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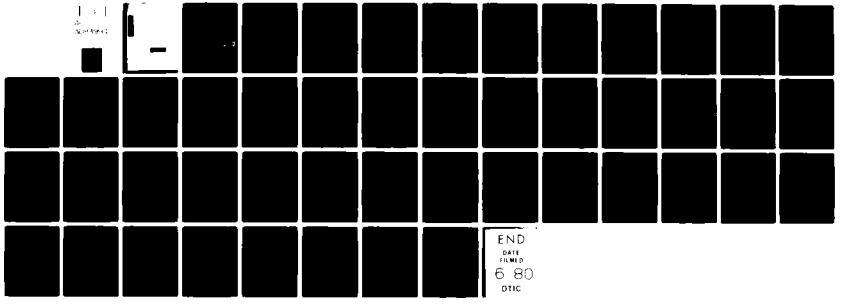

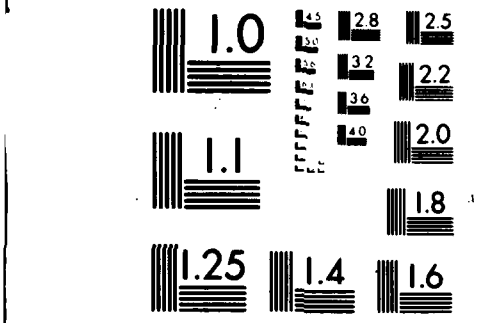

Table 1

Error Rate During Shadowing: Full Sample

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The relationship of personality and stimulus variables was experimentally investigated. A selective attention paradigm was employed using a dichotic listening task. The results provided evidence of the mediation of cognitions by emotional and personality factors at both the attentive and preattentive levels of processing.

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Abstract

Interest in the relationship between cognitions and behavior has drawn personality researchers and clinical psychologists to incorporate models of information processing into their own paradigms. One concept that has found broad popularity is that of selective attention. However, the theorizing of some cognitive psychologists as well as recent research in selective attention, though particularly germane to personality and clinical psychology, has been neglected in these areas. Notably, evidence for preattentive processing has been largely ignored. In this study, the effect of presenting emotionally salient material preattentively - during shadowing - was examined, along with the interactive effects of personality variables. College students high in anxiety were found to hear sexually explicit messages imbedded in an unattended message, and as a result to experience difficulty in shadowing. Intrusion of the sexually explicit material and interference with shadowing did not occur for those low in anxiety. If subjects did not hear or were not presented with these messages in the unattended channel, personality variables still tended to predict subjects' judgments about these messages. In this one task, evidence was found for mediation of cognitions by emotional and personality factors at both attentive and preattentive levels of processing. These mediational effects were sometimes specific to level of processing, e.g., one emotional message received one response during the highly attentive processing involved in applying a judgment and quite a different response during preattentive processing. Viewing personality functioning cognitively may, therefore, require a multifactorial approach considering interactions between multiple levels of processing, emotional salience of the material processed, and personality states.

> [Attention is] the systematic admission of perceptual data into consciousness . . . the process whereby perception is biased toward or against specific inputs. . . . We propose that attention can consume processing capacity, . . . the limited pool of energy, resources, or fuel by which . . . cognitive operations or processes are mobilized and maintained.
>
> The act of becoming conscious depends upon a definite psychic function - attention - being brought to bear. This seems to be available only in a determinate quantity.

Both of these quotations could comfortably fit into a contemporary issue of the Journal of Experimental Psychology. The first one, in fact, does come from that journal (Johnston & Heinz,1978, p. 421-422). However, the second comes from Freud's Interpretation of Dreams (1900/1938, p. 529). The similarity between the two provides impetus for attempts at interrelating the methods and models of cognitive and personality psychology. Klein (1970), Wachtel (1967), and Erdelyi (1974) have related some principles of information processing to psychodynamic conceptions of personality. More recently, Bandura (1977), Mahoney (1974), and Mischel (1977) have integrated information processing models of attention with social learning theory in order to conceptualize the behavior change process. Selective attention in particular has been shown to play an important role in a wide range of behavioral phenomena, including psychopathology ranging from hyperactivity in children (Rosenthal & Allen, 1978) to impotence (Geer & Fuhr, 1976). Deficits in attention have been shown to be important in the disordered thought patterns of schizophrenics (Chapman & Chapman, 1973; Oltmans, 1978).

Major portions of contemporary experimental work on cognition and perception overlap with research areas of personality and clinical psychology.

Encouragingly, evidence pointing toward an overlap has increased in recent years, as with the examination of individual differences in information processing (Eysenck, 1977). Among the topics studied by cognitive psychologists, attention may have the greatest potential for adding to our understanding of personality and clinical phenomena. Some cognitive psychologists believe that the converse is also true, that attention can be fully understood only in the context of its interaction with the moods, biases, and motives which must inevitably filter and mix cognitions. In 1967 Neisser noted that the complex decisions humans make are preceded by equally complex screening processes that may not be available to awareness, a surprising parallel to psychodynamic theory at a time when the concept of the unconscious was anathematized by behavioral researchers. Broadbent (1977) has more recently observed that attitudes, motives, and fears are vital to understanding attention and called for research on these "hidden preattentive processes." As an example, he described a group of social scientists examining a complicated computer printout. Though each is presented with the same set of stimuli, each is likely to focus on different features of the information present there. The complexity and subtlety of the cognitive processes - the hidden preattentive processes - evident in this and similar examples of selective attention demand, according to Broadbent, the focused attention of psychologists. Though cognitive behavior modification has adopted portions of the information processing approach, the notion of a complex preattentive processing system has not yet found its way into current models of pathology or behavior change.

The present study was designed to examine performance on a commonly used selective attention task, shadowing, while varying the emotional salience of the stimuli presented in the task and taking into account the interactive effects of relevant personality variables. The study was aimed at the cognitive underpinnings of responses to different types of emotionally-laden material.

Laboratory research has greatly expanded our understanding of selective attention. It is now widely accepted among cognitive psychologists that multiple perceptual stimuli can be processed simultaneously during preattentive processing stages and that grouping of the stimuli or selection from among them according to semantic features can occur prior to processing in awareness (Broadbent, 1971; Shallice, 1978). The pertinence of each of these multiple inputs to the task at hand is the factor cited as determining whether or not a particular portion of incoming information is selected for careful, highly attentive processing (Norman, 1968; Shallice, 1978). Context and past experience would obviously help determine what is salient for attention and what is not (Sarason & Sarason, in press). But much more extensive elucidation of how information becomes salient should be possible, along with descriptions of how different kinds of information operate in the preattentive and fully attentive processing systems for different individuals.

As one of us has noted (Sarason, 1979), the history of an individual's cognitions, interactions among cognitions, and the patterns of emergence and maintenance of particular kinds of cognitions are important, but neglected, topics in personality and clinical psychology. Laboratory methods currently used in selective attention research, particularly dichotic listening and shadowing, might help unravel the relationship between personality and attention. Dichotic listening consists of selecting and attending to one of two or more simultaneous auditory messages. Shadowing, used in the present research, adds the extra attention-focusing requirement that the subject repeat one of the two or more messages that are presented as they are presented.

Shadowing one of several simultaneous spoken messages results in an extreme focusing of attention. It is easy enough for most people to carry out the task of shadowing, but the task requires that they concentrate on one message, the shadowed channel (SC), to such a degree that any attempt to attend to the other message in the ignored channel (IC) invariably disrupts shadowing.

