

The Impact of Interstimulus Interval and Background Silence on Recall

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Three experiments investigate how the interval between target items of information in an audio context influences recall under background conditions of music and silence. In experiment 1, when a goal-directed learning task encouraged allocation of resources to the message, recall increased linearly for both background conditions as the interval increased. However, under the incidental learning task used in experiment 2, increasing the interval from two to three seconds had a deleterious impact on recall, but only in the background silence condition. Experiment 3 suggested that this was due to a surplus of cognitive resources in the background silence condition producing interfering extracommunication thought. Results also support the theory presented that background music borrows resources from the processing of message information in an incidental learning task. Although music impairs processing of brand information and reduces recall at shorter intervals, relative to silence, it increases the interval preceding the onset of excess resources, delaying interfering thought.

One of the goals of most advertising is to achieve a high level of information retention. Although much discussion has centered on the measures used to assess memory for information contained in advertisements (e.g., du Plessis 1994), enhancing retention of such information remains an important objective. For example, research has examined both how new information is integrated with material already stored in long-term memory (Greenwald and Leavitt 1984; Sujan and Bettman 1989) and how recall is influenced by the way we process information (Myers-Levy 1991; Unnava, Burnkrant, and Ervelles 1994). However, little work in marketing has considered how mental processes involved in the encoding of auditory information influence its retention. In this article, a resource-matching perspective is applied to (1) consider how the time interval between items of information may influence information retention, (2) examine how the impact of the interval between items of information may be moderated by background music and task instructions, and (3) investigate these issues empirically.

INTERSTIMULUS INTERVAL AND INFORMATION RETENTION

Within broadcast advertisements, the amount of time between two items of information, where an item may be

one or more words used to describe a particular product feature (the interstimulus interval or ISI), is proposed to have multiple influences on information retention. Specifically, as the ISI is lengthened, the period for uninterrupted processing of information would be extended and there would be an associated increase in the cognitive resources available to the listener. Consistent with resource matching (cf. Anand and Sternthal 1989, 1990), when available cognitive resources are insufficient, processing of information will be incomplete, thereby hindering retention. However, as cognitive resources increase to the point where those available match those required, information may be sufficiently processed, and a higher level of recall would be anticipated.

H1: As the interstimulus interval increases, information recall will increase.

In research involving advertising repetition effects, Craig, Sternthal, and Leavitt (1976) demonstrated that beyond some optimal level of repetition a decrement in recall occurs as frequency of exposure increases. This effect is attributed to decreased attentiveness to the advertisement and a reduced motivation for retrieval of information. Similarly, resource matching suggests that habituation (i.e., a reduction in the perceived novelty of a stimulus) and tedium (resulting from decreased incremental learning, boredom, and reactance) may occur when the resources available exceed those required. If such habituation and/or tedium results in inattention to the message or the generation of extracommunication thought unrelated to message information, thereby hindering the processing of incoming information, recall is likely to be

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impaired. However, as Anand and Sternthal (1989) noted in explaining the results of Cacioppo and Petty (1979), if the extracommunication thought is related to the message, such as counterargumentation with an issue in the advertisement, it may strengthen recall for that particular information. The extent to which the extracommunication thought is brand related (i.e., information about the product specifically, rather than executional features of the ad) is likely tied to the extent to which individuals are both motivated and able to process the brand-relevant information. Individuals high in both motivation and ability to process such information are most likely to engage in brand-related thought (e.g., MacKenzie and Spreng 1992).

Transferring the above concepts to the current context, as the ISI increases, individuals have a longer period of time in which to process information, and there will be a surplus of cognitive resources. If task instructions require the memorization of advertisement information, surplus resources may be used to engage in further processing of advertisement information to fulfill the requirements of the task, and extracommunication thought is likely to be brand related. Therefore, recall would be expected to increase as the ISI is extended until such time that all information is recalled.

