Cross-cultural comparisons of absolute pitch and relative pitch in music students in different countries

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ABSTRACT

Background

Absolute pitch (AP) is commonly known to be a rare and highly valuable musical ability. However, there are a few reports indicating that AP is relatively prevalent among musicians in East Asia (China and Japan) compared to the West (Deutsch et al., 2006, 2013; Miyazaki et al., 2012). More evidence is needed to shed light on the prevalence of AP among different countries.

On the other hand, the musical significance of AP is called into question by the evidence indicating that some music students having AP performed poorer in identifying or recognizing transposed musical intervals and melodies than those having no AP (Miyazaki, 1995; Miyazaki & Rakowski, 2002). AP is no more than an ability to identify isolated pitches without any context. When we consider the fact that essential elements of music (e.g., melody and harmony) are constructed on the basis of pitch relations independently of AP, far more important is the ability to perceive relative pitch (RP), and AP is almost irrelevant to every aspects of music activities.

Aims

The present study aims at comparing the accuracy of AP and RP in music students among music conservatories and departments in different countries. To our knowledge, there has been so far no systematic research that has examined both AP and RP performances. With the AP and RP scores obtained from a large number of music students of different musical, cultural, and social backgrounds, we could evaluate the relationship between AP and RP across different music institutions and discuss their significance to music.

Method

We conducted AP and RP tests on music students attending conservatories and departments of music in different countries (Japan, China, Germany, Poland, and USA). The participants were grouped as follows:

- Central Conservatory of Music (CCOM), China, n = 63
- Shanghai Conservatory of Music (SCOM), China, n = 103
- Fryderyk Chopin University of Music (UMFC), Warsaw, Poland, n = 127
- Institute of Music, Martin-Luther University (MLU) Halle-Wittenberg, Germany, n = 61
- School of Music, University of Minnesota (UMN), USA, n = 100

The participants took the test in group setting with exactly the same instruction and procedure used. In the first AP test part, sixty recorded piano tones over a 5-octave range were presented in a nearly random order with an inter-tone interval of 3 s, during which the participants were required to write down their musical pitch labels. The latter part of the test was the RP test, in each trial of which an authentic cadence (V–I) was followed by a pair of successive tones; the first tone was always the tonic of the key established by the preceding cadence and the second tone was the test tone whose pitch was 1- to 11-semitone higher than the first tonic tone. The key of the chords-tones sequence changed in every trial. There were 4 different key conditions (C major, A flat major, F sharp major, and a major with a half-tone lower E as its tonic). The time interval between the onset of the test tone and the onset of the first chord of the next trial was 3.5 s, during which the participants answered a musical interval name or a movable sol-fa name of the test tone relative to the tonic. Before or after the test, the participants filled out a simple questionnaire about their music background.

Results

We summarized performance of the AP test results for each group as the median proportion correct responses and the percentage of participants who made 90% or more correct responses.

<table>
<thead>
<tr>
<th>Institution</th>
<th>Median Proportion</th>
<th>Percentage 90%</th>
</tr>
</thead>
<tbody>
<tr>
<td>NGTU</td>
<td>.750</td>
<td>35.0%</td>
</tr>
<tr>
<td>KCUA</td>
<td>.950</td>
<td>60.0%</td>
</tr>
<tr>
<td>CCOM</td>
<td>.667</td>
<td>25.4%</td>
</tr>
<tr>
<td>SCOM</td>
<td>.533</td>
<td>27.7%</td>
</tr>
<tr>
<td>UMFC</td>
<td>.150</td>
<td>11.0%</td>
</tr>
<tr>
<td>MLU</td>
<td>.075</td>
<td>0%</td>
</tr>
<tr>
<td>UMN</td>
<td>.083</td>
<td>0%</td>
</tr>
</tbody>
</table>
The Japanese participants stood out in their accuracy of AP. Remarkably, in KCUA, most students had accurate AP and those having no AP were in a tiny minority. Performance of the Chinese students was close to that of the Japanese students. To the contrary, only small minority had AP in UMFC and no in MLU and UMN.

