BRIEF REPORTS AND SUMMARIES

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Falling on Sensitive Ears? The Influence of Musical Ability on Extreme Raters' Judgments of L2 Pronunciation

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■ The past few years have witnessed an increased interest in the relationship between music and language (e.g., Schön, Magne, & Besson, 2004). In a recent volume on the psychology of learning and motivation, for example, Palmer and Hutchins (2006) devoted an entire chapter to *musical prosody*, a term that underscores the link between music and spoken language. Several parallels can be drawn between music and speech, including structural similarities, evidence that they both convey emotion and that both may be processed in the same regions of the brain (Levitin & Menon, 2003; Palmer & Hutchins, 2006). Despite mounting evidence for a music–language link, there is surprisingly little research on the relationship between musical ability and second language (L2) pronunciation (for a review, see Slevc & Miyake, 2006). In the present study, we attempt to fill this research gap.

To date most research on the topic of music and L2 pronunciation has investigated the link between L2 learners' musical ability and the quality of their L2 perception or production. Some researchers have

shown a relationship between these two variables (e.g., Arellano & Draper, 1972; Slevc & Miyake, 2006; Tanaka & Nakamura, 2004), whereas others have failed to reveal any clear association (e.g., Flege, Yeni-Komshian, & Liu, 1999; Pimsleur, Stockwell, & Comrey, 1962; Thompson, 1991). In the present study, however, our focus is different. We examine the role of musical ability in *listeners' assessments of L2 pronunciation*.

Listeners' musical ability is just one of several listener characteristics that has the potential to influence listeners' judgments of L2 pronunciation. Other factors that have been investigated in relation to listeners' evaluations of L2 speech include listeners' native language (L1) background (e.g., Field, 2005; Munro, Derwing, & Morton, 2006), their L2 exposure (e.g., Gass & Varonis, 1984; Kennedy & Trofimovich, 2008), and their attitudes toward L2 accents (e.g., Lindemann, 2002; Lippi-Green, 1997). Is it possible that individual differences in listeners' musical ability also result in measurable differences in their evaluations of L2 speech? Even if listeners' musical ability does not directly affect their judgments of L2 pronunciation, musical ability might still affect their social evaluations of L2 pronunciation in interactions with their L2 interlocutors, possibly altering the dynamics of these interactions. Listeners' musical ability might also affect their scoring of L2 speech in assessment contexts, possibly threatening the validity of their assessments. Therefore, the effect of musical ability on listeners' evaluative reactions to L2 pronunciation needs to be understood in greater depth.

In apparently the first study to examine the effect of musical experience on listeners' judgments of L2 pronunciation, Isaacs and Trofimovich (in press) compared 30 music majors and 30 nonmusic majors in their judgments of accentedness (degree of foreign accent), comprehensibility (ease of understanding), and fluency (smoothness and speed of delivery) in oral narratives spoken by 40 French learners of English. They showed that, as a group, the music majors were significantly more negative in their judgments of L2 accentedness than the nonmusic majors. In contrast, the two listener groups were no different in their judgments of L2 fluency and comprehensibility. These findings implied that university-trained musicians are overall sensitive to aspects of speech that contribute to the impression of a foreign accent, but that musical background does not seem to influence listeners' perceptions of how easily they understand L2 speech or how fluent it sounds.

One weakness of Isaacs and Trofimovich's (in press) analyses is that their group-based comparisons concealed considerable variability in how severely or leniently the listeners rated the speech. Indeed, the 60 listeners in that study varied greatly in their musical experience and (as

we show later) approached the rating task with varying degrees of severity. If any potentially biasing effects of musical ability on speech evaluations involve listeners on the scoring periphery (i.e., the most severe or lenient raters), then such effects need to be examined in detail, and implications for L2 pedagogy and rater training need to be discussed. In addition, Isaacs and Trofimovich's original report dealt with several rater characteristics besides musical experience (i.e., the cognitive variables phonological memory and attention control) and was written for a primarily psycholinguistic audience. If there are potentially biasing effects of listeners' musical ability on their L2 pronunciation ratings, then these effects should be described to L2 teachers and assessment experts. Therefore, in this brief report, we revisit some of the data from Isaacs and Trofimovich. Our objectives were (a) to examine in detail the ratings given by listeners who were most extreme in their judgments, and (b) to discuss implications of these findings for L2 pronunciation assessment, pedagogy, and cross-cultural interactions in real-world contexts. Our overall goal was to determine whether listeners' musical ability is associated with any bias in their ratings of L2 pronunciation.

