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Some Effects of Differential  
Pretask Instructions on  
Auditory Vigilance Performance

by

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### **Prefatory Note**

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## SOME EFFECTS OF DIFFERENTIAL PRETASK INSTRUCTIONS ON AUDITORY VIGILANCE PERFORMANCE

G.L. Neal

There is consensus among a large number of vigilance researchers that the motivational state of the monitor plays a significant role in determining how well a vigilance task is performed. Some good examples of the effects of motivation on monitoring have been shown in studies in which (a) false knowledge of results was presented to subjects (Weidenfeller, Baker, and Ware, 1); (b) knowledge of results was personalized rather than automated (Hardesty, Trumbo, and Bevan, 2); (c) subjects were visited by authority figures (Bergum and Lehr, 3); (d) experimenter attitude toward subjects was systematically varied (Ware, Kowal, and Baker, 4). Surprising as it may seem, our review of the literature showed that the most obvious of all methods for motivating subjects, *pretask instructions*, had not been systematically studied, except for a project designed to study the placebo effect in relation to vigilance performance (O'Hanlon, Schmidt, and Baker, 5).

Orne's (6) formulation of *demand characteristics*, and to some extent Rosenthal's (7) work in experimenter bias, suggested the approach to follow in an evaluation of instruction effects on vigilance performance. In an over-simplified "nutshell," the concept of demand characteristics implies that subjects in an experiment try to be "good subjects" and support the experimenter's hypothesis. To accomplish this, subjects will seek out and utilize cues in the experimental setting which they think suggest the experimenter's hypothesis so they can behave accordingly. Two important determinants of subject performance in this conceptual framework are (a) perceived significance of the experiment, and (b) the extent to which cues connoting experiment importance and the experimenter's hypothesis are mutually supporting.

Considering these factors the following experiment was designed to answer two questions:

- (1) Can differential pretask instructions to monitors lead to differential vigilance performance?
- (2) Will there be measurable differences in motivation between monitors in a vigilance task who perceive the task to be "important" and those who perceive the task to be "not important," and will such differences be reflected in performance on a vigilance task?

Subjects for the experiment were recruited from "Introductory Psychology" classes at the University of Oklahoma by their instructors. All that "volunteers" were told about the experiment by their instructor was the time and place of the experiment, and that they would be told more about it by the experimenter at that time. Subjects were

given a choice of experiment session, which they indicated on a sign-up roster circulated by their instructor. A total of 203 students—104 males and 99 females—participated in the experiment. The number of subjects participating per session ranged from 6 to 27. The restrictions on a session were: (a) a minimum of six subjects and (b) both males and females in a session.

Experimental sessions were held in a typical classroom. After a group of subjects reported for a session, they were told it was a "vigilance" experiment and were presented with one of four possible reasons for the experiment. These were:

(1) It was a Psychology 1 requirement, and they could not be told the purpose of the experiment at that time. This was called the *Required Chore* or RC treatment.

(2) The experiment was training methods research for a space capsule communications project, and we were planning to confirm the optimal training method (actually the vigilance task training trials) on that group. This was called the *Important Task* or IT treatment. This orientation was supported by having NASA and Air Force research reports lying around the room and by the experimenter's reading these as the subjects performed their tasks. Furthermore, subjects were asked to imagine themselves to be in a space capsule as they performed their assigned experimental tasks.

(3) Some subject groups were told they were expected to do well on the vigilance task because a test score *derived* from their freshman orientation tests indicated they should do exceptionally well. This treatment was called the *Subject Important* or SI treatment. This treatment was supported by telephoning all subjects prior to the session and reminding them to come. Upon arrival each subject was given a packet of answer forms with an attached card with his name and test score of "90" or higher written on it. Subjects were asked to record this score on all answer sheets used, and were told that a score of 90 or better indicated they should do well in vigilance.

(4) Finally, the fourth condition combined all elements of the *Important Task* and *Subject Important* task treatments and was designated the *Combined Treatment* (CT).

Note that experiment importance was varied in two ways—in terms of results utilization in *Important Task*, and to the subject himself in *Subject Important*. Order of reasons was designed to counteract the "campus grapevine."

After the orientation, subjects were trained, following standard instructions, in three practice steps to perform a group-administered Bakan (8) cognitive stimulus auditory vigilance task presented by loudspeakers of a magnetic tape recorder. In this task, the subject listens to single digit numbers presented at the rate of one per second. The subject's task is to detect the occurrence of three successive odd numbers all of which are different (for example, 3-1-7) and record them on an answer sheet. After the training sessions, *all* subjects performed a 48-minute, 3-subperiod Main Listening Task with 18 critical signals.