Conversely, under incidental learning conditions, where there is reduced external impetus to process brand information as extensively, longer ISIs may generate a surplus of cognitive resources, leading to greater inattention to brand information, resulting in extracommunication thought mainly unrelated to the message. In a situation where there are multiple items of information, with an ISI placed between each, a number of effects on information recall are possible. If the ISI following the initial item of information is sufficiently long that it results in inattention to the message and the cessation of brand information processing, a plateau in recall may occur. That is, only the first item of information in a series will be processed sufficiently to be recalled. Another possibility under incidental learning conditions is that recall would actually continue to decrease as the ISI increases beyond the optimal length (i.e., even recall for the first item of information may diminish). As extracommunication thought unrelated to the message commences, reducing attention to brand information, further processing of the first item of information and the memory of additional retrieval cues that would aid in its recall would decline or cease, thereby decreasing retention even for that item. Further, even though it is possible for individuals in a longer ISI condition to perform as much processing of brand information as individuals in a shorter ISI condition, a decrease in retention may be observed due to extracommunication thought influencing the ability to retrieve stored information. This is consistent with mounting evidence concerning interference and forgetting, suggesting that interference does not necessarily reduce memory because of a disruption during the encoding process or an unlearning of information but, rather, through a decrease

in the ability to retrieve information (Bower, Thompson-Schill, and Tulving 1994; Mensink and Raaijmakers 1988; Murnane and Shiffrin 1991).

For the preceding reasons, under incidental learning conditions, retention is hypothesized to plateau or be adversely influenced as the ISI extends beyond an optimal length.

H2: Under incidental learning conditions, for a given ad, there is an optimal interstimulus interval beyond which information recall will plateau or decline.

In several studies that have examined different types of background music, the music has had a detrimental effect on information retention (Gorn et al. 1991; Kelaris, Cox, and Cox 1993). Features associated with the music may influence message-based processing (cf. MacInnis and Park 1991), but other factors also may be operating. Music may reduce recall by distracting the listener, thereby reducing the resources available to process information (Anand and Sternthal 1990). However, because it distracts, music may also forestall interfering extracommunication thoughts unrelated to the message. Consequently, an ISI could last longer before having any negative influence on recall. The proposed distracting effects of music would be expected under an incidental learning condition but not under goal-directed learning because under the latter condition, listeners would be focused on the content of the ad rather than elements of the ad execution.

H3: Under goal-directed learning, background music will not influence recall of brand information, relative to background silence.

H4: Under incidental learning conditions, prior to a corresponding point at which the interstimulus interval would be optimal in the background silence condition, the presence of background music results in relatively lower recall of brand information compared to a background of silence.

H5: Under incidental learning conditions, the presence of background music extends the optimal length of the interstimulus interval for information retention relative to background silence.

EXPERIMENT 1

The first experiment examined the effect of ISI length and presence of background music in a goal-directed learning task to examine Hypothesis 1 and Hypothesis 3. Under such a paradigm, recall was expected to increase as the ISI lengthened. As such a task was not expected to foster extracommunication thought unrelated to the brand, no differential impact on recall was expected in the two background conditions as the ISI increased.

Method

Subjects. A total of 254 students in seven sections of an introductory marketing course participated in the study. Responses from 14 subjects were unusable because of mechanical problems with equipment. Subjects were paid \$2 for their participation.

Experimental Design. A 4×2 between subjects full factorial design was used, with manipulation of the inter-stimulus interval (zero, one, two, and three seconds) and the background condition (i.e., background silence throughout or background music throughout). The ISIs above reflect the amount of time inserted after the natural pause between items of information (roughly 0.25 seconds).

Pretesting was conducted to ensure that the intervals would provide a sufficient range for adequate investigation of the influence of ISIs on information recall. The pretest used an incidental learning paradigm, where subjects listened to experimental ads, in addition to several other advertisements. Five ISI levels were examined (zero, one, two, three, and four seconds). Fifty-two individuals participated in the pretest. Each participant heard only one version of the experimental advertisement, with approximately five people per ISI background condition. Subjects who heard music in the background rated ads in terms of audibility ($\bar{X} = 6.8$, on a scale from 1 [no words audible] to 7 [all words audible]) and pleasantness of the background music ($\bar{X} = 5.8$, on a scale from 1 [extremely unpleasant] to 7 [extremely pleasant]). A debriefing session was conducted after the advertisements were heard to receive input from participants about the stimuli and the dependent measures. The great majority of subjects in the three- and four-second background silence conditions reported difficulty remembering any information contained in the ad, which they attributed to the distracting influence of silence between items of information. This preliminary finding was the basis for selecting the ISI levels used for the series of experiments reported here and also provided an initial confirmation that longer ISIs may have an adverse effect on information retention under an incidental learning condition.

Three items of information were presented in each experimental advertisement. To control for effects of information order, separate ads were created for each of the six possible information combinations in each of the eight conditions. Hence, 48 different experimental advertisements were used.

