recall of the experimental commercial, respectively. Because there were eight product claims, claim recall scores could range from 0 to 8. In fact, no subject in the study recalled more than three claims. Two judges familiar with the study coded 10% of the claim recall data. Interrater reliability was estimated to be 92.5% (Cohen's kappa = .89). Because of the high degree of agreement, the remainder of the data was coded by one judge. Brand and claim recall scores were com-

[4]Rather than using all 23 items, we decided to discard item 21, "I would have less confidence in using [this brand] now than before I saw this commercial," and hence used only 22 items from the Puto and Wells (1984) scales. We took this step because we were using all novel commercials, and subjects could not have used the brand before.

[5]In a two-alternative forced-choice recognition, test subjects see two items at a time during the test. One of the items is a stimulus item and the other is a distractor. The task is to identify the original stimulus.

Table 1
MEAN RECALL INDEX SCORES[a]
(Standard deviation in parentheses)

Age	*Spacing (Lag) Between Presentations*	*Measurement Delay*[b] *SMD*	*LMD*
Younger adults	Short lag	1.98* (1.11)	1.17 (.95)
	Long lag	1.45 (1.08)	1.38 (.94)
	Control condition (one exposure only)	1.37 (1.11)	.85 (.87)
Older adults	Short lag	1.20** (.95)	.32* (.82)
	Long lag	.78 (.80)	.83 (1.01)
	Control condition (one exposure only)	.52 (.78)	.24 (.44)

[a]The reported numbers are the sum of the brand recall and claim recall scores. In the control condition, subjects were exposed only once to the experimental ad.
[b]SMD = short measurement delay; LMD = long measurement delay.
*denotes that the difference between the means in the column is significant at $p < .05$.
**following means in the column are significantly different at $p < .10$.

bined to form an index of recall memory.[6] The scores on this index could range from 0 (absolutely no recall) to 9 (recall of brand name and all eight claims). In reality the scores ranged from 0 to 4 (from neither claim nor brand name recalled to brand name and three claims recalled, respectively).

Scores on recognition of brand name and claim were assigned 0 or 1 for incorrect or correct recognition, respectively. A recognition memory index was formed from the combined scores on brand name and claim recognition. The scores on the recognition memory index therefore could range from 0 (neither brand nor claim recognized) to 2 (both brand and claim recognized). The lowest mean recognition score was 1.69 and the highest was 1.96. With a maximum possible recognition score of 2, these results translate to mean recognition scores ranging from 85% to 98%. An ANOVA model of the recognition scores showed a significant main effect of age, with younger adults recognizing significantly more than the older adults ($F_{1,402} = 10.16$, $p < .01$). Moreover, repetition significantly increased recognition ($F_{1,402} = 8.028$, $p < .01$). No significant effects were found for lag, measurement delay, or any of the interactions, perhaps due to the ceiling effects on recognition.

[6]The individual cell means for the brand and claim recall are as follows: (The means for claim recall are noted in parentheses.) For younger adults, in the short measurement delay condition, the means were .48 (1.50) and .34 (1.11) for the short and long lags, respectively. In the long measurement delay condition, the corresponding means are .21 (.96) and .33 (1.04). For older adults, in the short measurement delay condition, the means were .30 (.90) and .13 (.65) for the short and long lags, respectively. In the long measurement delay condition, the corresponding means were .04 (.29) and .13 (.71).

As expected, we found a significant main effect of repetition on recall of the experimental commercial for older adults ($F_{1,141} = 7.171$, $p < .01$, $\omega^2 = .04$) as well as for younger adults ($F_{1,264} = 7.73$, $p < .01$, $\omega^2 = .02$). As expected, the younger adults recalled significantly more than the older adults ($F_{1,405} = 53.64$, $p < .001$, $\omega^2 = .11$; see Table 2).

