

Hearing: Sound Localization

Objective:

To explain in words or diagrams how the ear and the brainstem determine the location of sounds, at the level of 85% proficiency for each student.

In order to achieve this objective, you will need to be able to:

1. Explain how the ear and the brainstem assist in determining the location of sounds.
2. Examine the anatomical organization of the cochlear pathways responsible for sound localization.

Materials:

Group Supplies

- 1 blindfold
- 8 pairs of chopsticks
- 8 post-it notes
- 1 meter stick

Methods:

This experiment examines the ability to identify the location of a sound.

1. Organize the class with the following members:
 - a. 8 students will be noisemakers
 - b. 4 students will be the subjects
 - c. 1 student will lead the experiments
 - d. 2 students will record data
2. The subject is positioned in the center of the room. The eight noisemakers should be positioned equidistant from the subject in a pattern resembling a circle, as shown in figure 1. Each noisemaker should be at least 3 m away from the subject.
3. The leader of the experiment should give each noisemaker a set of chopsticks and demonstrate how to strike the chopsticks together to make a consistent sound.
4. The noisemakers should practice making sounds with the chopsticks so that the same intensity of sound is made by each. If possible, the subjects should be out of the room as

- the noisemakers practice. If this is not possible, the subjects should be positioned in the room in such a way that he/she hears as little as possible of this practice session.
5. The subject should be blindfolded and seated in the center of the room within the circle of noisemakers as shown in Figure 1. *At no time during the activity should the subject move his/her head.*
 6. The leader of the experiment should randomly chose (point to or otherwise notify) one of the noisemakers to make a sound with the chopsticks.
 7. Without moving his/her head, the subject should point in the direction believed to be where the sound originated.
 8. *The data recorders should record on the data chart in Table 1. For each actual location of the sound (each position chosen by the leader of the experiment) the perceived location of the sound (the position pointed to by the subject) is recorded.*
 9. Each subject will be tested for two trials. For each trial repeat Steps 7-9 until each noisemaker has been chosen.
 10. The data recorders will tally the correct and incorrect responses for each position and consult with each other to resolve any conflicts.
 11. After all four subjects are tested, the data will be shared with the entire class.

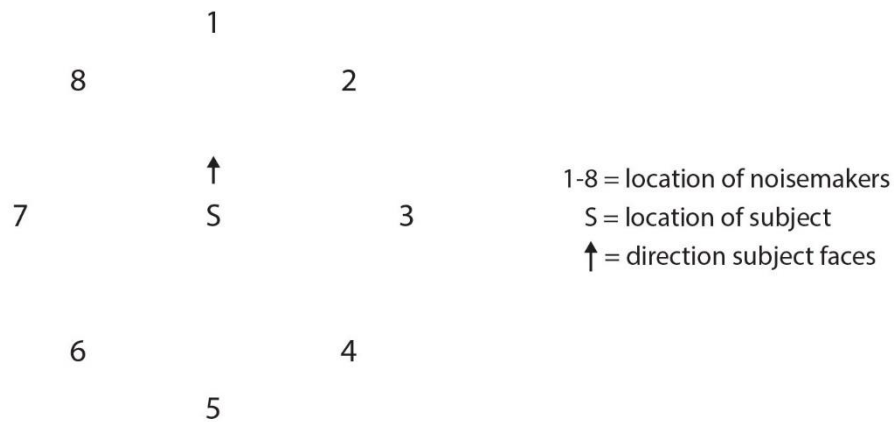


Figure 1.

Results:

Table 1. Perceived locations of sound relative to actual locations.

Subject (Name)	Trial	Actual Location							
		1	2	3	4	5	6	7	8
		Perceived Location							
	1								
	2								
	1								
	2								
	1								
	2								
	1								
	2								

Discussion:

1. Did the subject point correctly to the sound at each of these locations: 3? 7? 1? 5? 2? 8? 4? 6?
2. How might you explain the patterns of responses in each of the following locations:
 - a. 3 and 7 compared with 1 and 5?
 - b. 3 and 7 compared with 2, 4, 6, and 8?
 - c. 1 and 5 compared with 2, 4, 6, and 8?
3. Did you notice if the subject hesitated longer in responding to sounds coming from some locations than from others? How might you explain these differences?
4. What might be the neuroanatomical and/or neurophysiological basis for the ability to localize sounds?