If shadowing is maintained, the IC receives very little attentive processing, with the result that awareness of its contents has been found to be very limited. If the acoustical quality of the message in the IC is altered by changing from a speaker of one sex to a speaker of the other or if a distinctive non-verbal sound is presented, these events sometimes enter awareness and are remembered (Cherry, 1953). The overlearned stimulus of one's name presented in the IC is also often remembered (Moray, 1959). The intrusion of one's name upon awareness, the "Cocktail Party Phenomenon" (Broadbent, 1958), was an early impetus to theories that information is processed preattentively.

More recent evidence from shadowing experiments indicates that the contents of the IC can influence attention and information processing without surfacing in awareness. Presenting IC messages that have a distinct emotional quality or messages that are semantically related to the material being shadowed has been found to disrupt performance in shadowing. However, the words tied to the disturbances in performance are not later remembered or recognized (Lewis, 1970; Treisman, Squire, & Green, 1974; Straube & Germeer, 1979). Words associated with shock have been found to elicit increases in galvanic skin responses when presented in the IC of a shadowing task, though they are not later recognized or remembered (Corteen & Wood, 1972; Corteen & Dunn, 1974, von Wright, Anderson, & Stenman, 1975). These and other results suggest that the preattentive processes digest the perceptual inputs in the IC in a fairly complex manner. The IC in shadowing tasks may be a promising vehicle for directly "injecting" various kinds of stimuli, or attentional situations, into the preattentive system and monitoring their effects on performance, their entry into awareness, and their fate in light of personality states and traits.

In the present research, the shadowing paradigm was used to evaluate different attentional situations by presenting subjects with identical shadowed channels (SC), while ignored channels (IC) contained messages judged to be of a particular emotional quality. Several personality variables were measured and their relationship to shadowing and awareness during the presentation of these emotional messages was examined. The presentation of these emotional IC messages with the shadowing of another message in the SC represents a controlled interaction between simultaneous attentive and pre-attentive stimuli. It represents an extreme case of such an interaction, with awareness being focused almost completely upon the SC, permitting very limited awareness of the IC's contents. Dependent variables that reflect the effects of personality and the content of the information to be presented include shadowing proficiency as expressed in shadowing error rates, and recall or recognition of the material presented in the IC. Error rate provides an excellent indication of the activity of the attentive information processing system, indicating specifically how completely attention is focused on the SC as the task progresses. It has been consistently found that switching one's attention from the SC to the IC results in shadowing errors. Measures of recognition for the contents of the IC provide indications of major shifts of attention from SC to IC, of the general availability of the contents of the IC to awareness, and of how these words affect subjects' more deliberate judgment processes when examined following the shadowing task.

Method

Subjects

The subjects were 51 female and 63 male students at the University of Washington. They received Introductory Psychology class credit for their participation in the research. The subjects were randomly assigned to one

of five experimental groups described below. Each group received and shadowed the same message, while the contents of part of the IC were varied among groups. Five subjects, two females and three males not included in the totals above, were unable to shadow satisfactorily and were excused from the experiment. No reliable sex effects were present during data analysis, so sex differences will not be mentioned further.

Shadowing Tapes

Five two-channel stereophonic audio tapes were made for the shadowing task. A sixth tape was made for practice shadowing. The five experimental tapes consisted of 220 synchronized word pairs, with one word in each pair spoken in a male voice appearing in one channel, while a different word spoken in a female voice appeared simultaneously in the other channel. All 220 words in each channel were spoken in the same male or female voice. The male voiced channel was designated the shadowed channel (SC), while the female voiced words constituted the ignored channel (IC). The 440 words used in each tape were, for the most part, one and two syllable words selected from the Kucera and Francis (1967) word frequency lists.

The five tapes used in the shadowing task were made by recording word pairs in 20, eleven word pair sets. All five tapes included the same SC of 220 male voiced words judged to be neutral in emotional tone. The words, 500 msec. in duration, were presented at a rate of three word-pairs every two seconds. Each eleven word-pair set was preceded by 250 msec. with a 2,000 Hz. warning tone lasting 250 msec. Each set except for the eleventh was followed by a 4 1/2 second rest period prior to the onset of the next warning tone and set of word-pairs. The practice tape consisted of five sets of word pairs following this same format.

As noted above, the SC's of each tape were identical, the IC of each

tape also contained 170 identical female voiced words recorded in identical order. The ICs differed only in that each contained unique female voiced target words in the last ten sets of words. These were placed in the five middle positions in the last ten sets of words, i.e., following and preceding three words that were held in common between the tapes. One tape included 25 IC target words judged to be sexually explicit (Taboo Tape) and 25 unique IC neutral words; another contained 25 IC target words judged to convey hostility and aggression (Hostile Tape) and 25 unique neutral words; another contained 25 IC target words related to university education (School Tape) and 25 unique IC neutral words; another contained 25 IC target words related to educational evaluation (Test Anxiety Tape) and 25 unique IC neutral words; the fifth tape which was used as a control tape contained 50 unique IC words, all of which were judged to be emotionally neutral (Neutral Tape).

In summary, the five experimental tapes were identical in the SC, which was male voiced. They were also identical for 170 of the 220 words in the IC, which was female voiced. The other female voiced IC words were unique to each of the tapes and were systematically selected for their emotional quality.

The tapes were generated from computer modified human speech. The timing program used to modify and arrange the words provided accuracy to a thousandth of a second in determining the duration, spacing, and synchronization of words.

Apparatus

An Analogic model AN5400 Computer Data Conversion System (analogue to digital and digital to analogue converter), a Nova Model 800 minicomputer, a Marantz audio amplifier, and a Teac Model 1230 stereo tape recorder were used in the tape generation process. The analogue to digital converter was used to convert spoken words to digital messages which were stored by the computer. The words were judged for clarity, modified for length, organized,

and synchronized by the computer. They were then reconverted from digital to acoustical signals and recorded on audio tape.

During the experiment, one Teac model 1230 stereo tape recorder was used to present the shadowing stimuli, while another operating simultaneously recorded subjects' responses. Subjects wore Nova Pro stereo headphones during the shadowing.

Materials

Three to six weeks prior to the experiment, subjects completed a questionnaire including the items of the Test Anxiety Scale (TAS) (Sarason, 1978) and a Defensiveness Scale (Sarason, 1958). During the experiment, subjects completed the Today form of the Multiple Affect Adjective Check List (MAACL) (Zuckerman & Lubin, 1965). Following the shadowing of an experimental tape, subjects completed a scale on which they rated their confidence concerning whether selected target words, words from the IC of the experimental tapes, were present or not. This Confidence Rating Scale presented each word followed by six rating points, "Certain Did Not Hear" coded 0, "Probably Did Not Hear" coded 1, two "Uncertain" points coded 2 or 3 (allowing no mid-point response), "Probably Did Hear" coded 4, and "Certain Did Hear" coded 5. Five neutral words and five emotionally salient target words from each tape were included on this Confidence Rating Scale (no salient target words were present in the Neutral Tape, but five neutral words from this tape were included on the scale).