To test whether younger and older adults had differential sensitivity to repetition, we collapsed the cells across lag and measurement delays for the experimental group and across measurement delays for the control group. The age by repetition interaction is not significant ($F_{1,405} = .006$, $p > .10$), indicating that the pattern of improvement due to repetition is the same for younger adults and older adults and that the two groups do not differ in the benefits of repetition on recall memory.

The major interaction of interest is the lag by measurement delay effect, as proposed in our hypothesis. It predicts that the measurement delay will moderate the effect of lag. More specifically, it predicts that for a short measurement delay, a short lag will lead to higher recall than will a long lag. For a long measurement delay, in contrast, a long lag will induce higher recall than will a short lag. As Table 3 shows, lag × measurement delay interaction is significant ($F_{1,273} = 11.783$, $p < .01$, $\omega^2 = .03$). This interaction is significant for both older ($F_{1,91} = 6.339$, $p < .01$, $\omega^2 = .05$) and younger adults ($F_{1,182} = 6.142$, $p < .01$, $\omega^2 = .03$).

As is evident from both parts of Figure 1, all effects are in the hypothesized direction. We compared various cell means in Figure 1 using directional t-test. For the older adults, recall in the long lag condition is significantly greater than recall in the short lag condition at long measurement delays ($p < .05$), and recall in the short lag condition is marginally greater than recall in the long lag condition at short measurement delays ($p < .06$). For the younger adults, the first comparison is not significant ($p > .10$) but the second one is ($p < .01$). Three of four comparisons are significant at or near the conventional alpha level of .05 and the fourth is in the predicted direction. These results seem to offer support for our hypothesis.

DISCUSSION

The most important finding of our study is the demonstration of the lag by measurement delay interaction. To date, this interaction has been demonstrated primarily with word-list learning. To the best of our knowledge, ours is the only marketing study that has demonstrated this effect in an advertising context.

Interestingly, though the predicted interaction was significant for both younger ($p < .01$) and older adults ($p < .01$), a direct comparison of cell means showed somewhat mixed results, with two comparisons being significant at $p < .05$, one marginally significant ($p < .10$), and one not significant ($p > .10$). However, all results were in the predicted direction. The comparison that was not significant involved younger adults in the longer delay condition in which a short lag versus a long lag showed no differences in recall. Even though long lag between repetitions did not lead to a significantly higher recall than a short lag in longer delay condition, the fact that a longer lag prevented recall from declining in this condition is still a major finding.

Table 2

ANALYSIS OF VARIANCE RESULTS FOR THE AGE, REPETITION, AND MEASUREMENT DELAY EFFECTS ON RECALL[a]

Source	*Sums of Squares*	*d.f.*	*Mean Square*	*F*	*p*	ω^2
Age	49.989	1	49.989	53.64	.000	.1061
Repetition	13.376	1	13.376	14.35	.000	.0269
Measurement delay	19.300	1	19.300	20.71	.000	.0397
Age × repetition	.005	1	.005	.006	.940	—
Age × measurement delay	.213	1	.213	.228	.633	—
Repetition × measurement delay	.000	1	.000	.000	.985	—
Age × repetition × measurement delay	.260	1	.260	.279	.598	—
Residual	377.419	405	.932			

[a]The effect size, ω^2, is reported for significant effects only.

Table 3

ANALYSIS OF VARIANCE RESULTS FOR THE AGE, LAG, AND MEASUREMENT DELAY EFFECTS ON RECALL[a]

Source	*Sums of Squares*	*d.f.*	*Mean Square*	*F*	*p*	ω^2
Age	32.641	1	32.641	33.96	.000	.0978
Lag	.403	1	.403	.42	.518	—
Measurement delay	13.323	1	13.323	13.862	.000	.0382
Age × lag	.711	1	.711	.740	.391	—
Age × measurement delay	.011	1	.011	.011	.916	—
Lag × measurement delay	11.325	1	11.325	11.783	.001	.0320
Age × lag × measurement delay	.136	1	.136	.141	.707	—
Residual	262.393	273	.961			

[a]The effect size, ω^2, is reported for significant effects only.

