Comparison of Relative and Absolute Measures of Sound Localization in Cats Obtained Under Identical Acoustic Conditions.

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Studies of localization use relative or absolute psychophysical paradigms. Relative tasks assess acuity by determining the smallest angle separating two sources, the minimum audible angle (MAA), that can be discriminated. The MAA varies with stimulus frequency, duration, level, and location. Absolute tasks measure the actual ability to indicate sound location. Changing stimulus parameters affects the accuracy and precision of the location estimates. But whether and how these two measures are related and whether or not the same neural mechanisms mediate performance on these two tasks is unknown. Here, we examine the relationship between absolute and relative measures of localization in cats. Cats were trained using operant conditioning to make orienting gaze shifts (combined eye and head movements) to acoustic targets from an initial fixation LED. Independent variables were the angle (horizontal or vertical) between the fixation LED and the source and the properties of the stimuli. Stimuli consisted of broadband noises (15ms-1sec durations), high- and low-pass noise, and 1/6 octave narrowband noise. The data were separated into two groups based on trial number. Data from one group were analyzed as an absolute task and measures of precision and accuracy of the final gaze were determined. The remaining data were analyzed as a relative task and only the initial direction of gaze, and not magnitude, was used to determine the percentage of “correct” shifts toward the target; gazes away and non-responses were considered “incorrect” responses. This method is similar to that used in infant localization studies. The MAA was computed using the bias-free measure, d'. In general, horizontal MAAs were smaller than vertical MAAs mirroring the smaller standard deviations of absolute localization estimates for horizontal than vertical targets. But the MAAs were larger than the corresponding standard deviations of the actual location estimates. Support: NIH DC00116, DC02840, DC00376