METHOD

The oral narratives evaluated by the listeners in this study were recorded by 40 native French speakers (13 males, 27 females) from Quebec, Canada (mean age 36 years; range 18–61 years). Of the 40 speakers, 38 were first taught English (their L2) for 45 minutes a week in primary school and received up to 3 hours of English as a second language instruction weekly in subsequent schooling. The remaining two speakers learned both English and French in early childhood. As a group, the speakers represented a wide range of ability. Their self-rated L2 speaking and listening ability ranged between 1 and 9 on a 9-point scale, and they used English to varying degrees (0–70%) daily. The oral narratives were elicited through a picture sequence that depicted two strangers who collided while carrying suitcases, only to realize that they had accidently picked up the wrong suitcase after parting ways (see Derwing, Thomson, & Munro, 2006). The oral narratives were recorded individually in a quiet office. The recordings were edited for initial dysfluencies (e.g., false starts), and an excerpt of roughly the first 20 seconds of each narrative was then saved onto CD for presentation to listeners.

The listeners (raters) were 60 native English speakers (26 males, 34 females) born and raised in monolingual homes in Canada (29) and the United States (31). All were undergraduate students at an English-medium

university in Montreal (mean age 21 years; range 19–25 years). Half were music majors; the other half were majoring in other disciplines. Together, the listeners were highly variable in the amount of musical training they had received (0–19 years). This broad range of musical experience was consistent with our goal of examining whether severe and lenient raters of L2 pronunciation would differ in their musical ability.

Of course, listeners' university major status and self-reported years of musical training said nothing about the quality of their musical experience. Moreover, it is difficult to discount the possibility that a few music majors might have had especially low music ability and a few nonmusic majors might have had especially high music ability. This would result in overlapping distributions between the two groups on the measure of musical ability unless outliers were removed. Because, strictly speaking, these two groups only differed in their university major and presumed aspiration to become professional musicians, we independently assessed listeners' musical ability using the Musical Aptitude Profile (MAP). The MAP is a standardized musical ability test that is predictive of musical learning in Grade 4 to university-level students (Gordon, 1995, 2001). The listeners completed three MAP subtests, using recorded prompts provided with the MAP testing materials. In the melody subtest, the listeners indicated whether the overall melodic contour (i.e., pattern of pitch movements) of a musical statement and its musical answer were congruent. In the tempo subtest, they indicated whether the tempo established in a musical statement was maintained in the musical answer (i.e., did not speed up or slow down). Finally, in the phrasing subtest, they indicated their preference for one of two renditions of the same musical phrase. To summarize, the melody and tempo subtests were discrimination tasks focusing on tonal and rhythmic dimensions, respectively. The phrasing subtest was a preference task targeting musical sensitivity. Each listener's raw score on each subtest was converted to a standard score based on MAP percentile norms (Gordon, 1995). The standardized scores were out of 77 for melody, 72 for harmony, and 80 for phrasing, for a total possible MAP composite score of 229.

The rating sessions took place individually in a quiet room. The 40 oral narratives were presented to each listener in randomized order via headsets connected to a computer. After listening to each narrative, the raters assigned scores on three separate 9-point scales: fluency (1 = *not fluent at all*, 9 = *very fluent*), accentedness (1 = *heavily accented*, 9 = *not accented at all*), and comprehensibility (1 = *hard to understand*, 9 = *easy to understand*). The rating task was self-paced, in that the raters were permitted multiple listenings of the narratives, but most moved forward at a steady pace (for more detail on participants, materials, and procedure, see Isaacs & Trofimovich, in press).

RESULTS

As mentioned earlier, our goal was to document whether listeners' L2 pronunciation ratings were associated with individual differences in listeners' musical ability. For our preliminary analyses, we computed Cronbach's alpha coefficients (measures of rating consistency) and skewness and kurtosis indices (measures of distribution normality) separately for fluency, accentedness, and comprehensibility ratings. The alpha coefficients, which ranged between 0.988 and 0.993, showed that the listeners were highly consistent. The skewness and kurtosis indices fell within the range of distribution normality (Huck, 2004). On this basis, we calculated each listener's mean score for fluency, accentedness, and comprehensibility pooled over all speakers.