Ordinarily, one would expect memory to decline with the passage of time, and this is what we find in the short lag condition. However, a longer lag between message repetitions seems to forestall the forgetting of television advertising over time. For the short lag condition, decline in recall scores between the short and long measurement delays is about 40% for the younger adults, whereas in the long lag condition, recall scores drop by less than 5%. Similarly, for the older adults, the decline is 75% in the short lag condition and it increases slightly for the long lag condition.

We explored the lag by delay interaction by testing for the differences in the rate of memory decline from the short measurement delay condition to the long measurement delay condition for both the short and long lags. For the older adults, the decline in memory in the short lag condition was significantly greater than the decline in memory in the long lag condition ($t = 3.19$; $df = 41$; $p < .01$). For the younger adults as well, the decline in memory in the short lag condition was significantly greater than the decline in memory in the long lag condition ($t = 2.05$; $df = 89$; $p < .05$). The age by lag interaction is not significant for recall memory ($p > .10$), and hence the positive effect of lag in forestalling memory decay appears to be similar for both younger and older adults.

One finding of our study is that increasing message exposure (from one to two exposures) has a significantly positive effect on the recall of information contained in a television commercial for both younger and older adults. There are important theoretical reasons the memory of older adults in particular should benefit from repetition. For example, to the extent that older adults need more time to process a message, having a second exposure to the message provides additional time and hence helps improve memory. Interestingly, though, we found the age by repetition interaction to be nonsignificant, suggesting that despite their lower recall scores, older adults were not differentially sensitive to repetition in comparison with younger adults. At one and two exposures, the recall scores for the younger adults are 1.12 and 1.49, respectively, and for the older adults, the scores are .40 and .75, respectively. Overall, repetition produced a gain in recall of .37 for the younger adults and .35 for the older adults.

The lack of an age by repetition interaction tends to support the notion that providing additional processing opportunities benefits both the younger and older adults—at least for the conditions in our study. Despite the additional time and processing opportunities provided by the second exposure of the message, the processing operations of elderly adults still seem to be less effective than those of younger adults.

Finally, though we have attempted to accommodate age-related differences within the encoding variability framework, it can be argued that age-related changes in attentional processes account for the results obtained because the older adults performed exactly the same as the younger adults but at a lower level. However, Balota, Duchek, and Paullin (1989, p. 8) rule out the inattention explanation:

> First, there is the problem of a manipulation (lag) having one effect on memory performance at the long measurement delay and opposite effect on memory perfor-

> mance at the short measurement delay. Such a crossover interaction is not very common in the memory literature and, as noted, has been difficult to accommodate within other theoretical frameworks. Second, there is the finding that older and younger adults produce identical patterns of data, even though the younger adults recalled ... *significantly* ... more ... than did the older adults. Thus, one must have a mechanism(s) within such an alternative account that can change the level of overall performance but not the overall pattern of the data (italics added).

Thus, it seems that the results are due to less efficient encoding as well as less effective retrieval processes used by the older adults (Burke and Light 1981; Rabinowitz 1989). As shown previously, these results are accommodated by encoding variability theory.

IMPLICATIONS

Practical Implications

For decades consumer researchers have attempted to understand the effect of repeated exposure to advertising on viewer responses. However, the effect of lag in advertising repetitions has received little attention. To date, published data are available from only two studies, the original Pomerance and Zielske (1958) study (also reported in Zielske's famous 1959 article and reanalyzed by Simon 1979) and Strong's (1972) simulation of the Pomerance and Zielske (1958) data along with some new data that he collected.