Procedure

Three to six weeks after the trait measures were obtained at a large group testing session, subjects were telephoned and invited to participate in the experiment. Those accepting the invitation met the experimenter at the setting for the experiment, a 3 x 4 meter room containing two tables and chairs and the recording equipment for the experiment. The tables were situated at right angles to one another so that subjects were seated with their backs to

the recording equipment. The purpose of the experiment was described briefly:

> We are investigating people's ability to concentrate during a confusing situation. We would like you to listen to two sets of words that are recorded on different channels of this stereophonic tape. You will hear a male voice in one ear and a female voice in the other. We want you to repeat what you hear spoken by the male voice as it is spoken. This is somewhat difficult, but as long as you ignore what is spoken by the female voice you should be able to do this. This task is called shadowing. First we will give you some practice. You'll hear a warning "beep" followed by the words. After you repeat eleven words, you get a brief rest and then another warning "beep" and more words. We'll practice until you're comfortable with shadowing. Please speak into the microphone [before you] on the table.

Ear preference was determined and the stereo headset was placed so that the preferred ear received the SC. Subjects were allowed to shadow from the practice tape four to eight times until they achieved a criterion of perfect shadowing accuracy, as monitored by the experimenter, for four consecutive sets of words. If the subjects had difficulty getting started, the tape was stopped temporarily and they were given a few coaching statements, such as, "Be sure to ignore the female voice," or, "Repeat the male voice as soon as you hear it."

Immediately following the practice session, subjects completed the Today form of the MAACL with the instruction that they should consider how they felt at that particular moment. The shadowing instructions were then repeated:

> You're doing very well. Now I want you to do some more shadowing. The task will be the same, except that you will be repeating different words. Remember to ignore the female voice and repeat the male voice as soon

as you hear it. You should have no difficulty. Remember to speak into the microphone.

One of the experimental tapes was then played. Another recorder was started simultaneously to record subjects' shadowing. When the shadowing was completed, subjects were given another MAACL Today form, with the instruction repeated that they should complete it for how they felt at that moment.

Subjects were given the Confidence Rating Scale and told, "Some of these words may have been present in the female voice, please rate how confident you are of having heard them. I will tell you afterward whether any of them were presented or not." Upon completion of the Confidence Rating Scale, the true content of the IC was revealed and subjects were questioned about their impressions of the task. Before being excused they were asked not to discuss the experiment with anyone until after the end of the academic quarter to preserve the confidentiality of the IC contents and the design of the study.

Each subject's shadowing accuracy was analyzed from the recording made during the experiment. Tapes were reviewed for omissions, substitutions from the ignored channel, and distorted responses.

It was originally intended that 100 subjects, 50 males and 50 females, would be assigned equally and randomly to the five experimental groups. It was discovered during the experiment that a disproportionately large number of subjects presented with the Taboo Tape were experiencing shadowing difficulty and reported being certain of having heard Taboo words. To allow for investigation of this phenomenon, additional subjects (N=14) were randomly assigned to the group presented with the Taboo Tape. These subjects are included primarily in intragroup comparisons for those presented with the Taboo Tape.

Results

Shadowing Errors

Error rates were computed from the recordings of subjects' shadowing made during the experiment. The error rates provide the proportion of incorrect responses to the total number of SC words present. They were computed from the total number of words presented in the SC which were omitted, or, if spoken, distorted to such a degree that they could not be understood, or replaced with words that were not presented or which came from the IC.

Error rates were examined using a two-factor, split plot analysis of variance (ANOVA). The within plot factor, with two levels, was the section of the performance measured, first half versus second half. During the first half of the shadowing task, the same neutral words were present in the SC and IC for all subjects. During the second half of the task, the same SC appeared for all subjects but different target words appeared in the IC (Neutral, Taboo, Hostile, School, or Test Anxiety, depending on the tape presented). The plot or grouping factor, with five levels, was the Tape presented to the group, whether Neutral, Taboo, Hostile, School, or Test Anxiety (2 sections x 5 tapes).

There was a significant main effect for Section of the task, F (1, 95) = 19.3, $p < .001$. Error rates rose from .062 during the first half of the task to .089 during the second half. The Tape main effect and the Tape x Section interaction effects were not significant, F (4, 95) < 1 for the Tape effect and F (4, 95) = 1.5, $p > .2$ for the interaction effect. Though the interaction effect was not significant, a set of planned comparisons was carried out. The results of these comparisons are presented in Table 1. The first was a group by group examination of change in error rate from the first to second halves of the task. Error rate increased from .067 to .122, an increase of .055, when Taboo words appeared in the IC, F (1, 19) = 6.8, $p < .02$. An increase of .031 from .046 to .077, occurred in the group presented with

Table 1

Error Rate During Shadowing: Full Sample

Tape Presented	Contents of the Ignored Channel (IC): First Half Identical ICs	Second Half Target Words in IC	Increase in Error Rate
Neutral Tape	.055	.074	.019 (A)
Taboo Tape	.067	.122	.055* (B)
Hostile Tape	.066	.090	.014 (C)
School Tape	.046	.077	.031** (D)
Test Anxiety Tape	.075	.093	.018 (E)
M	.062	.089	.027**

During the first half of the task the same neutral words appeared in the Ignored Channel. During the second half different Target words were included in Ignored Channel, depending on which Tape was used for shadowing: The Neutral, Taboo, Hostile, School, and Test Anxiety tapes contained Neutral, Taboo, Hostile, School, and Test Anxiety words, respectively, in the second half of the Ignored Channel.

* $p < .02$

** $p < .001$

B>A, C, E; $p < .05$

School words in the IC, F (1, 19) = 10.9, $p < .01$. Error rate did not increase reliably in the other groups when viewed alone.

Next, Duncan's New Multiple Range Test was applied comparing the change in error rate from the first to second half of shadowing in each group with the change in error rate occurring in each of the other four groups. The increase in error rate occurring with the introduction of Taboo words was reliably greater than increases occurring in the Neutral, Hostile, and Test Anxiety groups at the .05 level. No other reliable differences were present, indicating that the introduction of Taboo words in the IC resulted in increases in shadowing errors over and above errors related to general progression of the shadowing task in these groups.

Confidence Ratings

Confidence ratings were computed for each class of words (i.e., Taboo words, Hostile words, etc.) appearing on the Confidence Rating Scale. These were computed from the total ratings for all the words of a certain class divided by the number of ratings made. This provided an average confidence rating for each class of words. Confidence ratings for Taboo words exhibited a reliable degree of sensitivity: The group presented with the Taboo tape gave higher ratings for Taboo words than for words they were not presented with. Groups presented with tapes containing other target words gave lower ratings for Taboo words, though they were not otherwise able to distinguish their own target words - those presented in their IC - from words they were not presented with. The group presented with the Test Anxiety tape appears to have given somewhat higher confidence ratings for words in general, though they were unable to distinguish their own Test Anxiety words from words with which they were not presented.

Confidence ratings were examined using another two-factor, split plot ANOVA. The within plot factor, with five levels, was the emotional class of the words on the Confidence Rating Scale (Word Class main effect). The five word classes were Neutral, Taboo, Hostile, School, or Test Anxiety words. The plot or grouping factor, also with five levels, was the Tape (Tape main effect) presented to each group. The five tapes contained either Neutral, Taboo, Hostile, School, or Test Anxiety words in the IC. Thus, the Tape factor distinguishes which words were actually present in the IC and actually could have been heard, though all words were rated by each subject (5 Word Classes X 5 Tapes).