In our first analysis, we classified the listeners into the 30 who had assigned the speakers the lowest mean score for each category of fluency, accentedness, and comprehensibility (low raters) and the 30 who had assigned the highest mean score (high raters) using a median split. Table 1 (top two rows) shows the mean pronunciation ratings for these two listener groups. We then conducted independent samples *t*-tests to determine whether the groups scored differently on the MAP. Results revealed no significant differences for any of the MAP subtests or the MAP composite score ($p > 0.05$). Thus, when we used a median split to group listeners into high and low raters, the groups did not differ in musical ability.

In our second analysis, we explored whether musical ability would be associated with L2 pronunciation ratings for listeners on the scoring periphery (i.e., extreme raters). To do so, we classified the 10 listeners who had assigned the lowest score for each of fluency, accentedness, and comprehensibility into the extreme low (severe) group and the 10 listeners who had assigned the highest mean score into the extreme high (lenient) group. Table 1 (bottom two rows) shows the mean pronunciation ratings for these new listener groups. U.S.-born raters accounted for 70% of raters in the severe group and 60% of the raters in the lenient group. However, there was little evidence to suggest that

TABLE 1
Mean Pronunciation Ratings (Ranges) for Different Listener Groups

	Pronunciation rating		
Listeners	Fluency	Accentedness	Comprehensibility
Low raters ($n = 30$)	4.6 (3.1–5.2)	4.3 (2.9–5.1)	5.3 (3.8–6.3)
High raters ($n = 30$)	6.1 (5.3–7.6)	5.9 (5.1–7.2)	7.2 (6.3–8.7)
Severe raters ($n = 10$)	4.1 (3.1–4.5)	3.5 (2.9–3.9)	4.6 (3.8–5.0)
Lenient raters ($n = 10$)	6.7 (6.2–7.6)	6.7 (6.1–7.2)	8.1 (7.3–8.7)

the U.S. raters behaved differently from their Canadian counterparts, because they were represented in both extreme groups in similar proportions. As before, we computed *t*-tests to determine whether these extreme groups scored differently on the MAP. Results revealed a significant difference only for comprehensibility ratings. The 10 listeners who assigned the lowest L2 comprehensibility ratings (severe raters) outperformed the 10 listeners who assigned the highest L2 comprehensibility ratings (lenient raters) on the MAP composite score, $t(18) = -2.19$, $p = 0.042$, r (*effect size*) $= 0.46$, and on the MAP melody subtest, $t(12.21) = -2.38$, $p = 0.034$, $r = 0.56$. However, the Levene's test for equality of variances was violated for the melody subtest; the result for melody should thus be interpreted with caution. Table 2 shows mean MAP scores for the severe and lenient listeners grouped by comprehensibility ratings.

To summarize, we found no association between listeners' musical ability and their L2 pronunciation ratings when we grouped listeners using a median split. However, when we compared only the most extreme listeners, we found that listeners who considered the L2 speech most difficult to understand had an overall higher musical ability than those who understood the speech most easily. In a follow-up analysis, we examined more closely this relationship between extreme listeners' musical ability and their L2 comprehensibility ratings.

We first plotted the listeners' mean comprehensibility ratings as a function of their MAP composite scores. However, this scatterplot (shown in Figure 1) revealed no straightforward relationship between listeners' L2 comprehensibility ratings and their musical ability. This is because the most severe comprehensibility raters were not necessarily those who had the highest musical ability and vice versa. Thus, although our *t*-test showed a significant difference between the two extreme listener groups in their musical ability, as measured through the MAP composite score, it was unlikely that the MAP composite score could clearly discriminate between the most severe and most lenient listeners.

TABLE 2
Mean Musical Aptitude Profile (MAP) Scores for Severe and Lenient Listeners

	MAP measures			
Listeners	Melody	Tempo	Phrasing	Composite
Severe raters ($n = 10$)	70.3 (4.2)	63.8 (5.6)	54.9 (8.9)	189.0 (13.8)
Lenient raters ($n = 10$)	62.2 (9.9)	60.4 (6.4)	54.1 (3.5)	173.9 (16.8)

Note. Standard deviations appear in parentheses.

