

Absolute Pitch – Simple Pair-Association?

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ABSTRACT

Background

Absolute pitch is the ability to name or produce a tone in the absence of a reference tone. The genesis of this rare ability is subject to numerous scientific investigations. A key issue is whether it reflects a genetic predisposition or the result of (early) learning (e.g. Takeuchi & Hulse, 1993; Vitouch, 2003). In a recent study Bermudez and Zatorre (2005; see also Zatorre et al., 1998) provided evidence that the cognitive requirements of the retrieval of a previously established association between an auditory stimulus and an arbitrary label have common neural substrates in AP musicians, non-AP musicians and nonmusicians.

Aims

The present study investigated the impact of simple pair-association-mechanisms for the acquisition of absolute pitch in a group of nonmusicians. In contrast to a previous study (Heller et al. 2011) a more motivating and challenging adaptive training procedure was applied.

Method

Participants. $N=20$ nonmusicians (12 female) aged from 18 to 32 years participated in this study.

Experimental Design. Participants were randomly assigned to the experimental group or the control group (between-subjects variable) and completed three pitch identification tests (within-subject variable, pre-, post-, and follow-up). Additional within-subject variables were pitch (12 levels) and timbre of the tone (two levels).

Stimuli and Apparatus. Tonal stimuli were created adding the fundamental frequency ranging from A3 (220 Hz) to G#4 (415 Hz) and the first five harmonics with different amplitudes. All Sounds were created with a piano-like or a clarinet-like timbre and envelope.

Procedure. Participants completed three identification tests at intervals of two weeks. Participants of the experimental group underwent a ten day adaptive training between the first and the second test.

The first test commenced with the presentation of all twelve pitches and their names in random order. In the following tests only the pitch names were presented again for reasons of refreshment. Subsequently participants completed the pitch identification task. Pitches (twelve replications each) were presented in random order and had to be named verbally.

For the experimental group the first training session commenced with the presentation of two different pitches which had to be named correctly four times in succession. Feedback was provided on each trial. Achieving the criterion, another pitch was added to the set. Each training session

consisted of 10 blocks with 24 trials. The next session resumed with the last number of successful discriminated pitches. This procedure entails that within the ten-day training period each participant reached an individual number of pitches which they could identify.

Results

Within the ten-day training participants of the experimental group learned to successfully identify seven to nine pitches ($M=7.5$). Relative frequency of correct responses as well as the difference in semi-tones in the pitch identification task revealed a positive effect of training in the experimental group compared to the control group. The effect even remained stable over the second two-week period without further training. However the positive effect was confined to the pitches learned during the training whereas the proportion of correct responses remained at chance for the other pitches.

In the experimental group the proportion of correct responses in the post and follow-up test was higher for piano-like tones compared to clarinet-like tones. Yet discrimination for clarinet-like tones was still better than in the control group.

Conclusions

Although the influence of genetic factors can not be ruled out, the results of the study suggest that simple pair-association mechanisms are one main aspect in the development of absolute pitch. Within only ten days of training a group of non-musicians was able to successfully discriminate seven to nine pitches within one octave and the achievement remained stable over a two-week period without training.

Keywords

absolute pitch, training, nonmusician,

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