The main effect for Word Class was significant F (4, 95) = 9.9, $p < .001$. Irrespective of which words actually appeared in the ignored channel, the mean ratings were 1.71 for Neutral words, 1.53 for Taboo words, 2.04 for Hostile words, 1.94 for School words, and 1.96 for Test Anxiety words. Duncan's New Multiple Range Test applied at the .05 level of significance revealed that lower confidence ratings were given Taboo words than Hostile, School, or Test Anxiety words.

The main effect for Tape presentation approached significance, with F (4, 95) = 2.38, $p \leq .06$. The mean confidence ratings for all five word classes were 1.79 among those presented with the Neutral tape, 1.84 among those presented with the Taboo tape, 1.45 for those presented with the Hostile tape, 1.81 for those presented with the School tape, and 2.30 for those presented with the Test Anxiety tape.

The Tape X Word Class interaction effect was significant, F (16, 380) = 4.3, $p < .001$. To aid in interpreting this interaction effect, protected versions of Duncan's New Multiple Range Test were applied within each group. ANOVAs applied to the ratings within each group were significant, with F (4, 76) $\geq$ 2.5, $p < .05$ in all five groups. The average F from these tests was 5.74, $p < .001$.

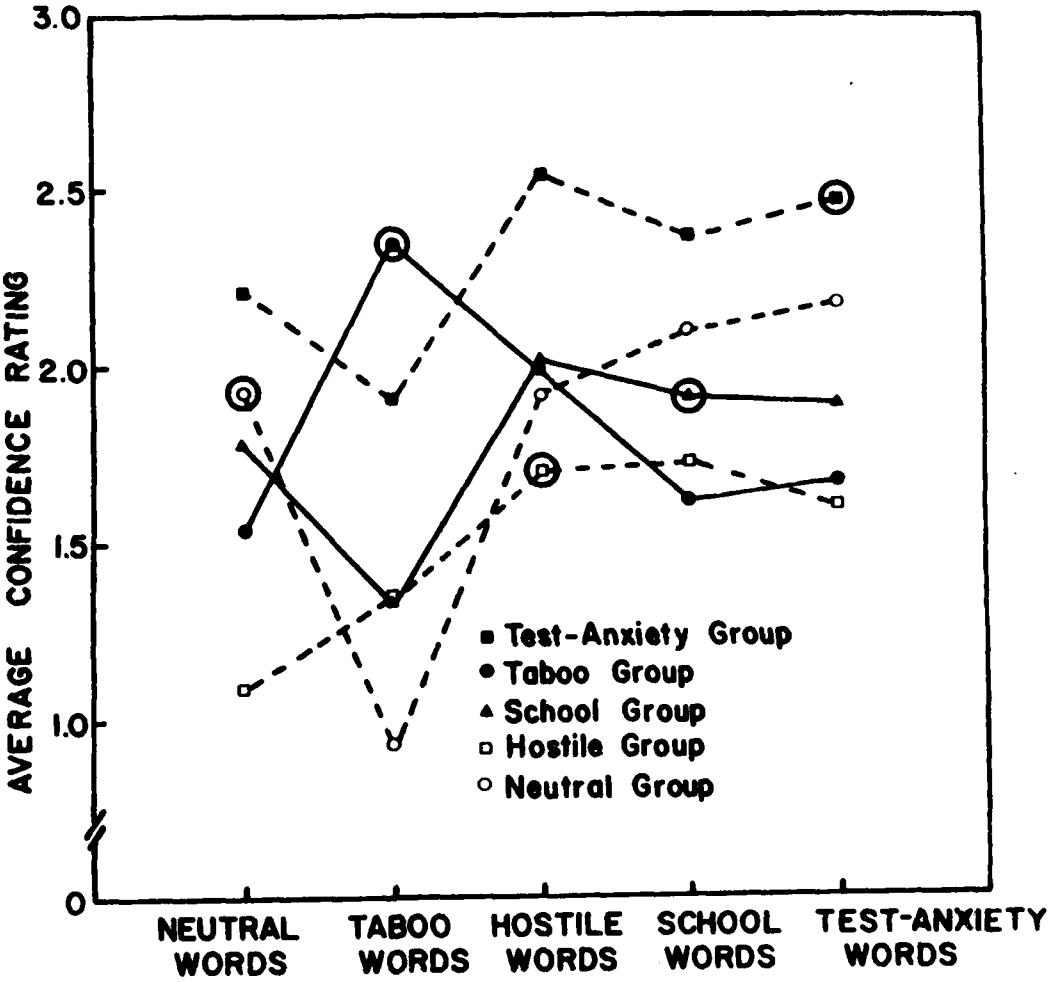
In the groups presented with the Neutral and School tapes, ratings for Taboo words were found to be reliably lower than ratings for Neutral, Hostile, School, and Test Anxiety words at the .01 level of significance. In the group presented with the Hostile tape, ratings for Taboo words were found to be lower than ratings for Hostile, School, and Test Anxiety words at the .05 level. In the Test Anxiety group ratings for Taboo words were lower than ratings for Hostile and Test Anxiety words at the .05 level. In the group presented with the Taboo tape, ratings for Taboo words were higher than ratings for Neutral, School, and Test Anxiety words at the .01 level.

Figure 1 provides graphic presentation of the interaction effect. Ratings for Taboo words dip in all groups except the group presented with Taboo words, where ratings for Taboo words rise. This pattern is indicative of sensitivity in rating Taboo words: Conservative or low ratings were given by subjects who were not presented with Taboo words. When Taboo words were actually present in the IC, less conservative, or higher ratings were given. Figure 1 also provides a possible explanation for the Tape main effect reaching a nearly reliable degree of variation between groups: The highest rating for every word class except Taboo words was given by the group presented with the Test Anxiety tape.

Mood States

Two-factor, split plot ANOVAs were applied to the MAACL Anxiety, Depression, and Hostility scores taken following practice and again following the shadowing task (two measures X the five tape groups). Hostility scores increased reliably from an average of 8.20 following practice to 9.06 following the task F (1, 95) = 14.3, $p < .001$ (Task main effect). Groups did not differ in

Figure 1



Mean confidence ratings for each class of target words by each experimental group. Subjects in the Neutral group were presented only with Neutral words in the ignored channel (IC), but gave confidence ratings for all classes of words; subjects in the Taboo group were presented with Taboo words in the IC and rated all classes of words; and so on for all five groups of subjects. Each group's average confidence rating for the class of words actually presented in their IC is circled.

Hostility (Tape main effect) F (4, 95)$<$1, and the interaction effect between groups and time of measurement was non-significant, F (1, 95) = 1.8, $p > .1$. No significant effects were present for Depression or Anxiety scores, though both sets of scores also tended to increase from the post-practice measure to the post-task measure. This indicates that an increase in negative mood tended to accompany shadowing. This task was reported to be taxing by subjects.

Interrelationships Between Measures

Table 2 provides the correlations between error rates, confidence ratings, MAACL scores, and the TAS for the whole sample. The Defensiveness Scale is not included because it was not found to be reliably related to either the confidence ratings or error rates. The two error rate scores were found to be highly correlated with one another, as were the five confidence ratings and the four personality measures. This is to be expected since these measures represent multiple samples taken within subjects, and indicate that a high degree of variance can be accounted for by individual consistency in similar performance and state measurements. Of primary interest are the relationships between confidence ratings and error rates, confidence ratings and personality measures, and between error rates and personality measures, since they provide clues to the interaction of attention, shadowing proficiency, and existing cognitions and moods. These correlations are outlined in Table 2.

