

Sensitive periods for absolute pitch: Pitch labeling or pitch memory?

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Speculations of plasticity in the development of musical knowledge are based primarily on common sense rather than data. Many people believe that a person needs to begin musical training very early in life in order to become a virtuoso or an accomplished musician. Indeed, it is well established that practice plays a major role in musical expertise. On the one hand, the importance of practice in musical expertise is consistent with the importance of early training (earlier beginning = more practice). On the other hand, it also suggests that plasticity is more or less irrelevant provided the requisite amount of practice is involved.

Plasticity appears to play a major role, however, in one area of musical development: *absolute pitch* (AP). AP, known colloquially as *perfect pitch*, refers to the rare ability (estimated at 1 in 10,000, bimodal distribution) to label or produce a musical pitch (e.g. middle C, concert A) in isolation. Most people have *relative pitch* rather than AP, which allows them to recognize a tune such as Happy Birthday whether it is sung by a woman in a high voice or by a man in a low voice. AP requires memory for musical pitch as well as knowledge of the label for the pitch (e.g., A, B, or C). As such, it is evident only among people with musical training because untrained people have never learned labels for pitches. AP is evident almost exclusively among individuals who started music lessons before the age of 7. It is also more prevalent among Asians than among other ethnic groups, possibly because many Asian languages are tone languages.

In a series of studies, my colleagues and I examined memory for pitch among musically untrained children and adults by using a task that does not require participants to know labels for pitches. On each trial, listeners hear an excerpt from a familiar instrumental recording presented twice: once at the original pitch and once shifted upward or downward in pitch. Their task is to identify which excerpt is presented at the original pitch.

The results reveal that the average undergraduate can identify the original pitch at above-chance levels, even when the pitch shift is only 1 semitone (i.e., the smallest pitch difference in music that is meaningful). When Canadians are compared with Asians living in Asia, the Asians perform better than the Canadians on the task. When cultural differences are minimized by testing children from Asian or European backgrounds who are all living and attending school in Canada, the Asian advantage disappears, despite the fact that other cultural differences (in scholastic abilities) remain evident. Moreover, performance levels are virtually identical between children and adults.

The findings indicate that memory for pitch level, like memory for relative pitch, is relatively constant across development. Moreover, the Asian advantage for AP appears to be cultural rather than genetic in origin and independent of learning a tone language. In sum, the sensitive period for AP reflects a decrease in plasticity around 7 years of age, such that linking arbitrary labels to auditory events becomes more difficult after this point in development.