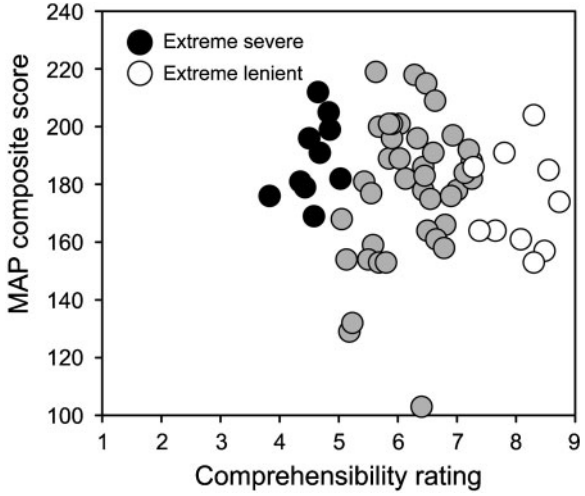

FIGURE 1. Scatterplot of listeners' MAP composite scores and their comprehensibility ratings. The 10 most severe and 10 most lenient listeners are represented separately.

Is it possible that the melodic dimension of musical ability alone can discriminate between extreme listener groups? Figure 2 charts the listeners' mean comprehensibility ratings as a function of their melody subtest scores. This scatterplot showed a clearer relationship between

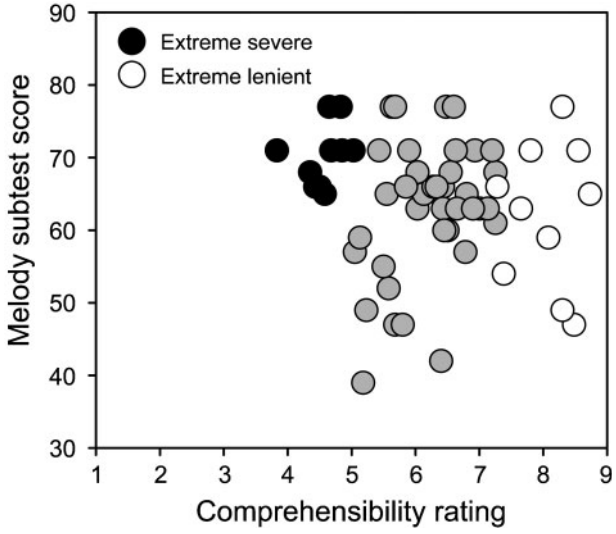

FIGURE 2. Scatterplot of listeners' scores on the MAP melody subtest and their comprehensibility ratings. The 10 most severe and 10 most lenient listeners are represented separately.

listeners' L2 comprehensibility ratings and their musical ability. The 10 most severe comprehensibility raters all attained high scores on the melody subtest and are tightly grouped together. In contrast, the 10 most lenient comprehensibility raters are distributed widely, spanning the entire ability spectrum on this melodic discrimination task. In fact, it is visually apparent why the assumption of homogeneity of variance was violated for the melody *t*-test reported earlier. The extreme severe listeners' scores are narrowly clustered near the top of the melody scale, whereas the extreme lenient listeners' scores are much more variable. In sum, our follow-up analysis confirmed that the most severe raters of L2 comprehensibility also received very high scores on the MAP melody subtest.

DISCUSSION

In this study, we examined the relationship between listeners' musical ability and their judgments of L2 pronunciation. We found no association between listeners' musical ability and their L2 pronunciation ratings when we classified raters into high and low groups using a median split. However, we did detect an association when we considered only the extreme (severe and lenient) raters. The listeners who found the L2 speech most difficult to understand had an overall higher musical ability than those who understood the speech most easily. This difference was mostly due to raters' performance on the melodic dimension of musical ability. The most severe comprehensibility raters clustered tightly at the high end of the melody scale, whereas the most lenient comprehensibility raters were scattered along the melody continuum. Our main finding can thus be summarized as follows: Listeners who assign extremely severe comprehensibility ratings are also likely to be sensitive to melodic dimensions of music, whereas the reverse is not necessarily the case.

This study, which focused on extreme raters, extends the results from Isaacs and Trofimovich (in press), although the two sets of findings are not identical to each other. In Isaacs and Trofimovich, music majors judged L2 accents more negatively than nonmusic majors; however, no effect for accentedness was detected in this study. Conversely, in the present study, severe and lenient raters of L2 comprehensibility differed in their musical ability, whereas university major status was not related to L2 comprehensibility ratings in Isaacs and Trofimovich. At least one reason for this discrepancy is that the two analyses differed in their level of detail. In this study, we focused on a few extreme raters grouped by musical ability, whereas Isaacs and Trofimovich compared large groups of musically trained versus untrained listeners. Nevertheless, the two sets of findings, taken

together, suggest that musical listeners are more attuned to certain aspects of L2 pronunciation than their less musical peers. Future research could attempt to isolate the source of these listener differences by targeting dimensions of speech that are more fine-grained than *accentedness* and *comprehensibility*, which appear to be too crude for this purpose (at least as they were defined for this study).