Experimental Stimuli. Pretesting was conducted to identify a product (1) in which subjects would be interested enough to process the information about it presented in the advertisement and (2) about which subjects would have little prior product knowledge, thus minimizing the likelihood of a ceiling effect with regard to recall.

A sample of 23 people drawn from an introductory marketing class were given a list of products. For each product, subjects performed three tasks. First, they rated

their level of interest in the product class on a seven-point scale, from 1 = not interesting to 7 = extremely interesting. They also indicated their product knowledge on a seven-point scale, which ranged from 1 = no detailed knowledge to 7 = very detailed knowledge. Finally, subjects were asked to list all features they could think of that might be considered when purchasing that product.

The product category chosen was cellular telephones, because this category received both a reasonably high level of interest ($\bar{X} = 6.1$) and a low level of perceived detailed knowledge ($\bar{X} = 3.3$) in the pretesting. Three items of information describing cellular telephone service were chosen for use in the radio advertisements: (1) customized rate plans, (2) free installation and activation, and (3) complementary voice messaging. None of this information was listed by respondents in the pretesting. Hence, any recall of these items was likely to be based on the experimental stimulus and not on experience outside the experimental setting.

Despite the general interest expressed for the product category, subjects' motivation to process the message information was not expected to be strong. Few of them owned a cellular telephone (4.5 percent) and few planned to purchase one within the next six months (6.8 percent). Further, their ability to process information about the product class was constrained by lack of knowledge about the product attributes mentioned.

A professional recording studio and announcer were used to produce the advertisements. The announcer was instructed to read each of the three pieces of information in the same tone so that each item could be placed in each of the serial positions without making the presentation seem different. A digitized version of the commercial created on a multimedia computer was manipulated to place the information items and lengthen the interval between the items. After all of the voice-overs had been assembled, music was added to the background in half of the conditions.

The music was faded in very quickly, prior to the voice-over. The equipment afforded precise control over the spacing of information, volume of background music, and volume of the recorded commercial. Digitizing of the voice-over also ensured minimal degradation in audio quality in the production of the commercials from one generation to the next. Light classical music, rated to be enjoyable in pretesting, was used for the background.

Procedure. Before subjects arrived for their class, the initial rating task, an envelope, and a personal cassette player with headphones were placed on each desk in the classroom. Each cassette player had one of the 48 different advertisements created for use in the experiment imbedded within four other ads. The position of these ads was held constant across conditions. Use of the cassette players allowed random assignment of subjects to conditions and enabled each individual to adjust listening volume to a comfortable level.

Participants were instructed to listen to the tape and

to rate each ad immediately after hearing it in terms of enjoyableness on a scale from 1 = extremely unenjoyable to 7 = extremely enjoyable. They were told that they would "later be asked questions regarding information in the advertisements." This instruction was used to encourage processing of advertisement information across conditions.

Participants heard a total of five advertisements, with the experimental ad always presented third. The first two ads, for a soft drink and insect repellent, and the last two ads, for a local lottery and a beer, were selected from an inventory of local radio commercials. Participants were asked to stop the cassette and remove their headphones when they had finished evaluating the five ads. All participants began and finished playing the tape at the same time. After all of them had removed their headphones, they were asked to place the sheet containing the five evaluations inside the envelope provided and to remove the sheet that was inside. That sheet contained the unaided free recall task, which asked subjects to list all of the information they could remember from the cellular telephone advertisement. Subjects placed the sheet in the envelope once they completed the recall task. They were then debriefed and cautioned not to tell other students about the study.

Results

Hierarchical loglinear analysis was used to examine the effects of ISI and background condition on recall. The main effect for ISI linear is significant ($G_3^2 = 11.26, p < .01$), with an average recall of 20.0 percent, 27.8 percent, 31.7 percent, and 37.3 percent for the zero-, one-, two-, and three-second ISIs, respectively. Hence, Hypothesis 1 is supported.

The main effect for background is not significant ($G_1^2 = 0.17$, not significant [n.s.]) and does not interact significantly with either the ISI linear ($G_3^2 = 0.09$, n.s.) or the ISI quadratic ($G_1^2 = 0.07$, n.s.) term. Both of these findings provide support for Hypothesis 3. In addition, the ISI quadratic term was not significant ($G_1^2 = 0.32$, n.s.), indicating that only a linear relationship between ISI length and recall is present for learning over the range tested.

