

**] Abbreviated Title and  
] Page Number on each page**

Thresholds are Altered by Their Measurement **] Title is descriptive and informative  
] IV is Threshold Measurement  
] DV is Threshold**

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## Abstract

The possibility that a threshold is altered by the process of measuring it was examined in an experiment on word identification thresholds. **First sentence states hypothesis; summarizes introduction.** Thresholds were obtained for a female subject in two phases, first using the method of limits then using the method of constant stimuli. The words used to measure threshold in the first stage were retested in the second stage, along with new words. **Next 2 sentences summarize the method.** The results showed that thresholds were lower for retested words than for previously untested words; thresholds for the untested words matched the thresholds obtained initially. **This sentence summarizes the results.** The results are interpreted to mean that people learn to experience threshold level stimuli. **This sentence summarizes the discussion.**

[ Abstract is on separate page, with the word "Abstract" at the top, centered. This abstract is about 7 lines long. Each major section of the paper is summarized by about a sentence in the abstract. Note that everything is double spaced. ]

Thresholds are Altered by Their Measurement | **Title is repeated**

Methods for measuring thresholds are commonly used to determine basic sensory function. The goal of these methods is to provide a relatively fixed measure of processing capacity. For example, as a result of an eye examination, a person is said to have a certain level of visual acuity, such as 20/20 or 20/30. It is assumed that this level of visual acuity applies to all situations in which the individual is using visual information. **Start with research background.**

The question investigated in this experiment is whether the act of measuring a threshold can change it. Specifically, the experiment tests the hypothesis that thresholds are lowered simply as a result of measuring them. **Statement of hypothesis.**

This hypothesis was tested using a word identification paradigm. The word identification paradigm measures the threshold of exposure duration necessary for people to identify a word, and it has been widely used to examine unconscious influences on cognitive processing (e.g., Jacoby & Dallas, 1981). The fact that word identification thresholds may reflect nonconscious influences suggested that they might be changed by experience without a person's being aware of the change.

Prior research with word identification suggests that the measurement of a threshold can change it. For example, Rajaram and Roediger (1993) reported that their subjects identified fewer words during a threshold-setting period than during a later test period. However, Rajaram and Roediger did not compare thresholds for identical items in the two phases, and their results may have reflected differences in thresholds between different items. **Justification for hypothesis; prior research suggests it is reasonable.**

To test the hypothesis, the experiment obtained two measurements of threshold. In the first part of the experiment, thresholds were obtained on a target set of words. These thresholds were obtained using the method of limits, because this method insured that the subject would identify the word. In the second part of the experiment, thresholds were again obtained on the target set of words, designated “Old”, as well as on another set of words, designated “New”, that had not been previously exposed. These thresholds were obtained using the method of constant stimuli. **Summary description of method.**

If the measurement of a threshold changes it, the threshold for Old stimuli in the second part of the experiment should be lower than the threshold obtained for those stimuli in the first part of the experiment. Because thresholds were obtained with two different methods, it was important to be sure that the methods did not themselves produce different thresholds. Fortunately, the thresholds for New stimuli provide a control for any differences due to the differences in method. As long as the threshold for New stimuli in Part 2 is equivalent to the threshold obtained in Part 1, one can assume that the two methods yield comparable thresholds. **Summary description of what results would mean, with respect to the hypothesis.**

#### Method ] “Method” is centered

*Participants.* The participant was a 22 year old female with normal vision and no known visual impairments. **Vision is relevant because the task is visual. Gender and age are typically indicated.** She participated as part of an assigned laboratory activity for a class in experimental psychology. **Reason for participation.**

*Materials & Apparatus.* The stimulus materials consisted of 90 common words selected from the Thorndike-Lorge corpus of high frequency words (A or AA). Words were randomly assigned to conditions for the participant. **The nature of stimulus materials, their source, and their assignment to conditions is important to**

**describe.** The experiment was conducted using an IBM PC. The timing and recording of responses was all handled by the computer. **The equipment or apparatus used should also be described.**

*Design.* The experimental design varied the type of threshold test (Method of Limits or Method of Constant Stimuli) and the prior exposure of words used in the Method of Constant Stimuli (Old or New), in a within-subject design. The experiment consisted of two parts. In the first part, the Method of Limits was used to obtain word identification thresholds for 36 common words. In the second part, the Method of Constant Stimuli was used to obtain word identification thresholds for these same words and for 54 additional common words.

