MUSICAL TRAINING AND PITCH SCHEMATA:TONAL INFLUENCES IN MICROTONAL CONTEXTS

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INTRODUCTION

In music-perception experiments, participants who have had many years of formal music training are typically classified as "musically trained listeners". Such individuals often perform differently than non-musicians. The differences may be simply quantititative and attributable to familiarity with attending to sound. Qualitative differences, however, also arise. These are interesting because they may shed light on the presence and use of pitch schemata. The notion of availability and exploitation of pitch schemata by experienced listeners has been previously described (e.g., Cuddy, 1970; Lerdahl, 1991). Nevertheless, specific, quantitative examples in musical contexts are rare.

The present work provides quantitative evidence for some aspects of pitch schemata available to and exploited by musicians. To illustrate the point, musicians and non-musicians are presented with a pitch identification task in an unfamiliar pitch context. In such a situation, both groups perform poorly. But when provided the opportunity to take advantage of major triadic structural context, musicians, unlike non-musicians, benefit greatly.

The primary goal of the paper is to demonstrate the particular advantage of major triad structure for musicians. A secondary goal is to illustrate the functional significance of the major triad for musical memory. A final goal is to emphasize the importance of controlling for musical training in experiments aimed toward understanding pitch schemata.

PROCEDURES AND RESULTS

In all conditions, listeners are presented with 9 discriminable tones (to be referred to as microtones) each separated by 1/3 semitone. For purposes of identification, the listener is told to assign 1 to the lowest microtone, 9 to the highest, and intermediate numbers for the microtones in between.

Six students in a university music faculty and six other university students who had almost no musical training all performed badly in this baseline condition. Several other conditions were also examined. One condition in particular let musicians exploit their special knowledge, or pitch schemata, to make 1 of the 9 microtones special in the set. In this Consonant Condition, each of the 9 microtones was embedded as the middle tone of a 5-tone sequence. The sequence consisted of an ascending major third followed by one of the microtones and, finally, the descending major third, e.g., C - E - microtone - E - C. Again the task was to identify the microtones from 1 (lowest) to 9 (highest).

One of the 9 microtones completed a major triad: e.g., C - E - G - E - C, where G represents the 6th tone of the microtonal scale. All 8 other microtones formed poorer structures, sharp or flat by multiples of one-third semitone. For example, tone 8 was two-thirds semitone sharp, while tone 5 was one-third semitone flat. The information in the task was nominally the same as in the original No Context condition. For musicians, however, the task was now much easier. They improved for tone 6 and for almost every other tone of the set. Non-musicians, however, did not fare as well. Thus, musicians brought known pitch schemata to bear on a novel pitch context. By making one tone of an unknown set special, the major triad context facilitated performance in general.

It was possible, of course, that any context at all would have facilitated musicians' performance. Was the major triad the key factor? To address this question, several additional contexts were examined. In one case, the embedding context sequence itself was mistuned so that no major triad relation could form with any of the microtones. Performance was worse in this condition than in the major triad context condition.

Simultaneous contexts were also examined. In one case, a low note accompanied each microtone, making a 3:1 small integer relation with the 6th microtone. This enhanced performance both on its own, and in combination with the major triad context. Finally, a tone identical to the 6th microtone accompanied all microtones. In this case, the 6th tone formed a perfect unison with the context tone. The remaining 8 microtones were distinctive because of beats and dissonance. This simultaneous context tone enhanced performance in the vicinity of the special tone for all subjects. This facilitation can be distinguished as more sensory than the cognitive schematic cue of the major triad.

A second series of experiments, with different groups of musicians and non-musicians, used specially synthesized complex tones which embodied the major triad structure. Performance changed dramatically when major triad and bass context were added, but, again, primarily for musically trained listeners.

A MODEL AND DISCUSSION

To account for the effects of musical context on identification of microtones, a model is introduced which represents pitches on a subjective continuum (see also McAdams, 1993). Associated with each pitch representation is a degree of noise with a specific variance about its mean. The narrower the noise dispersion, the more stable the pitch schema or representation; the less confusion with neighboring pitches. It follows that pitch schemata are then represented in terms of patterns of noise dispersion on the subjective continuum. For musicians, tones of the major triad can be understood as having narrower dispersions than other tone sets. Moreover, the presence of this schema serves to decrease the dispersion of all tones of another less familiar but intersecting set. From confusion matrixes from the identification data in all conditions of the experiments previously described, the discriminability between adjacent tones and variances associated with individual tones were calculated. Narrower variance of the 6th (contextually special) microtone was observed for musically trained listeners in the major triad context condition. It is argued that this greater stability served as an anchor for all other members of the microtonal set.

Thus, musical schemata may be considered in terms of patterns of dispersion along a subjective continuum. The major triad schema, by reducing dispersions of one tone of an unfamiliar microtonal set can consequently decrease dispersion associated with all members of the set. In summary, musical training leads to differentiation and exploitation of pitch schemata; the major triad is special not simply because it sounds nice but because it aids memory; and the control of music training in experiments can provide further insight into musical pitch schemata.

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