Discussion

Consistent with the hypotheses, under goal-directed learning, recall increased as the ISI was extended and was equivalent for both the background silence and background music conditions. This finding contrasts with predictions for the incidental learning conditions that recall should plateau or decrease as the ISI increases beyond a certain length and that, relative to background silence, background music should have an impact on recall. Hence, when brand processing is not implicitly encouraged, differences observed between background music and background silence conditions would suggest that

music is borrowing resources from the processing of brand information. Similarly, a plateau or decline in recall at longer ISIs would be consistent with a reduction in brand information processing and interference resulting from extracommunication thought. Experiment 2 examined these issues further.

EXPERIMENT 2

Similar to experiment 1, this experiment examined the impact of the interstimulus interval and the interaction of the ISI with background stimuli on information recall. However, an incidental learning task, similar to those used in previous research to produce low involvement conditions (e.g., MacKenzie and Spreng 1992; Petty, Cacioppo, and Schumann 1983), was employed to explore Hypothesis 1 further, as well as Hypotheses 2, 4, and 5. Subjects were not aware that they would be asked to recall information, so there was no extrinsic motivation to process brand-relevant information. Combined with the low product knowledge reported in pretesting, these limitations on motivation and ability to process brand information suggest that there would be minimal processing of brand-related material during any extracommunication thought.

Method

Subjects. A total of 409 students in 12 sections of an introductory undergraduate marketing class participated in the experiment. Responses from 10 subjects were discarded because of failure to follow instructions, and results from another 13 had to be eliminated because of problems with their listening apparatuses. Subjects were paid \$2 for their participation.

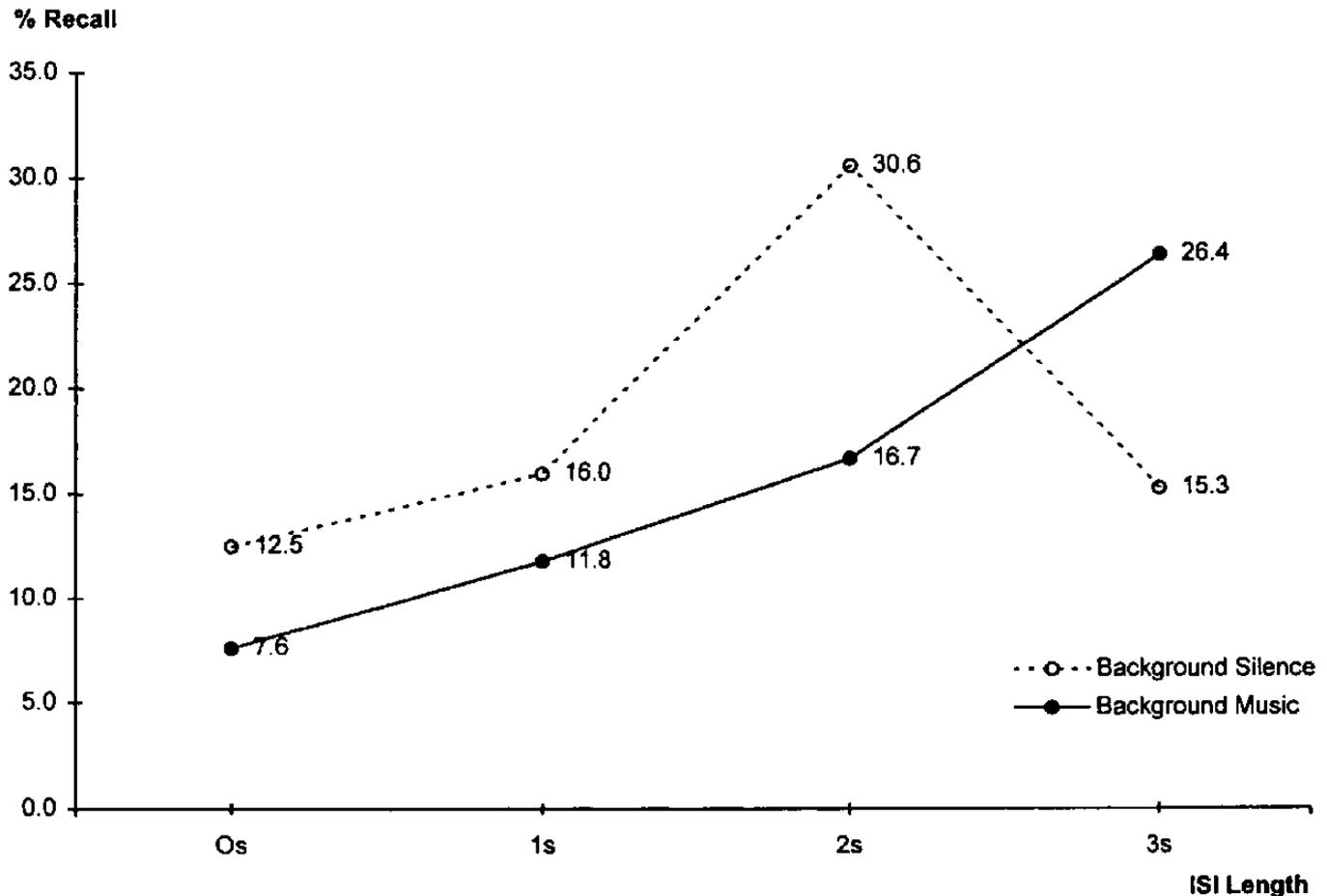
Experimental Design and Procedure. The experimental design and stimuli were identical to those in experiment 1, with the exception that subjects were not told they would later be asked questions regarding information in the advertisements. A 4×2 between-subjects full factorial design was again used, with manipulation of the interstimulus interval (zero, one, two, and three seconds) and the background condition (background silence throughout or background music throughout).