No reliable relationships between error rates and personality measures were present. However, eight small but significant correlations with the confidence ratings were present: Error rates when target words were present in the IC were positively related to ratings for Taboo words, and negatively

Table 2 Intercorrelations Among Measures: Full Sample

Measures	1	2	3	4	5	6	7	8	9	10	11
Shadowing Error Rate											
1. Identical IC	1.00										
2. Targets in IC	.69***	1.00									
Confidence Ratings											
3. Neutral Words	-.08	-.08	1.00								
4. Taboo Words	.01	.25**	.32***	1.00							
5. Hostile Words	-.12	-.05	.59***	.45***	1.00						
6. School Words	-.16	-.19*	.56***	.23***	.72***	1.00					
7. Test Anxiety Words	-.17	-.16	.70***	.37***	.81***	.87***	1.00				
Personality Measures											
8. Test Anxiety Scale	.01	-.03	-.04	-.23**	-.10	.12	.02	1.00			
9. MAACL Anxiety	.09	.16	-.19*	-.04	-.20**	-.02	-.13	.40***	1.00		
10. MAACL Depression	.07	.00	-.12	-.08	-.29**	-.02	-.13	.37***	.78***	1.00	
11. MAACL Hostility	.01	.06	-.22**	-.07	-.26**	-.01	-.16	.39***	.80***	.80***	1.00

Note: IC refers to the Ignored Channel. During the first half of the shadowing task all tapes had identical Shadowed and Ignored Channels, during the second half of the shadowing task all tapes had identical Shadowed Channels, but different target words were now included in the Ignored Channel. One group had Neutral words in the IC, another had Taboo words, and so on.

*$p < .05$ (Two-tailed probabilities)

**$p < .02$

***$p < .001$

related to ratings for Test Anxiety words. Scores on the TAS were negatively related to ratings of Taboo words. MAACL Anxiety, Depression, and Hostility scores were negatively related to ratings of Neutral and Hostile words.

Each of these correlations is based on one set of confidence ratings made when the words rated were actually present in the IC, plus a larger set of ratings from those subjects not presented with these words in the IC. Comparison of the correlations between these two groups provides information about whether a relationship is based on the presence of a stimulus in the preattentive system, making it a predictor of stimulus sensitivity, or based on response irrespective of stimulus presence in the preattentive system, making it a predictor of response bias. Ratings for Taboo words were reliably related to error rates during the second half of shadowing, when target words appeared in the IC, r (112) = .25, $p < .01$. This relationship is restricted to the Taboo group, however, where r (32) = .36, $p < .05$. It is absent in the rest of the sample: When the target words were not Taboo words, r (78) = -.03, $p > .50$. These correlations differ reliably, Z = 1.94, p = .053. Therefore, error rates were reliably related to confidence ratings for Taboo words, but only when the Taboo words were actually present in the ignored channel. The relationship of error rate to ratings of Taboo words is one of sensitivity to stimulus presence in the ignored channel.

No reliable differences between stimulus groups were found for the seven other significant correlations in Table 2 using this analysis, indicating that these relationships predict response bias rather than sensitivity to contents of the IC. Subjects were predisposed to respond in a certain direction if they had certain mood state scores or error rates. When subjects had high error rates they gave conservative ratings for School words whether they were presented with them or not. TAS scores were negatively related to ratings for Taboo words whether subjects were presented with the Taboo tape

or not. (It is not surprising that the individuals who rate themselves high in preoccupation with evaluation give lower ratings for Taboo stimuli. It is quite noteworthy that this relationship was present for the highly attentive system of confidence rating, and not for the preattentive system.) MAACL Anxiety and Hostility scores were negatively related to ratings for Neutral words, and all three MAACL scores were negatively related to ratings for Hostile words, whether these words appeared in the IC or not.

Intrusion Effects

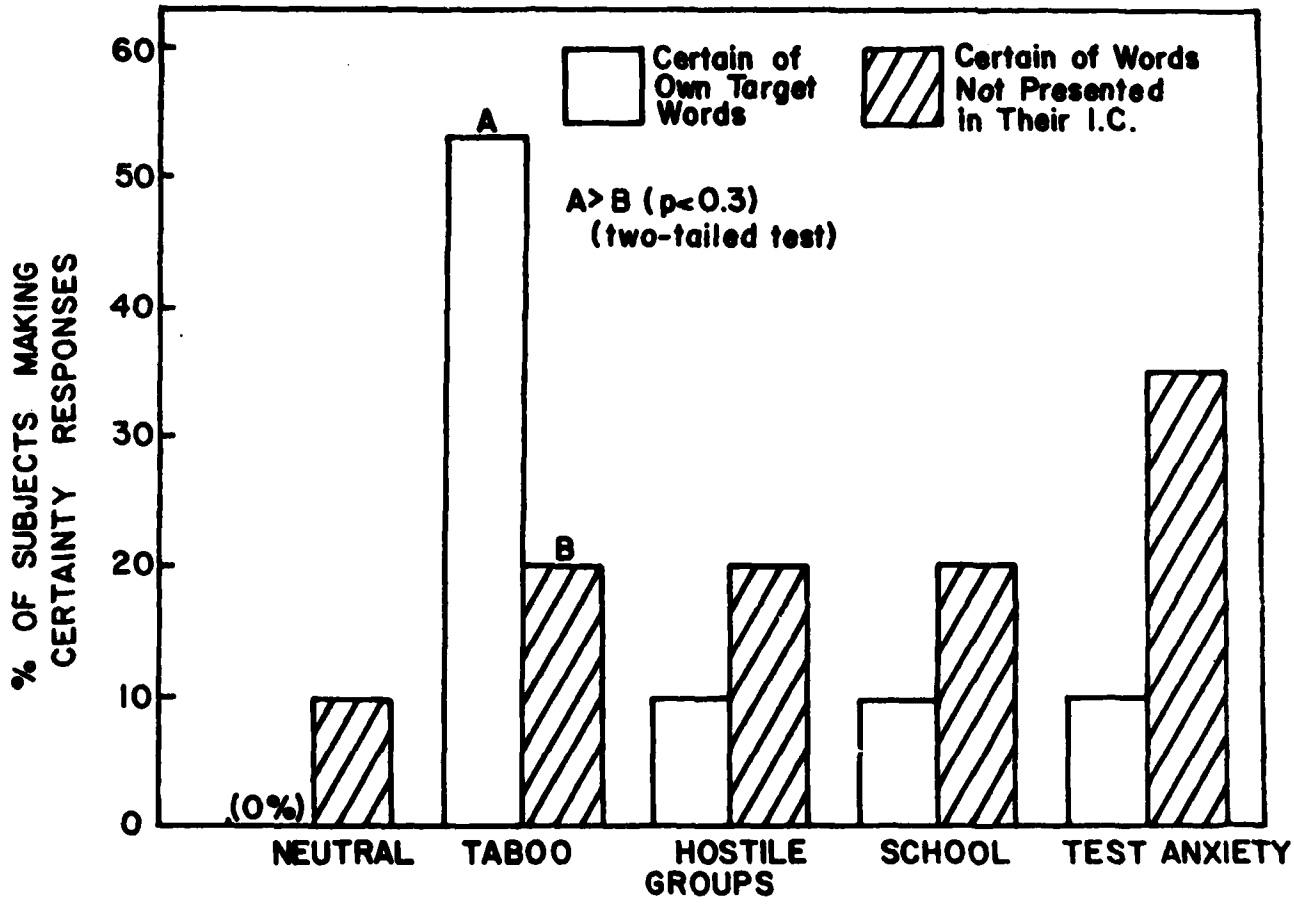
The high confidence ratings given Taboo words by the Taboo group, the large increase in shadowing errors in the Taboo group, and the relationship between error rate and confidence ratings for Taboo words were all due to the "intrusion" of Taboo words upon the awareness of subjects during shadowing. More than half the subjects in the group presented with Taboo words reported being certain of having heard one or more Taboo words (18 of 34). These subjects reported that these words had intruded or "popped" into their awareness. Many were observed to start laughing when the Taboo words appeared in the IC. Two became aware of the Taboo words when they discovered that they were repeating these words instead of the words from the SC. Because of these reports, this effect can be referred to as an intrusion effect. The intrusion effect caused the higher confidence ratings for Taboo words and the increased shadowing error rates. Mood state prior to the task predicted these intrusions independently of shadowing proficiency.