According to the non-parametric Kruskal-Wallis test, the difference in the AP test score among groups was statistically significant ($\chi^2 = 373.86, df = 6, p < .0001$). Post-hoc pairwise comparisons revealed significant differences between the pairs, KCUA > all others, NGTU > SCOM, SCOM > UMFC, and UMFC > UMN ($p < .05$). Differences of percentage of the participants having accurate AP among groups were also statistically significant ($\chi^2 = 84.43, df = 4, p < .0001$). Tukey’s multiple comparisons revealed significant differences between the pairs, KCUA > all others, and NGTU, SCOM, and CCOM > UMFC ($p < .05$).

For the RP test results, the median values of the proportion correct responses and the percentage of participants who made 90% or more correct responses were as follows:

- NGTU: .485 3.5%
- KCUA: .606 9.1%
- CCOM: .818 31.8%
- SCOM: .818 22.9%
- UMFC: .939 69.3%
- MLU: .848 36.1%
- UMN: .848 38.0%

The pattern of the RP performance exhibited remarkable differences, and its pattern was almost parallel to the pattern of the AP performance. The Japanese music students, most of whom had accurate AP, showed extremely poor scores in the RP test. On the contrary, the students in the Western countries showed much higher scores; remarkably, most of the UMFC students achieved the excellent level of RP. Performance of the Chinese groups was similar to the Western groups.

The difference in the RP test score among groups was statistically significant ($\chi^2 = 298.62, df = 6, p < .0001$). Post-hoc pairwise comparisons revealed significant differences between such pairs as UMFC > all others, NGTU < all others, KCUA < CCOM. Percentage of the participants who surpassed the level of 90% correct was also significantly different among groups ($\chi^2 = 190.69, df = 6, p < .0001$). Tukey’s multiple comparisons yielded significant differences between such pairs as UMFC > all others, and KCUA and NGTU < all others ($p < .05$).

Some caveats should be noted regarding the differences among groups we compared. First, the NGTU group consisted of students of Faculty of Education and the MLU group consisted of students majoring musicology and music education. Therefore, participants of these groups should be different to some extent in the amount and degree of musical training they had received from those of other conservatory-level groups who might have had more extensive and professional music training. The lower AP and RP scores of NGTU than KCUA and no AP in MLU may be partially due to this difference. However, the higher AP score of the NGTU group and the higher RP score of the MLU group require other explanations.

Another caveat is regarding the difference in specialties of the conservatory-level students. For example, in the KCUA group, percentage of the accurate AP amounted to 90% of the participants majoring in piano, but it was about 30-40% of those majoring wind instruments or singing. On the other hand, percentage of the accurate RP participants was no more than 23% for the piano majors, less than 10% for string and wind instrument majors, and, oddly enough, 0% for the singing majors. In the SCOM group, the AP percentage was 74% for the composition and piano majors, as opposed to the string instruments (11%) and singing majors (0%). Percentage of the accurate RP was 45% for the singing majors, 35% for the Chinese traditional instruments majors, 19% for the composition and piano majors, and only 4% for the string instrument majors. In the UMFC group, the AP percentage was 29% for the students of sound engineering, and around 10% for the instrument majors. In contrast, the accurate RP participants was 91% for the sound engineering majors, and about 70% for the instrument majors. In spite of these considerable differences in the AP and RP performance among subgroups of different specialties in each group, there were greater contrasts in the overall AP and RP performance among the Japanese, Chinese and Western groups.

Conclusions

We found remarkable differences of the AP and RP performance among music students of different countries. Most salient features of the results requiring explanation are the high AP scores and the extremely low RP scores of the Japanese music students. We speculate that one of the most important factors that produce the high prevalence of AP in Japan is widespread early music education that facilitates acquiring AP as well as a favorable view of AP accepted in Japan, and that, once acquired, AP may have negative effects on the development of an ability required to perform the present RP task. Furthermore, it could be speculated that, in a class where most of the students have AP, usual ear-training may not be effective. It is likely that those who had acquired AP in early childhood may lose an opportunity to fully develop RP. The present results point out the problem of the current practice of music education, particularly of ear-training in Japan.

It is, however, important to note that this study is a correlational type and therefore it is not justified to discuss possible factors that produced the differences observed here. Speculations above mentioned should be taken as suggestions for future research.

Keywords

absolute pitch, relative pitch, pitch naming, ear training, cross-cultural comparisons

REFERENCES