This served as the criterion task for the experiment and vigilance performance data were derived from it. Subjects were trained and performed this task either under Normal Task Load or under High Task Load (i.e., high arousal) depending on the experimental session; the latter entailed tallying the occurrence of the number "6" in addition to listening for critical signals.

An assessment was made of the extent to which subjects perceived (a) being motivated in the experimental situation, (b) the experiment as having arousal or interest value, and (c) the experiment as having "importance." A questionnaire containing Bakan's (9) "arousal-interest" items and three independent items was administered to subjects at the end of the Main Listening Task. The three independent items were: "I would like to participate in this kind of experiment again"; "I was made to feel this was an important experiment"; and "I feel that I made a useful contribution to scientific psychology by serving as a subject in this experiment." Subjects were told the questionnaire was for the Department of Psychology, and was intended to help the department provide more interesting experiments in the future. Subjects were asked to place it in an envelope as they left the room, because the experimenter was not supposed to see how it was filled out. Subjects were released after completing the questionnaire. The entire session lasted two hours.

The basic data analysis plan involved the following factors: (a) four levels of instructions—RC, IT, SI, and CT; (b) two monitoring loads—Normal and High; (c) three watch subperiods; (d) male and female monitors; (e) subjects per cell. Since number of subjects per cell varied, the ANOVA plan used in the analysis of signal detection data utilized the unweighted means technique for multifactor experiments with repeated measurements. Newman-Keuls procedure was utilized to compare means where required. ANOVA was also used to analyze arousal-interest scores. Chi-square analysis was used to evaluate erroneous signal reports and item response data.

The analysis of variance of signal detections is summarized in Table 1. Vigilance performance for all treatment combinations across subperiods is shown in Figure 1. The significant periods effect ( $p < .01$ ) indicates that the number of signals detected declined across subperiods (e.g., vigilance decrement occurred).

Instruction effects were significant ( $p < .05$ ). Comparison of Instruction means by Newman-Keuls procedure showed that subjects who received either *Important Task* or *Combined Treatments* instructions tended on the average to detect more critical signals during the Main Listening Task than subjects who received either *Required Chore* or *Subject Important* instructions ( $p < .01$ ). These results suggest that instructions can differentially effect signal detection in a vigilance task.

Analysis of the significant Instruction x Load interaction by Newman-Keuls procedure suggested that *Important Task* and *Combined Treatments* instructions improved signal detection under Normal Task Load ( $p < .01$ ), but only *Combined Treatments* was superior ( $p < .05$ ) in terms of

Table 1  
**Analysis of Variance<sup>a</sup> of Number of Critical Signals  
 Detected During Auditory Vigilance Task**

Source	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>
Instructions (I)	3	10.675	3.70	< .05
Task Load (L)	1	0.746	0.94	
Sex (X)	1	4.829	1.67	
I x L	3	7.695	2.67	< .05
I x X	3	2.973	1.03	
L x X	1	2.074	0.72	
I x L x X	3	4.266	1.48	
Error <i>a</i>	187	2.883		
Periods (P)	2	13.461	16.89	< .01
I x P	6	1.110	1.39	
L x P	2	1.069	1.34	
X x P	2	0.059	0.07	
I x L x P	6	1.457	1.83	
I x X x P	6	0.714	0.90	
L x X x P	2	1.242	1.56	
I x L x X x P	6	0.902	1.13	
Error <i>b</i>	374	0.797		

<sup>a</sup>Unweighted-means solution for unequal Ns.