Results

Hierarchical loglinear analysis was used as in the first experiment to examine effects of ISI and background condition on recall. Mean recall levels by condition are presented in Figure 1.

Consistent with Hypothesis 1, the linear main effect for ISI is significant ($G_3^2 = 13.33, p < .01$), suggesting that as the ISI increases more information is recalled. Further, the average amount of information recalled is greater at the one-second ISI than at the zero-second ISI (10.1 percent vs. 13.9 percent), though the difference is

FIGURE 1
EXPERIMENT 2: PERCENT RECALL BY CONDITION



not statistically significant ($G_1^2 = 2.00$, n.s.). However, at the two-second ISI, the amount of information recalled (23.6 percent) is significantly greater than that recalled at the one-second ISI ($G_1^2 = 9.02$, $p < .05$). Therefore, Hypothesis 1 receives support.

Hypothesis 2 states that there is an optimal ISI beyond which information retention declines. The significant ISI quadratic term, both alone ($G_1^2 = 14.00$, $p < .001$) and in interaction with the background variable ($G_1^2 = 4.35$, $p < .05$), is consistent with Hypothesis 2. Indeed, in the background silence condition there is a notable decrease in recall as the ISI increases from two seconds (30.6 percent) to three seconds (15.3 percent, $G_1^2 = 9.45$, $p < .05$) providing support for Hypothesis 2.

Theories related to Hypothesis 2 suggest that the decrement in retention created as the ISI becomes too long might extend to the first item of information. That is, even though that item would be initially attended to and processed as in other conditions, retrieval might be adversely affected by extracommunication thought occurring after presentation of the initial item. Testing reveals that in the three-second ISI background

silence condition recall of information is not affected by the serial position ($G_2^2 = 0.11$, n.s.); recall of information in the first position is not significantly different from recall of information in the second position ($G_1^2 = 0.08$, n.s.) or the third position ($G_1^2 = 0.00$, n.s.), and recall of information in the second position is not different from recall of information in the third position ($G_1^2 = 0.34$, n.s.). A corresponding pattern is observed for the two-second ISI background silence condition, with no overall difference in information recall among serial positions ($G_2^2 = 1.82$, n.s.). More specifically, no difference exists between the first and second positions ($G_1^2 = 0.21$, n.s.), the first and third positions ($G_1^2 = 1.75$, n.s.), or the second and third positions ($G_1^2 = 0.75$, n.s.). Similarly, serial position did not have a significant influence for the zero-second ($G_2^2 = 1.55$, n.s.) or one-second ($G_2^2 = 0.74$, n.s.) ISI background silence conditions. Hence, the reduction in recall appears to be due primarily to a disruptive effect of the prolonged silence on the recall of all information, not just items subsequent to the first.