Of the 34 subjects presented with the Taboo tape, 18 (53%) experienced intrusions. On the Confidence Rating Scale this appeared as certainty of having heard one or more Taboo words. The proportion of subjects in other groups reporting certainty of having heard one or more of their own target words (20% or fewer) was reliably lower, χ^2 (4) = 30.5, $p < .0001$. A few subjects in all groups incorrectly reported that they were certain of having

heard one or more words that were not present in either their SC or IC, these reports constitute False Alarms while intrusions constitute Hits. There was no reliable difference in proportions of subjects in the different groups giving such False Alarm reports, χ^2 (4) = 3.84, $p > .25$ (see Figure 2). Binomial tests for multiple measures (Edwards, 1972) were applied in each group to determine if the proportion of subjects reporting certainty for words that were really present in the IC (Hits) differed from the number reporting words that were not present and therefore could not have been heard (False Alarms). Within the Taboo group, more subjects reported hearing Taboo words (Hits) than words that were not present (False Alarms), $Z = 2.29$, $p < .022$ (two-tailed probability). No reliable differences were present in other groups.

The relationship of intrusions to error rates was examined with two-factor, split plot ANOVA, using Intrusion as the grouping factor. Error rate did not differ between groups, F (1, 32) = 1.8, $p > .10$ (Intrusion main effect). Error rate did increase in the Taboo gorup as a whole (Section main effect), F (1, 32) = 10.1, $p < .001$. However, a highly reliable Intrusion X Section interaction effect was present for error rates, F (1, 32) = 15.7, $p < .001$. As can be seen in Table 3, comparison of the error rates in the four cells of the interaction using Scheffe's Test at the .05 level reveals that errors increased in the second half of the task when Taboo words were present in the IC, but only among those experiencing intrusions. This is the only cell which differs from other cells. (This pattern of results does not change with the use of more liberal comparisons.) The pattern of results indicates that shadowing errors did not differ among those experiencing intrusions and those that did not

Figure 2



Percentage of subjects in each group stating they were certain of having heard words presented in their ignored channel (IC). These words actually could have been heard and constitute Hits. And percentage of subjects stating they were certain of having heard words which were not present in their own ICs. These words could not have been heard and thus constitute False Alarms.

Table 3

Error Rates During Shadowing: Within the Taboo Group

	Ignored Channel Contents	
Intrusion Effect	All Neutral	Taboo Words Included
Intrusions Occurred	.080 (A)	.193 (B)
No Intrusions Occurred	.059	.068 (C)

Note: During the first half of the shadowing task all subjects were presented with an identical Shadowed and Ignored Channel. During the second half of the shadowing task all subjects were presented with Taboo words in the Ignored Channel.

B > A, C; $p < .05$

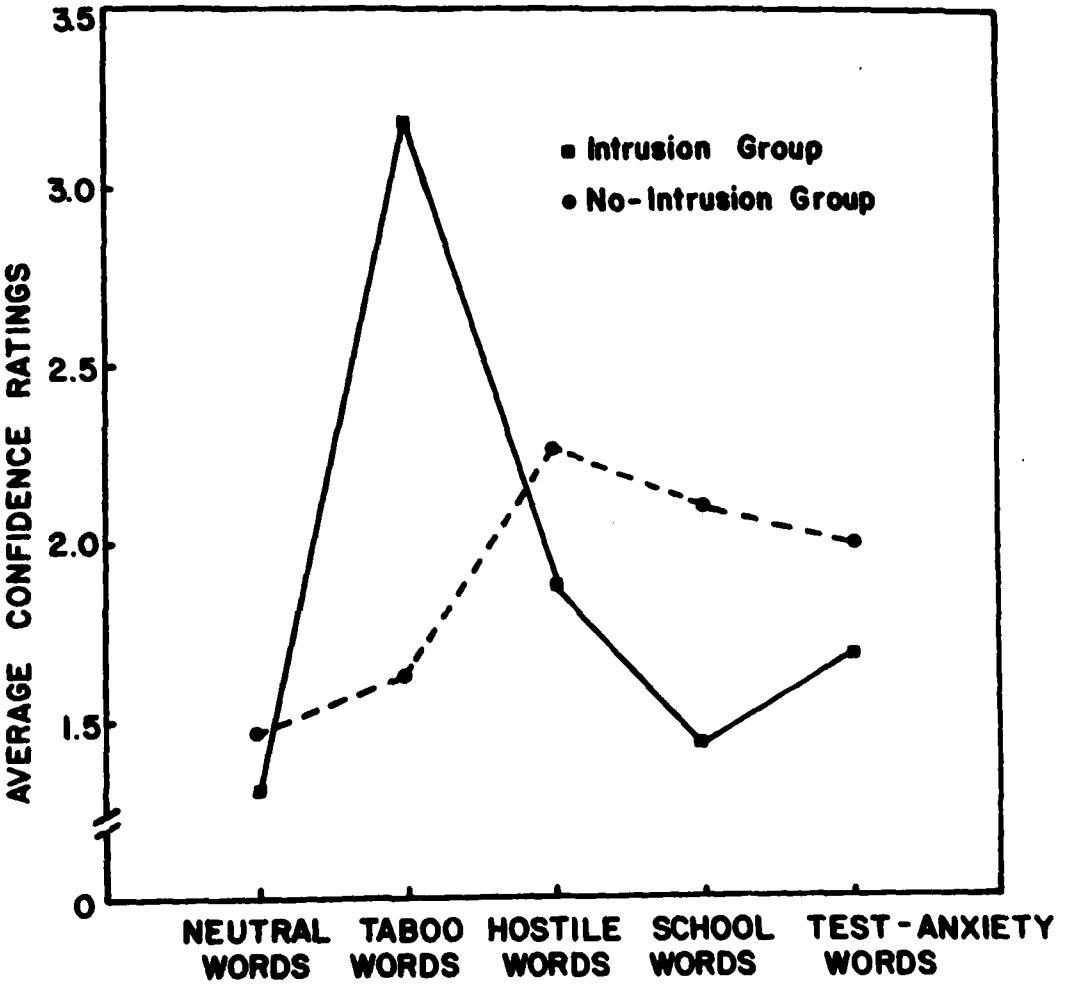
experience intrusions until the Taboo words appeared in the IC.

