# Adaptive Staircase
# PSY310: Lab in Psychology
# Lab Report


**August 31, 2025**

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**GitHub link:**

## Introduction

Also referred to as the 'method of up and downs,' is a psychophysical research method that estimates an individual's threshold and ability to detect and discriminate a stimulus by adjusting the stimulus intensity based on the subject's responses, instead of presenting a fixed sequence of stimuli. The method is particularly useful in finding low-level perceptual thresholds in the perceptual fields of vision, hearing, and touch.

Compared to other traditional psychophysical methods, this method has been found to have less complicated computation. This method allows us to identify sensory deficits or disabilities in individuals. This method is extremely efficient as it requires the presentation of fewer stimuli, because, once the first few easier stimuli are out of the way, all of the other, comparatively more difficult stimuli, fall nearer to the threshold- level, thus adding to the final computed threshold value (Cornsweet, 1962, 4).

## Method

*Participant*

The participant is a 19 year-old female undergraduate student studying in Ahmedabad University. She was informed of the trial's objective, which was to determine the direction of the tilt, and consent was provided.

*Materials and Procedure*

This experiment assesses the participant's ability to discriminate orientation using the adaptive staircase method, estimating the difference threshold (just noticeable difference) for tilt perception. We created the adaptive staircase experiment on a desktop with a resolution of 1000 x 600 pixels using PsychoPy v2021.2.3. 100 trials of the experiment were conducted.

The trial started with a fixation presented for 500 milliseconds, which was followed by the stimuli- a sinusoidal shape with a Gaussian mask (figure 1), which was presented for 300 milliseconds. The experiment was coded such that the orientation of the grating on the stimuli was allocated either left or right based on a random probability at the start of the trial. The maximum tilt it would have, was 10 degrees, while the minimum was 0 degrees. The direction of the tilt changed to left or right based upon the participant's response. If the orientation was left-tilted, the left arrow key (←) was pressed, and if the orientation was right-tilted, then the right arrow key (→) was pressed. Additionally, one-up three down procedures with the steps sizes of 2, 1, 1, and 0.5 were used in the staircase.

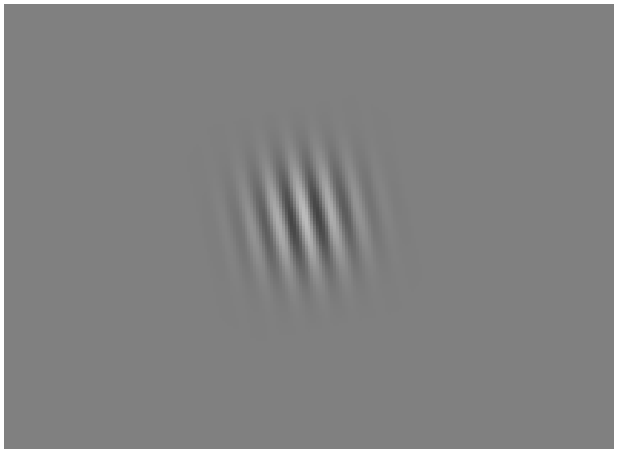

*Figure 1. The grating stimuli: A Sinusoid with a Gaussian mask tilted to the left*

