

## A unique pattern of ratio effect in musicians that are absolute pitch possessors

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### ABSTRACT

#### Background

According to the ratio effect, when the difference between two magnitudes is large, the comparison between them is faster. This effect complies with Weber's law and was found for many modalities such as numbers, brightness and musical tones. However, the ratio effect is elusive in ordinal scales (i.e., alphabet). Absolute pitch (AP) is a rare ability to identify musical pitches without an external reference tone; in general, most people use the relations between pitches (relative pitch) in order to process musical information.

#### Aims

The current work aimed to study the representation of pitch tones in AP possessors by using a comparative judgment task of auditory pitches. To this end, we investigated possible differences in the ratio effect, in AP and nAP possessors. We predicted that nAP possessors would show a ratio effect, while AP possessors would show a diminished ratio effect, if any at all.

#### Method

Musicians with and without AP performed a comparison of two auditory pitch tones. The manipulated variables were group (AP and nAP), and ratio (0.1-0.8). The ratio between two tones was divided into two categories: small ratios (0.1-0.4)—the most dissimilar tones, and large ratios (0.5-0.8)—the most similar tones. Note that the small ratio group contained couples of tones that were a large distance apart from each other, and the large ratio group contained the tones that were a small distance apart from each other. The dependent measures were RT and error rates.

#### Results and Conclusions

Results yielded a significant ratio effect for nAP group, as expected according to the literature; namely, RTs were longer for large ratios than for small ratios. Interestingly, AP possessors showed no ratio effect; namely, RTs for small and large ratios were similar. To the best of our knowledge this is the first study that demonstrates the lack of the effect in a particular group of people. We suggest that pitch tones can be represented on ordinal or cardinal scales, contingent on AP ability. Alternatively, it is possible that AP possessors, in addition to their ability to identify pitch tones without any referential tonal context, possess also an enhanced proficiency in recognizing musical intervals. The absence of a ratio effect might be attributed to the efficiency of these subjects to

identify the interval and decide which one of the tones is higher.

#### Keywords

Absolute pitch, ratio effect.