Confidence ratings for the Taboo group, split according to whether or not they experienced the intrusion of Taboo words, were analyzed using split plot ANOVA. There was no main effect for intrusions, F (1, 32)<1. A significant main effect for class of word and a significant interaction between class of word and intrusions were present, F (4, 128) = 9.6, $p<.001$ and F (4, 128) = 13.0, $p<.001$, respectively. Protected versions of Duncan's New Multiple Range test were applied to both groups with $p<.05$. It was found that for those experiencing intrusions, ratings for Taboo words exceeded ratings for all other classes of words, while the other classes of words did not themselves differ from one another. Within the group not experiencing intrusions, ratings for Taboo words and Neutral words were reliably lower than ratings for Hostile words. These relationships are apparent in Figure 3.

This pattern of ratings further supports the notion that words may have one stimulus value for conscious judgment processes and another for pre-attentive processes. Without the information provided by intrusions of the Taboo words, conscious judgment processes seem to favor the class of Hostile words. With intrusions, the relative advantage of the Hostile words in the attentive ratings system is overwhelmed by the Taboo words, which were selected by the preattentive processes and admitted to attentive processing.

The relationship of the intrusions of Taboo words to shadowing errors and personality measures is presented in Table 4. It is noteworthy that error rate when Taboo words were present in the IC is correlated with intrusions, r (32) =

Figure 3



Mean confidence ratings for each class of target word for all subjects presented with Taboo words in the ignored channel. Ratings are divided according to whether or not subjects experienced intrusions of one or more Taboo words.

Table 4

Intercorrelations Among Measures: Within the Taboo Group

Measures	1	2	3	4	5	6
1. Intrusions of Taboo Words	1.00					
2. Error Rate Without Taboo Words	.19	1.00				
3. Error Rate With Taboo Words	.54**	.79**	1.00			
4. MAACL Anxiety	.44*	.17	.24	1.00		
5. MAACL Depression	.22	.09	-.03	.74**	1.00	
6. MAACL Hostility	.26	.11	.09	.80**	.76**	1.00

*$p < .02$

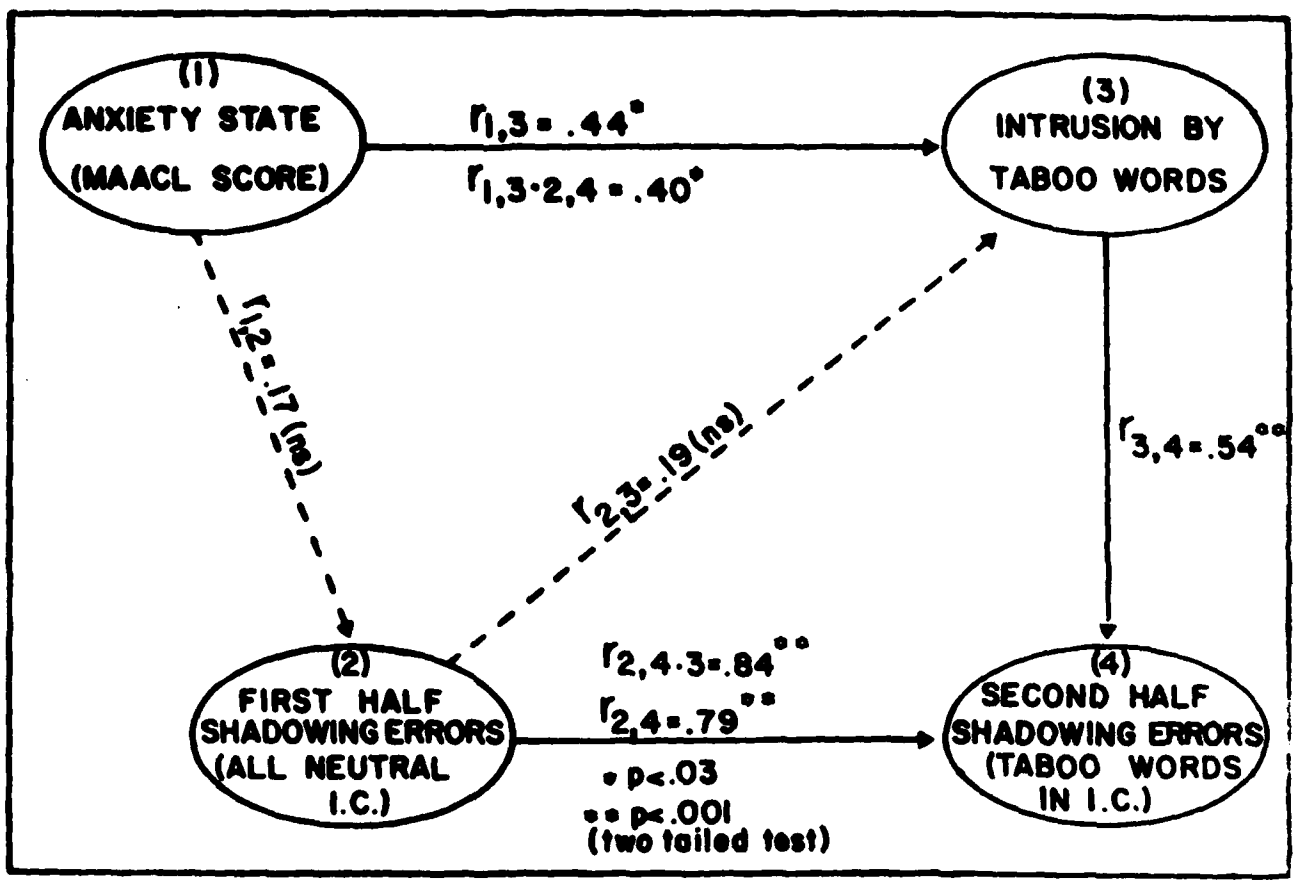
**$p < .001$

(Two-tailed probabilities)

.54, $p < .001$. Error rate when only neutral words appeared in the IC was not related to intrusions, r (32) = .19, $p > .25$. Yet, the two error rates, with and without Taboo words in the IC, are highly correlated, r (32) = .79, $p < .001$. Error rate with only neutral words in the IC is an indicator of general shadowing proficiency, and, to an extent, the degree to which subjects focused their attention on the SC. The correlation between first and second half shadowing is an indication of the consistency of focusing in the first and second halves of the task. These correlations, in addition to the average error rates (see Table 3), demonstrate that shadowing proficiency, and with it the focusing of attention, was consistent within and between subjects until the Taboo words appeared in the IC. Early shadowing errors, lack of proficiency in shadowing, or poor focusing of attention do not seem to account for intrusions.

If the effect of intrusions is removed using partial correlation, this causal sequence is further supported: The magnitude of the correlation between first and second half shadowing errors is increased upon controlling for intrusions, r (31) = .84, $p < .001$. This change indicates that intrusions changed performance in the second half of the task by detracting slightly from the consistency of performance between the first and second half of the task. This causal sequence is included in Figure 4. It is clear from the average error rates that consistency changed because subjects experiencing intrusions began to make more errors. The converse possibility, that poor shadowing allowed scanning of the IC is not supported by mean error rates or the pattern of correlations.

Figure 4



Schematic of the apparent causal sequence of events during the experiment. MAACL scores were obtained before the shadowing task began. MAACL Anxiety was predictive of intrusions when the Taboo words were presented. Intrusions then disrupted shadowing during the second half of the shadowing task.