## **Results**:

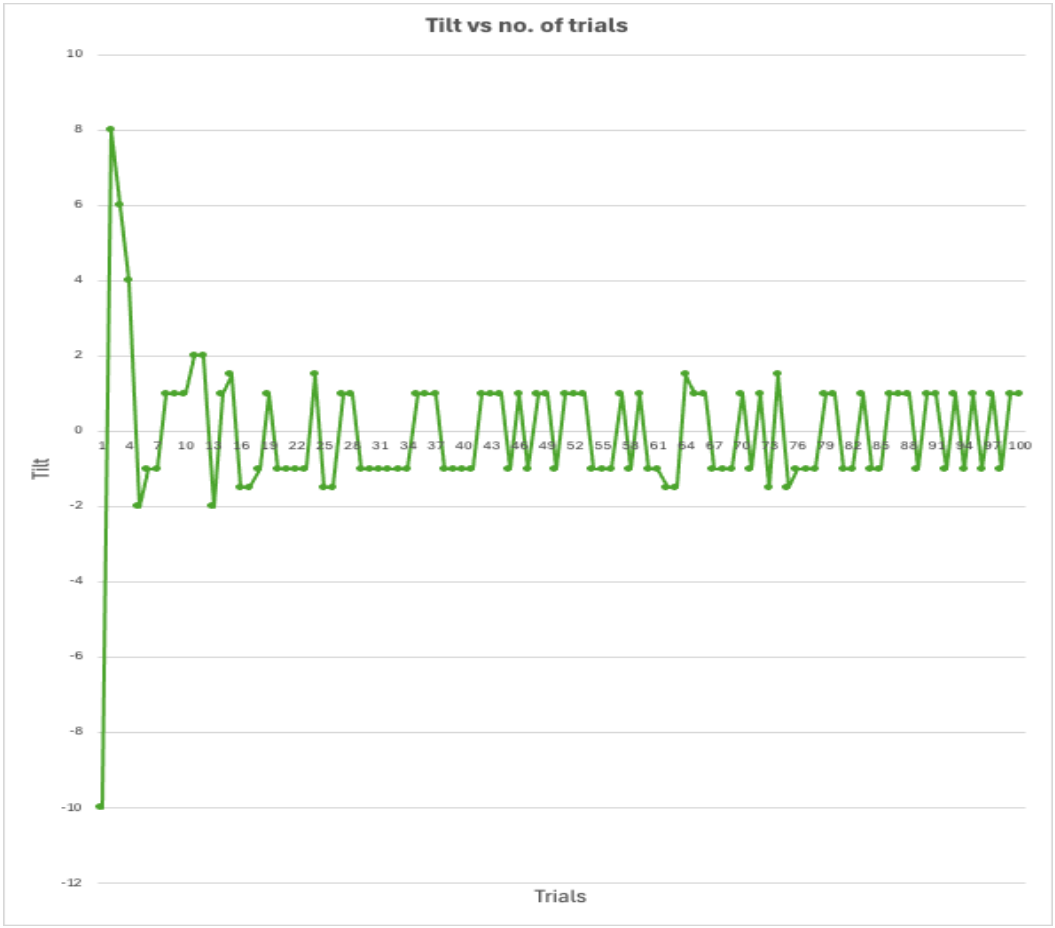

*Figure 2. The degree of tilt throughout the trials*

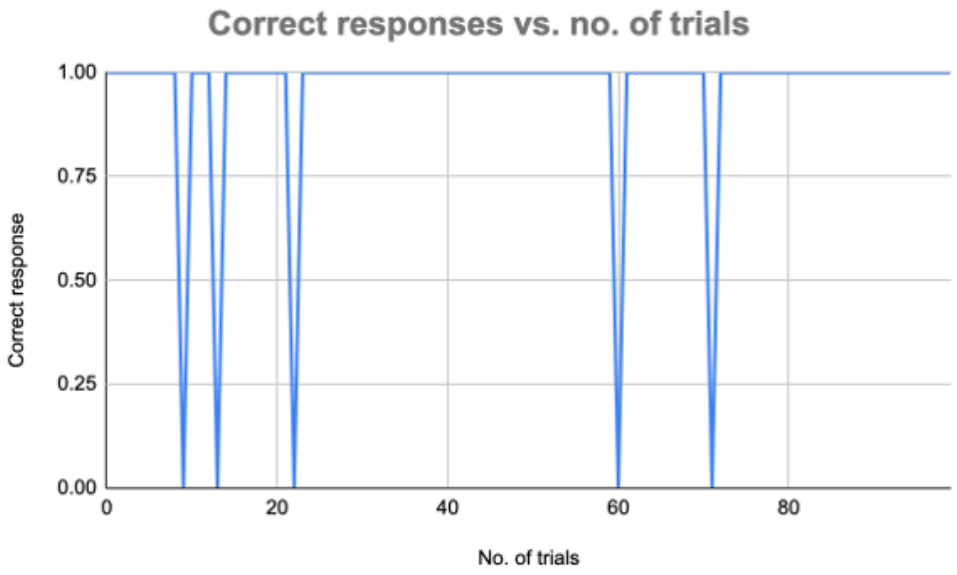


*Figure 3. Graph representing the participant's responses to the stimuli. The accuracy in discriminating the tilt of the stimuli was 95%.*

With the help of the data, we calculated the absolute threshold to be 1.3 degrees and the accuracy to be 95%.

Absolute threshold = (1.5 + 1 + 1.5 + 1 + 1.5) / 5

Through this we can infer that the participant was not able to discriminate the variation in orientation at the intensity of 1.3.

## Discussion

The data collected shows that the participant had a threshold value of 1.3 degrees with an accuracy rate of 95%. This indicates that the participant can detect a change in stimuli at the lowest tilt of 1.3 degrees, and that they can efficiently distinguish and discriminate between various tilt orientations. However, the validity of this inference may be true only in the provided lab and experimental environment. Further extensive research with different stimuli and a different environment can give more in-depth and varied results.

## References

Cornsweet, T. N. (Ed.). (1962, September). The Staircase-Method in Psychophysics. *The American Journal of Psychology*, *75*(No. 3), 485-491. https://www.jstor.org/stable/1419876