The nonsignificant main effect in the hierarchical loglinear analysis for background condition ($G_1^2 = 1.26$, n.s.)

suggests that the background condition does not influence recall. However, this is due to the sharp decrease in recall observed in the three-second background silence condition (i.e., a point after the optimal ISI). A comparison of the amount of information recalled for two-second and shorter ISIs supports Hypothesis 4, indicating that recall is greater for the background silence condition (19.7 percent) than for the background music condition (12.0 percent, $G_1^2 = 9.45, p < .05$).

According to Hypothesis 5, the presence of background music would extend the length of the optimal ISI under incidental learning conditions. The significant interaction between background and the ISI linear term ($G_3^2 = 9.93, p < .05$) indicates that increasing the ISI influenced recall in background silence conditions differently than did background music conditions. Further, the significant interaction between background and the ISI quadratic term is consistent with Hypothesis 5. At the three-second ISI, recall was greater in the background music condition (26.4 percent) than in the background silence condition (15.3 percent, $G_1^2 = 4.99, p < .05$). Therefore, Hypothesis 5 is supported. An examination of recall by position in the three-second ISI background music condition indicates that recall for information in the first position (29.2 percent) does not differ from recall for that in the second position (27.1 percent, $G_1^2 = 0.05, n.s.$) or the third position (22.9 percent, $G_1^2 = 0.49, n.s.$). Similarly, the second and third positions do not differ in terms of recall ($G_1^2 = 0.22, n.s.$). This finding suggests that music maintained a constant level of attention to brand information throughout the series.

Discussion

Consistent with expectations, relative to background silence, background music hindered recall at ISIs of two seconds or shorter but enhanced recall at the three-second ISI. This finding is consistent with the explanation that music has a detrimental effect on retention at shorter ISIs because it distracts cognitive resources from rehearsal of brand information. Results are also in line with the prediction that, at longer intervals, background music encourages the processing of brand-relevant information for a greater period of time by maintaining attention and decreasing the amount of extracommunication thought that might otherwise interfere with retention.

As predicted, under the incidental learning condition, information recall increased and then decreased in the background silence condition as the ISI became longer. This finding suggests that, although allowing time for additional information processing is beneficial to recall, processes that hinder recall will commence once the ISI reaches a certain magnitude. The decrease in recall observed in the three-second ISI background silence condition may be attributable to extracommunication thought generated by surplus cognitive resources. The extent to which the different conditions influenced attentional processes and extracommunication thought in the two- and

three-second ISI conditions was examined further in experiment 3.

EXPERIMENT 3

An incidental learning task was used to examine the influence of ISI on the perceived attractiveness/aversiveness of features of the advertisement. The purpose of experiment 3 was to supplement understanding of the results of experiment 2, where recall was observed to decrease rapidly as the ISI was increased from two to three seconds in the background silence condition but was observed to increase across those ISI levels in the background music condition.

Method

Subjects. Eighty-one undergraduate students drawn from an accounting class participated in the study. Responses from seven subjects were discarded because of equipment malfunctions and inability to follow directions. None of the subjects had participated in the previous studies, nor were they familiar with them. Subjects were paid \$2 for their participation.

Experimental Design and Procedure. Although the advertisements were the same as the ones used in the first two experiments, a reduced design was employed to examine the background condition (silence or music) and two ISIs (two and three seconds). As in experiment 2, the subjects were not informed that they later would be asked additional questions about information in the advertisements.

Dependent Measures. Seven-point Likert scales were used to provide a self-report measure of the influence of ISI on a number of dimensions. The questions and the associated means-by-treatment condition are reported in Table 1.

Results

The means provide insight about why information recall dropped markedly in the background silence condition as the ISI was increased from two to three seconds. Specifically, the two-second ISI ads were perceived as more enjoyable, more pleasant to listen to, having a shorter space between information, and less likely to evoke station-switching behavior than the three-second ISI ads. Particularly relevant to the underlying rationale proposed for recall effects observed in experiment 2 are the findings that the two-second ISI background silence ads were perceived as being more helpful in the retention of information, disrupting communication less and evoking less extracommunication thought unrelated to the advertisement. In contrast, in the background music condition the increase in the ISI did not significantly influence any of those variables.