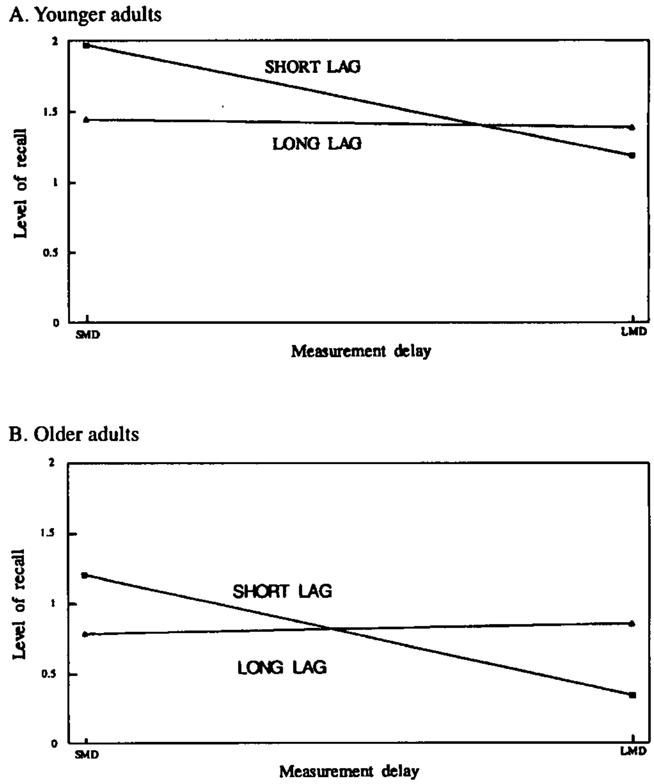
Findings in this area have been somewhat controversial. Strong (1972) concluded that a massed schedule (short lag) was slightly better than the distributed one. But Simon (1979), in his influential critical article based on reanalysis of the Pomerance and Zielske (1958) data, argues that a spaced advertising schedule (long lag) is unequivocally better.

Part of the reason for this confusion may be that marketing studies of the spacing effect have focused primarily on the empirical phenomenon rather than the underlying processes. Though Simon's conclusion is correct (for Pomerance-Zielske study conditions, spaced advertising certainly will produce better results), as our data show (and encoding variability theory predicts), spaced advertising will be less effective when the goal is memory maximization at short measurement delays.

Consider, for example, a direct marketer who is trying to make the viewers of a commercial dial an 800 number to order merchandise. The goal here is to get the point across quickly. Or consider a retailer who is announcing a major sale or a manufacturer who is introducing a new product and wants a quick diffusion. In all these cases, the aim is to maximize memory at short measurement delays under the assumption that advertising memory influences sales.

In most cases, though, the advertiser's goal would be to increase delayed memory because most purchase decisions are made long after the advertising exposures. Hence, a distributed advertising schedule would be better. Simon recommends spreading the advertising budget over the maximum period. However, this approach may be impractical if such distribution results in so much spacing between the two presentations of an advertising message that the viewers forget the first presentation before the second (Crowder 1976).

Figure 1
INTERACTION EFFECT OF LAG AND MEASUREMENT DELAY ON RECALL



SMD: short measurement delay
LMD: long measurement delay

Our study has other practical implications, too. For example, given a particular spaced schedule, an advertiser would be prudent to place ads in different media and in different vehicles within a medium (within the constraints of target audience reach goals). This approach should provide more unique contexts to be encoded and improve delayed memory for the message. In addition, when repeating an ad within a pod, an advertiser would be sensible not to run the ad back to back (the same is true for print ads), because at lags of zero the second presentation will not add much to the first one. Finally, if the goal is to maximize delayed memory, repeating the ad in the same pod (or even in the same program) may not be prudent.

Encoding variability theory has some media implications for the split 30-second format as well. For example, one should never present two identical 15-seconds in a split 30-second format because of the inattention problem, and such presentation should lead to only a single representation of the stimuli being encoded. Also, using the two halves of the split 30-second format for two maximally different messages (e.g., in style, format, product class) should enhance delayed memory.