*Procedure.* After reviewing instructions describing the nature of the experiment, the subject was seated comfortably in front of the computer. Trials in both parts of the experiment were subject-paced. In the beginning of each trial, an “X” was situated in the center of the computer screen. When the subject was ready to begin, she pressed the space bar. Next, the subject was briefly presented with a word, followed by a masked row of characters. The computer presented a request for the subject to respond to the briefly flashed word by typing in the word she thought had appeared. If the subject’s response was incorrect, the word “ERROR” appeared. If the response was correct, the word “CORRECT” appeared.

In the first part of the experiment, using the Method of Limits, each incorrect response was followed by another presentation of the same word, but presented for a slightly longer duration. The subject continued to receive presentations of that word until she was able to identify it correctly.

In the second part of the experiment, using the Method of Constant Stimuli, each response, whether correct or incorrect, was followed by a presentation of a different word. Additionally, the durations in the Method of Constant Stimuli varied randomly among the 6 durations of 28.5, 35.5, 42.5, 49.5, 56.5 and 63.5 ms. At each duration, there were 12 presentations of Old words and 18 presentations

of New words. Note that the procedure section provides a very detailed description of how the experiment was carried out, from the perspective of what events occurred at what time, for a participant.

At the conclusion of the second part of the experiment, the computer provided a summary of the data from both parts of the experiment.

### Results ] “Results” is centered

The threshold for word identification obtained in the first part of the experiment was 33.9 ms, with a standard error of the mean of 4.5 ms. Note the use of abbreviations for units; in this case, “ms” stands for “milliseconds”. This value is comparable to that reported by Rajaram and Roediger (1993).

Thresholds from the second part of the experiment, which used the Method of Constant Stimuli, were estimated from the psychometric functions shown in Figure 1. Refer to graphs by number. The figure plots the proportion of correct responses for Old stimuli and New stimuli as a function of the duration of exposure. As can be seen in the figure, identification increased from proportions of .30-.40 correct at the shortest duration to 1.00 at the longest duration. Briefly describe what the figure shows.

As estimated by linear interpolation, the threshold for Old stimuli was 28.5 ms and the threshold for New stimuli was 35.5 ms. This difference was significant,  $t(35) = 2.41, p < .05$ . Results of statistical tests are summarized thusly. consistent with the hypothesis, the thresholds were lower when words were retested than when they were initially tested. The fact that the threshold for New words was essentially the same as the threshold obtained in the first phase of the experiment indicates that both psychophysical methods produce similar threshold values.

## Discussion | “Discussion” is centered

The results of this experiment showed that after testing a person’s threshold for identifying a word, the threshold is lower when the word is retested. This result supports the hypothesis that the act of measuring a threshold changes it. Thus, a threshold does not seem to be a fixed and invariant characteristic of an individual’s processing capacity. Rather, it varies as a function of experience with threshold measurement. **Results are summarized.**

The present results are consistent with data presented by Rajaram and Roediger (1993). They found an apparent change in threshold between a threshold-setting phase and a subsequent test phase. However, they did not retest the same items, and their finding may have simply reflected a general practice effect rather than a change in threshold for a particular item. **Results of this study are related to those reported in other studies.**

Thresholds were obtained by two different methods, but results from the data for New stimuli suggest that thresholds obtained from the method of constant stimuli are similar to those obtained from the method of limits. Thus, the confounding between the type of method and the retesting of threshold is not likely to be important.

As a practical matter, these data raise questions about the standard practices of eye examinations. People who wear corrective lenses typically receive repeated, annual or biannual tests, of their thresholds for visual acuity. According to the present study, these tests may themselves produce reductions in threshold. Thus, the results of later exams may overestimate how well people see. **Implications of results are described and discussed.**

## References | "References" is centered

Jacoby, L.L. & Dallas, M. (1981). Note date of publication is in parentheses after authors, and followed by a period.

On the relationship between autobiographical memory and perceptual learning. Title of article is not marked with quotes, italics or underlining. *Journal of Experimental Psychology: General*, 110, 306-340. Journal title is italicized, followed by the volume number, then the page numbers.

Rajaram, S. & Roediger, H. (1993). Direct comparison of four implicit memory tests. *Journal of*

*Experimental Psychology: Learning, Memory and Cognition*, 19, 765-776.