Given that the three-second ISI background music con-

TABLE 1
EXPERIMENT 3: MEAN RESPONSES

	Background silence		Background music	
	Two-second ISI	Three-second ISI	Two-second ISI	Three-second ISI
Initial rating of enjoyableness	2.75 (1.52)	1.50* (.71)	3.50 (.92)	3.44 (2.09)
"This ad was pleasant to listen to"	2.61 (1.62)	1.56* (1.42)	3.28 (1.57)	3.44 (2.09)
"If this ad aired on the radio I would be inclined to change stations"	4.22 (1.90)	6.06* (1.35)	4.06 (2.07)	4.28 (2.19)
"I noticed there was a space after each key item of information"	5.78 (1.87)	6.94* (.24)	5.06 (1.51)	5.83 (1.79)
"The silence provided after each item helped me to remember the information"	3.33 (1.82)	1.61* (1.20)	3.11 (1.71)	3.50 (2.09)
"The silence after each item of information was annoying"	4.56 (1.65)	6.83** (.38)	3.56 (1.69)	4.39 (1.98)
"The silence between items of information gave me the perception that the communication had stopped"	4.83 (1.58)	5.83* (1.40)	3.25 (1.66)	3.58 (1.68)
"During the ad I found myself thinking of things unrelated to the advertisement"	3.78 (1.80)	6.06** (1.35)	3.39 (1.54)	3.72 (1.56)

NOTE.—Item 1 is based on a seven-point scale rating enjoyableness in the first portion of the experiment. The remaining items are based on a seven-point Likert scale ranging from 1, strongly disagree, to 7, strongly agree. Standard deviations are reported in parentheses below the means. $n = 18$.

* $p < .05$.

** $p < .01$.

dition and the two-second ISI background silence ads produced similar recall levels in experiment 1, a comparison of those advertisements provides insights for application. A significant difference was that the ISI was perceived to interrupt the communication to a greater extent in the background silence ads ($t(34) = 2.29, p < .05$). However, no differences were observed between the ads in terms of enjoyment ($t(34) = 1.13$), pleasantness ($t(34) = 1.33$), perceived likelihood of evoking station-switching behavior ($t < 1$), perceived length of the ISI ($t < 1$), perceived ability to help listeners remember the information ($t < 1$), or likelihood of inducing thoughts extraneous to the advertisement ($t < 1$).

Although the recall levels for the two-second ISI background music ad and the three-second ISI background silence ad are similar in experiment 2, the ads differ markedly on the measures taken, with the two-second ISI music ad being perceived as more enjoyable ($t(34) = 7.30, p < .001$), more pleasant to listen to ($t(34) = 3.45, p < .05$), less likely to evoke station-switching behavior ($t(34) = 3.43, p < .05$), having a less noticeable silent pause ($t(34) = 5.22, p < .001$), aiding in the retention of information to a greater extent ($t(34) = 3.05, p < .05$), and producing less of an impression that the advertisement had ended ($t(34) = 5.04, p < .001$). Further, the silence was perceived as being less annoying ($t(34) = 8.01, p < .001$), and the amount of perceived extracom-

munication thought was lower for the two-second ISI background music ad ($t(34) = 5.53, p < .001$).

Discussion

The results from this experiment suggest that in the background silence condition a three-second gap is perceived as resulting in a greater interruption in communication, an increase in negative feelings toward the ad, and less attention paid to the advertisement. Consequently, it is not surprising to observe that this condition also results in an elevated level of reported extracommunication thought.

The substantial differences observed between the two-second ISI background music condition and the three-second ISI background silence condition on the dependent measures used in this experiment further aid in the interpretation of the results from experiment 2. Although recall levels for these two conditions were very similar, different mechanisms appear to have produced the recall levels observed. In the two-second ISI background music condition, the theory presented suggests that the recall level was diminished because the music engaged processing resources and therefore resulted in incomplete processing of brand information. Conversely, in the three-second ISI background silence condition, recall was negatively influenced by reduced attention and the production of addi-

tional extracommunication thought. This interpretation underscores the observation that using a pause between key items of information involves a trade-off between liking of the advertisement and processing of the information. That is, one would prefer to have high levels of each, but there is a point at which the benefit of having an uninterrupted interval for processing may be overshadowed by the negative affect generated and extracommunication thought unrelated to the advertisement.

Due to the focus of this experiment, neither the zero-second nor the one-second ISI conditions used in the first experiment was examined. However, given that an ISI of one second may be perceived as more favorable than an ISI of two seconds, the extent to which this increase in ISI negatively influenced affect is not clear. Therefore, over this range, it is not possible to weigh the impact of any decrease in affect on recall against the benefit of having extra time available for information processing. Future research examining this trade-off may benefit from the inclusion of such conditions in an effort to further understand the functional forms of the dependent measures as the ISI increases.