Television Advertising and Older Adults

One significant implication of our study pertains to television advertising to older adults. Phillips and Sternthal (1977), in their review article on age differences in information processing, concluded that marketers should use only self-paced media such as newspapers and magazines because information presented in non–self-paced media would be poorly understood by older adults. Authors of subsequent reviews (e.g., Meadow, Cosmas, and Plotkin 1980) also accept this thesis. However, as Ensley and Pride (1991, p. 2) observe, "Utilizing only self-paced media would remove television and radio as viable media vehicles for communicating with the elderly, a rather drastic decision given Stephens' (1981) study which shows that television is an important and trusted media source among the elderly." Rather than abandoning the broadcast media, Ensley and Pride advise, marketers should be researching ways to improve the impact of the television ads for older adults.

Our findings suggest that simply repeating a message significantly enhances recall and recognition scores for both younger and older subjects. Moreover, manipulating the lag between the repetitions can enhance immediate or delayed recall to accord with advertising objectives. Repetition, lag, and measurement delay appear to influence younger and older subjects in fundamentally the same way because none of the age-related interactions—age by repetition, age by lag, age by measurement delay, and age by lag by measurement delay—is significant.

That older adults could benefit from repeated ad exposures is not a trivial finding. As mentioned previously, the mnemonic manipulations that work for younger adults do not necessarily work for older adults. Our findings suggest that repetition can be an effective strategy to improve memory for television commercials.

Critics may argue that repeating ads to enhance memory is an expensive strategy. At least four counterarguments can be made. First, we do not have a choice if we want to use broadcast media to reach older viewers. Because older adults find television an important and trusted source of information (Stephens 1981), not using it would be unwise. Second, advertising repetition is a ubiquitous strategy that is used for all sorts of reasons, including enhancement of memory for the advertised brand (Unnava and Burnkrant 1991). Third, other proposed strategies, such as expansion of television ads (e.g., from 30 seconds to 45 or 60 seconds), are no less expensive. Fourth, older adults in our study exhibited substantial amount of recognition memory for the brand name and claims (as did younger adults). Therefore, low recall scores do not mean "no memory"; they simply mean that recall is a more stringent test of memory (Singh, Rothschild, and Churchill 1988) and is especially difficult for older adults because of their deficient usage of encoding and retrieval contexts in memory tasks (Rabinowitz 1989; Rabinowitz and Ackerman 1982).

Theoretical Implications

Our study has several theoretical implications. For example, the encoding variability theory used in the study is a succinct yet powerful model that offers theoretical explanations for several empirical findings. Moreover, the model explains Zielske's (1959) finding (that increasing lag leads to better delayed memory) in terms of the lag effect hypothesized by encoding variability theory. Similarly, the model can explain Schumann, Petty, and Clemens' (1990) finding that wearout can be forestalled by using different versions of an ad. According to encoding variability theory, changing the versions changes the contextual information, which in turn increases context utilization, promoting delayed memory of the ad and postponing wearout.

Our findings and conclusions must be viewed in light of two limitations. First, they are based on a laboratory study and, though we tried to enhance the external validity of the results by using real commercials in real programming and a convincing cover story, the study should be replicated in real-world settings. Second, our lag manipulation was limited to one pod of commercials; therefore, the various implications described must be interpreted with caution until further research verifies the crossover interaction between different programs and over time.

Our study has several implications for further research. For example, encoding variability theory predicts that presenting an ad in different contexts will enhance memory for the ad. However, the nature and magnitude of the effect of context variation should be determined by further research. A related issue is that of the optimal spacing between repetitions of an ad. Encoding variability theory suggests that increasing the spacing between repetitions will enhance long-term memory for the ad. However, if there is so much spacing between two exposures that people forget the first exposure, the beneficial effects of spacing on memory may not be realized. Researchers must establish what time interval between the two repetitions of an ad is optimal. Encoding variability theory predicts that the optimal time interval will be a function of the variation in the contexts of the ad as well as the elapsed time between the exposures. Another interesting research issue relates to the impact of ads for competing brands on the memory for the target ad. In the present study, none of the filler ads was for a brand competing with the experimental commercial. Most likely, the presence of competing ads will interfere with the encoding of the target ad and hence lower memory for this ad. Research is needed to verify and explain this effect within an encoding variability framework.

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