MAACL Anxiety scores prior to the shadowing task were predictive of intrusions, r (32) = .44, $p < .02$. The relationships between intrusions and Depression and Hostility scores are in the same direction, but not reliable. It is again noteworthy that while error rate when Taboo words were in the IC is related to intrusions, and though error rates before and during intrusions are highly correlated, neither of these error rates are related to the MAACL scores. This pattern of correlations indicates that MAACL mood state has an impact on preattentive processing, which affects intrusions, and that intrusions then affect shadowing proficiency, but that mood did not interfere with shadowing directly (see Figure 4). This is further confirmed by applying second order partial correlations to the relationship of mood states to intrusions: MAACL Anxiety is correlated r (30) = .40, $p < .03$ with intrusions, when controlling for error rates during the first half of the task with neutral words only in the IC and error rates during the second half of the task with Taboo words present in the IC. A strong relationship between MAACL Depression and intrusions is also present when controlling for error rates r (30) = .44, $p < .02$, along with a non-reliable, but suggestive, relationship between Hostility and intrusions, r (30) = .32, $p < .09$. Thus, independent of shadowing proficiency, which is an indicator of the status of subjects' attentive information processing proficiency, mood state was predictive of whether preattentive contents entered awareness. This causal sequence is also depicted in Figure 4.

Discussion

This study showed that sexually explicit messages presented in the ignored channel of a shadowing task tend to enter awareness in a very forceful manner,

so that subjects are certain they were present. These intrusions upon awareness tend to disrupt ongoing information processing as reflected in shadowing proficiency. Intrusions were not related to prior errors or disruptions in shadowing, indicating that they entered awareness because of their preattentive effects. On the other hand, when presented attentively, sexually explicit information had a response biasing stimulus value. If it did not intrude upon awareness when in the IC or if it was not presented in the IC, subjects rated Taboo words lower than other classes of words on the Confidence Rating Scale.

The study further showed that certain personality measures are significantly related to the intrusion or shift of attention to sexually explicit material and to the attentive judgment of completing the Confidence Rating Scale. Anxiety state and depression scores predicted intrusions. The predictive efficiency of these mood measures was independent of shadowing proficiency. Mood predicted shifts of attention to Taboo words independently of fluctuations in information processing proficiency. Mood and personality measures also predicted confidence ratings for some classes of words whether the words had been presented in the IC or not; these correlations were negative. For intrusions the correlations were positive, however, indicating a degree of independence in the operation of moods in preattentive and attentive functioning.

A major implication of the results concerning the intrusion of the sexual material upon awareness is that there may be complex classes of emotional templates or filters that govern what passes from preattentive processing systems to awareness. Even though half the subjects in the Taboo group were certain of having heard one or more Taboo words, only a few rated themselves as relatively confident of having heard other Taboo words. Instead they tended

to rate themselves as certain the words were present or relatively certain that they were not. It seems that the extreme focusing of attention required by shadowing, along with the extreme salience of the Taboo words, established an all or nothing boundary between preattentive and attentive processes. Perhaps a situation requiring extreme focus can be diverted or disrupted only by a powerful distractor. Certainly, sexual information is very interesting, salient, or distracting to many individuals.

The other classes of emotionally-laden information used in the experiment did not enter awareness at detectable levels. It may be that tasks that involve divided attention, but which require less focus upon some primary task than does shadowing, would reveal more permeable boundaries between attentive and preattentive processing for other classes of information. Evidence supporting this possibility comes from Geer and Fuhr's (1976) study which found that as attentional demands were eased for a task similar to shadowing which required extensive focusing of attention, the effects of sexual information presented in the ignored channel increased proportionately. For example, a less demanding form of shadowing or dichotic listening coupled with a situation that enhances situationally specific evaluative cues might reveal a tendency for messages related to test anxiety to intrude upon awareness for individuals high in test anxiety.

The finding that MAACL Anxiety and Depression scores are predictive of intrusions is one of the most important results of this experiment. The relationship between these measures and intrusions indicates that the labels subjects affix to their moods interact with the preattentive processing of sexually explicit material. This relationship provides evidence for a fairly complex relationship between mood and preattentive processing. One possibility is that the relationship between the MAACL measures and intrusions represents an interaction between subjects' cognitions about their feelings and the

cognitions injected into the preattentive processing system through the ignored channel. Another possible explanation is that the MAACL measures reflect arousal which operates as a catalyst for information processing.

Kahneman (1973) has suggested that attention is a finite, cognitive resource, a determinate quantity of effort available for processing multiple tasks. It is argued that as arousal increases, a corresponding increase in the processing capacity available will occur. If the MAACL measures represent arousal, these findings would conform to this capacity model of attention: People with high MAACL scores are more aroused, have more preattentive capacity available and process sexually explicit material more completely. However, arousal induced increases in processing capacity cannot explain the unique intrusion of the Taboo words. If semantic and emotional factors were not operating, if a strong cognitive interaction were not occurring, arousal would be expected to improve processing of all types of information equally.

Easterbrook (1959) and Wachtel (1967) have argued that arousal narrows or restricts the cue utilization of the "beam" of attention. These results also seem to qualify these arousal based theories. If mood is related to arousal and subsequent restriction of cue utilization, few errors in shadowing and fewer intrusions should occur among more highly aroused subjects. The opposite occurred. If attention does become narrower with arousal, the focusing is limited to some material, while an apparent broadening occurs for others. Future examinations of intrusion effects might distinguish between arousal and cognitive components of attention by monitoring physiological indicators of arousal, manipulating arousal experimentally, inducing specific sets of cognitions in subjects, and by conducting controlled introspective analyses of these phenomena in practiced subjects.

This study showed that subjects' confidence ratings for certain classes of words could be predicted by their MAACL scores and by their scores on the Test Anxiety Scale, whether the specific words rated were presented in the IC or not.

When MAACL or TAS scores were high, subjects tended to give some words low confidence ratings. This suggests that when subjects were asked to make judgments about highly ambiguous stimuli, they tended to give cautious ratings when high in these traits.

These findings are consistent with evidence showing that judgment is correlated with personality states. But these findings further suggest that the information processing systems of preattentive processing and conscious judgment (confidence ratings in this case) can operate quite independently from one another, simultaneously interacting with the same mood states in different directions. When intrusions occurred, MAACL scores were positively correlated and predictive of confidence ratings for Taboo words. When intrusions did not occur, MAACL scores were negatively predictive of confidence ratings for other classes of words. This points out the complexity of the information processing system. Sub-components of the processing system may operate in concert or they may operate with striking independence. One system may be sensitive to certain classes of information while others may be insensitive or even defensive for these classes. Personality states and traits may independently influence each processing system and they may interact uniquely with each class of information present in the system.

Because it deals with the transition from preattentive to attentive processing, selective attention may be a vital component in models of personality. In the case of person x situation interaction, for example, each situation would have a cognitive representation which competes with already present material for processing in the attentive or preattentive information processing systems. Considering possible interactions between salient features of a complex situation, existing thoughts, personality states, and personality traits, each in different levels of processing, potentiates nearly endless variation in individual response. While this complicates the already complex interactionist view considerably, it may also appreciably increase our ability to find individual consistency in personality functioning by specifying more accurately the loci of functioning, and consistency at these loci.

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Chief of Naval Education & Training (N-5)
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Naval Military Personnel Command (2 copies)
HRM Department (NMPC-6)
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National Institute of Education
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National Institute of Mental Health
Minority Group Mental Health Programs
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Office of Personnel Management
Organizational Psychology Branch
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Chief, Psychological Research Branch
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Social & Developmental Psychology
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LIST 12

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