Although a significant difference is seen between the two- and three-second ISIs in the background silence condition, in many cases the ad with the two-second ISI was still perceived somewhat negatively and as having some disruptive effect on the flow of communication. This finding suggests that perhaps an even shorter ISI (between one and two seconds) would have produced stronger recall of information under an incidental learning condition.

Mean responses to questions about pleasantness and enjoyment, though not exceptionally high for any of the ads, are particularly low for the three-second ISI background silence ad. Part of the reason may be the format of the advertisement, a fairly straightforward presentation of factual information about the product. Enjoyableness and pleasantness may have been further lowered by the presentation of this ad with the other four ads that were relatively upbeat. Further research is needed to identify whether increasing the ISI from two to three seconds would result in the same decrement in recall for a similar advertisement (i.e., one that does not have background music) that is relatively more enjoyable.

GENERAL DISCUSSION

Recall data in experiments 1 and 2 suggest that, as the ISI increases, the processing resources available to the individual increase and therefore generate a higher level of information recall. In addition, recall findings from the incidental learning task used in experiment 2 support the concept of an optimal ISI in the background silence condition, which may initially seem counterintuitive. That is, although it is understandable how too little time may limit the extent of the information processing, one might expect the level of recall to plateau as the ISI increases because the aggregate amount of information processing should not be lower as the opportunity for uninterrupted pro-

cessing increases. Indeed, no decline in recall was observed in either the background music or the background silence conditions as the ISI increased in experiment 1, where subjects were aware that they would be asked questions about the advertisements they had heard. Under such a condition, subjects are motivated to process brand-related information during the entire ad. However, under an incidental learning procedure such as the one used in experiment 2, where no extrinsic motivation to process brand information is provided, the downturn in recall is consistent with the explanation that extracommunication thought unrelated to the brand information interferes with recall of information. Further support for this view comes from the findings of experiment 3, which suggest that, in the background silence condition, increasing the ISI from two to three seconds diminishes attention to the advertisement and that extracommunication thought unrelated to the advertisement increases.

In experiment 2, the optimal ISI in the background silence condition was approximately two seconds. In all experiments, the average item of information to be remembered was about two seconds long. Hence, the optimal ISI may differ somewhat in an experiment where the target information is only one second long. In cases where the resources required for processing are modest, one might expect a surplus of resources to become available sooner, along with the commensurate extracommunication thought, resulting in a shorter optimal ISI than was observed in the present research.

Similarly, the processing resources required and therefore the time prior to the emergence of distracting extracommunication thought are likely to be influenced by the subjects' familiarity with information contained in the advertisements. As demonstrated by Ratneshwar, Mick, and Reitingier (1990), when information is presented rapidly, recall for attributes that are chronically accessible remains reasonably strong. In the experiments reported here, subjects were not familiar with any of the attributes prior to the session. Consequently, a greater increase in information retention might be witnessed at an ISI of one second in conditions where information about the subject matter is already well known. Although the above factors may influence the introduction of extracommunication thought, the length of the ISI prior to the perception that there is a disruption in communication, as witnessed in experiment 3, may have more to do with executive features (e.g., pace of speech) than with the length of the target information. Further investigation is needed to examine how these factors and others such as pace of the music and overall advertisement enjoyment influence the optimal ISI.

When participants are encouraged to devote processing resources to brand information, as in experiment 1, background music does not influence recall. However, under incidental learning conditions, music has a dual impact on recall as the ISI increases. When the ISI is short, processing of information is slowed by the demands placed on cognitive resources by the music, and recall is

negatively affected. In experiment 2, this was found to be the case for conditions with ISIs of two seconds or less. The same principles can be employed to explain the finding that the background music condition produced considerably higher information recall than the background silence condition at the three-second ISI in experiment 2. Specifically, the extra processing required slowed the onset of extracommunication thought that otherwise would have diminished recall. Results from experiment 3, although indicating that music produced less extracommunication thought with the three-second ISI, also suggest that any effect on recall was augmented by a reduction in the aversion to the ad created by the longer pauses.

This research focused on how the interval between key items of information may influence recall. The significant results, especially the finding of an optimal ISI, point to the need to examine issues related to information processing, such as information rehearsal and other short-term memory processes in general. It is hoped that by doing so a clearer picture of factors associated with long-term retention will also emerge.

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