**Mean Number of Critical Signals Detected Per Subperiod  
 Per Treatment Combination During Auditory Vigilance Task**

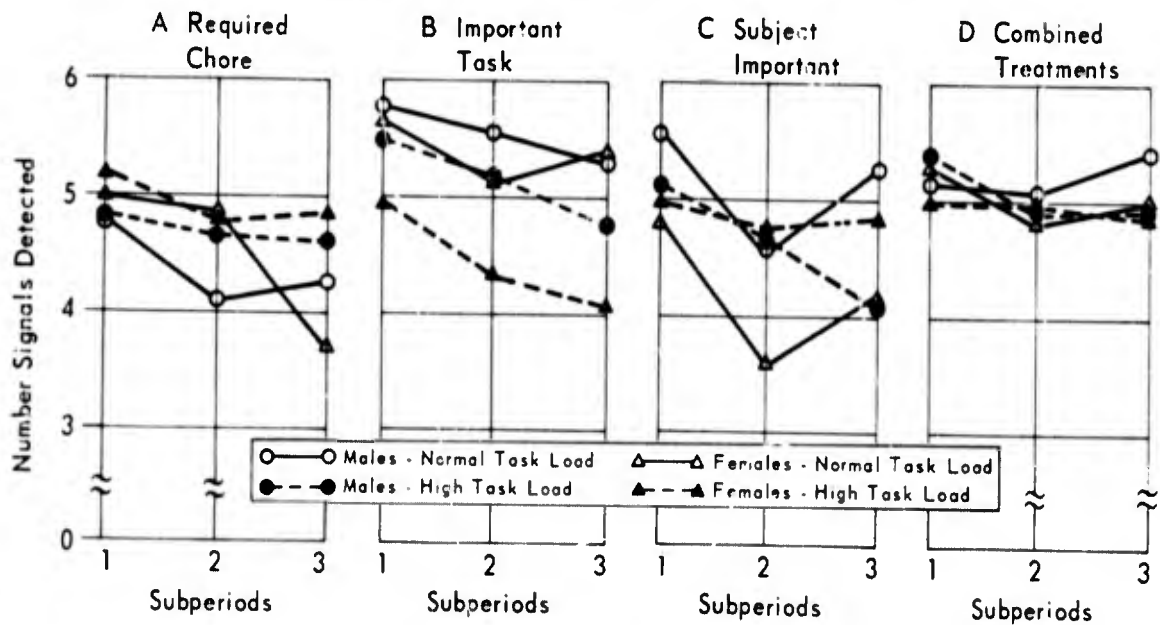


Figure 1

increased signal detections under High Task Load. *Important Task* instruction in conjunction with Normal Task Load was found to be superior to all treatment combinations in terms of vigilance performance. Inspection of Figure 1 suggests that poor vigilance performance of female subjects monitoring under High Task Load may have prevented *Important Task* treatment from showing significance under High Task Load monitoring. That is, the poor performance of female subjects was the main contribution to the significant interaction. We do not know why this group of subjects did so poorly.

Chi-square analysis of erroneous signals (e.g., combined false positive and recording errors) showed (a) female subjects were more likely to report erroneous signals than male subjects ( $p < .01$ ), and (b) the erroneous response rate of females resembled *Required Chore* subjects (i.e., intended low motivation treatment), whereas the erroneous response rate of males differed significantly from this group ( $p < .01$ ), suggesting that erroneous signal rates may reflect quality of attention paid to the task as a function of interest in performing the task.

Analysis of variance of the Bakan "arousal-interest" items suggested that (a) subjects who had received either *Important Task* or *Combined Treatments* found the task to have greater "interest value" or be more "arousing" than did those who received either *Required Chore* or *Subject Important* ( $p < .05$ ), and (b) women found the task to have less interest value than men ( $p < .05$ ).

Chi-square analysis of the independent items suggested that (a) on the whole, *Important Task* and *Combined Treatment* subjects were more inclined to report they were made to feel "the experiment was important" than *Required Chore* or *Subject Important* subjects ( $p < .001$ ), and (b) *Important Task* and *Combined Treatment* male subjects indicated a greater willingness to participate in this kind of experiment than *Required Chore* or *Subject Important* male subjects ( $p < .001$ ), or female subjects in general.

We believe that we have demonstrated that subject motivation level mediated via pretask instructions can influence the course of the monitor's performance, at least in the short run. These results cannot be predicted from expectancy or reinforcement theories of vigilance. Arousal theory might account for the results if we can assume the monitors generated some form of self-stimulation. If our subjects did this, it was subtle or highly individualistic to the extent that we could not observe this kind of behavior during the experiment.

Implications of the experiment are (a) the desirability for contemporary theories of vigilance to assign a significant role to the monitor's initial level of motivation as he begins his watch, and (b) the desirability for the serious vigilance researchers to assess initial level of subject motivation, since this may account for the wide range of individual differences often reported in vigilance research.

As for sex differences in motivation, it might be speculated that female subjects perceived the vigilance task as a male-type task and not interesting. As for the unexpected poor performance associated with *Subject Importance*, comments by subjects led us to suspect there were inconsistencies in instructions to subjects, and supporting cues.

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