QUESTION

How does the relative position affect the decibel readout?

RESEARCH

Sound Relativity and the Doppler Effect are two very similar concepts. The Doppler Effect states that motion shifts the frequency of electromagnetic waves. Whether the relative movement is towards you or away from you determines the direction of the shift. Additionally, the speed of the source determines the magnitude of the shift. The first step in understanding the Doppler effect is to look at sound waves. (Zavisa). Sound wave energy spreads out as it moves away from its source. The range covered by a sound wave increases as the distance from the source increases. So, the same amount of energy is spread over a wider area. This means that the louder the sound is, the less intense it is. This is why loud noises also become weaker as the distance from the source increases (Foundation). For example, there is a sound of 80 decibels and you add another 10 decibels, now the sound is about twice as loud to the ear. These units used to measure sound intensity are called decibels. The decibel scale is logarithmic, in contrast to many standard measuring instruments such as rulers which are linear (Clason). Utilizing this research, I have formed a testable hypothesis.

HYPOTHESIS

If the relative position is approaching the decibel meter, then the decibel readout will be higher.

MATERIALS

- Speaker
- Decibel X app
- Camera
- Remote control car
- Stopwatch
- Masking Tape
- Sharpie
- Empty Room
- Sound Recording Device
- Extra people for help

VARIABLES

Independent Variable: Relative Position

Dependent Variable: Decibel Readout

Control Group: Center Relative Position

CONCLUSION

The hypothesis of “If the relative position is coming towards the decibel reader, then the decibel readout will be higher on the scale,” was accepted. According to the data table, the decibel readout when the siren was one foot to the left of the control was higher than the decibel readout when the siren was one foot to the right of the control. For example, when it was one foot to the left of the control, the decibel readout was 111.4 decibels. However, when it was one foot to the right of the control, the decibel readout was 92.4 decibels.

ERROR ANALYSIS

There were a couple of errors noted in the procedure. The first random error is the angle at which the metric ruler was when the different sections were measured. This could have led to inaccurate measurements. Another random error could be in the relationship between the stopwatch and the decibel reader. If the decibel number was recorded at the wrong time, the data table and graph would be affected. The last random error is that the speaker used was a professional-grade speaker. Therefore, there were pauses in the siren sound a couple of times. One systemic error could have been that the decibel reader app was not completely accurate due to some of the ambient noise. This would have led to inaccurate measurements throughout the whole experiment.