**Signal Detection Experiment**

**Lab Report**

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**PSY310 Lab in Psychology**

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**Github link:** [**https://github.com/sana45545/PSY310**](https://github.com/sana45545/PSY310)

**Introduction**

Accuracy-based experiment results can be interpreted using the signal detection theory (SDT) framework. During these types of studies, an observer is required to choose a response that corresponds to the class that is presented. For example, in a detection experiment, signal and noise are sampled frequently, whereas in a memory task, old and new items are sampled once. The degree of overlap between the distributions of a choice variable caused by the stimulus classes determines observer sensitivity, which, in turn, limits performance in such tasks, according to Spatial Choice Theory. Observers are given a choice of decision rules to choose from within this sensitivity restriction to meet performance objectives. Receiver operating characteristics (ROCs) can be constructed by experiments that change decision rules appropriately. These functions enable the distinction between response bias and sensitivity and can be employed to assess assumptions regarding the assumed distributions. Performance may be predicted across paradigms thanks to SDT, which describes how sensitivity affects accuracy in various discrimination techniques. (Macmillan, 2001)

Numerous disciplines, including psychology, neurology, medicine, and engineering, use signal detection theory. It is employed to investigate decision-making, perceptual processes, and the effects of individual biases, noise levels, and stimulus intensity on signal detection performance. SDT advances our understanding of human perception and behavior by assisting researchers in the analysis and justification of how people make decisions under unclear circumstances. (Andriy)

**Method**

A participant was selected from Ahmedabad University's undergraduate student cohort. She was made aware and briefed before the experiment began. The experimental setup was made with PsychoPy v2024.1.5 (Peirce et al., 2019). The 14-inch monitor that was used has a resolution of 1920 x 1080 pixels and a refresh rate of 60 Hz. In our experimental setup, we employ an orientation discrimination problem. Once fixation was achieved, the trials were designed to display a sinusoid with a Gaussian mask for a brief 0.3-second tilted in various directions. The participant is asked to indicate whether the figure is perfectly vertical or slanted using the "up" and "down" arrow keys once it has been displayed. The tilt is shown by the down arrow, and the vertical position by the up arrow. For the experiment to yield precise d-prime and criteria values, 100 random trials were to be conducted.

**Result**

The d’ value is calculated to be 0.842122, while the criterion was 1.265446.

**Discussion**

Two crucial elements in Signal Detection Theory (SDT)—d' (d-prime) and criterion (c)—define an observer's threshold for making a choice and their capacity to identify signals.  
  
Regarding the specified values:  
  
criteria (c) = 1.265446 criterion d' (d-prime) = 0.842122

D' = 0.842122 in this instance indicates a moderate sensitivity. This indicates that although there is some overlap between the signal and noise distributions, the observer can still tell the difference between the two with an adequate degree of accuracy. Though not extremely sensitive, the observer can identify the signal she is looking for more accurately than she could by coincidence.

Criterion = 1.265446 are met. That is a sign of an observer who establishes a decision threshold that is somewhat conserved. In other words, an observer would only say "no signal" if they were fairly certain that one existed. A criterion larger than one indicates that the observer would prefer to overlook certain signals to avoid false alarms.

With a moderate d' of 0.842122, the participant can identify some difference between signal and noise; the distributions remain close. The conservative bias reflected in the comparatively high threshold of 1.265446 indicates that the observer is cautious and will respond "no signal" unless the evidence is extremely compelling.

Hence, the observer is cautious yet reasonably sensitive for d' = 0.842122 and criterion = 1.265446, compromising to prevent false alarms at the expense of missing certain signals.

# References

Andriy. (n.d.). signal detection theory. *PSYCHOLOGY*.

Macmillan, N. (2001). International Encyclopedia of the Social & Behavioral Sciences. *ScienceDirect*.