How could musical ability, especially its melodic dimension, contribute to listeners' judgments of L2 pronunciation? Patel, Peretz, Tramo, and Labreque (1998) note that melodic contour has a strong linguistic counterpart in speech intonation, and Alexander, Wong, and Bradlow (2005) suggest that musicians may be able to generalize their pitch-processing ability from music to speech. It is plausible, then, that the listeners who received high scores on the MAP melodic discrimination task are good at melodic pattern recognition in both music and speech. In support of this claim, Schön et al. (2004) observed that professional musicians were quicker and more accurate than non-musicians at detecting melodic incongruities in both musical phrases and spoken utterances. It may be, therefore, that listeners with heightened melodic discrimination are sensitive to nonnative intonation patterns. This heightened sensitivity could cause them to attend to other elements of the L2 speaker's message and thus cause their ratings to be lower. As a result, these listeners, compared to listeners who are less sensitive to melodic discrepancies, could experience more difficulty understanding L2 speech.

In interpreting the results of this study, it should be noted that the listeners provided ratings solely for French-accented speech, an accent to which Canadian raters in particular would likely have been exposed (e.g., through political debates on the national media), even if they had few direct opportunities to interact with Francophones. Both Canadian and U.S. raters were represented in the extreme rater groups, so it does not appear that attitudes toward the L1 French accent based on the raters' country of origin resulted in any discernible group differences in their scoring severity. However, it is unclear whether these same results would have been obtained had the listeners been asked to rate a different accent, such as Mandarin, Spanish, Korean, or an accent not familiar enough for listeners to stereotype. For example, in the case of a less familiar accent, differences between severe and lenient raters could be exacerbated, because listeners would have to depend more heavily on their speech-processing strategies (which may be qualitatively different for more and less musical raters) than on their experience with that accent. Until there is more evidence to support this claim, our results should not be generalized too far beyond the context of the present study.

IMPLICATIONS AND CONCLUSION

The finding of this study has several implications for L2 pronunciation assessment and pedagogy. One implication is that listeners' musical ability is a potential source of bias in their judgments of L2 pronunciation. Such a bias should not be problematic in assessment contexts where multiple raters evaluate L2 speakers, because rater idiosyncrasies would likely be averaged out. However, spoken assessments are often done by only a few trained raters, which implies that L2 speakers might be harshly evaluated if they are assessed by an extremely musical rater. Rater training could attempt to address this source of rater variability by making musical raters aware of their potential oversensitivity to certain aspects of L2 pronunciation that may cause them to rate the speech more harshly. This feedback might lead musical raters to adjust their scoring to converge more with their peers, even if it does not ultimately change the way they process the speech.

Another implication is that L2 teachers should be encouraged to focus on melodic aspects of prosody (e.g., intonation), because prosody might be related to native speakers' understanding of L2 speech. Pedagogical activities such as Graham's *Jazz Chants* series (e.g., 1978, 2001); kazoo playing (Gilbert, 2005); and the use of speech visualization technology, such as displays of intonation contours (Levis & Pickering, 2004), can all help L2 learners become more attuned to "musical aspects of speech" (Gilbert, 1994, p. 38), including the melodic dimensions that seemed to distinguish severe from lenient raters' comprehensibility judgments in this study. Furthermore, Derwing, Munro, and Wiebe (1998) provide evidence that native listeners are better able to discern L2 learners' improvements in comprehensibility following instruction on prosody than instruction on segmental aspects of speech or no pronunciation instruction at all. It is possible that musically inclined raters are particularly sensitive to changes in L2 learners' production of prosodic aspects of L2 speech as a result of instruction, although more research is sorely needed in this area. A final implication is that highly musical listeners' impressions of greater difficulty understanding L2 speech in research settings may translate into greater (perceived) difficulty understanding their L2 interlocutors in real-world contexts. This difficulty could have adverse effects on their interactions with their L2 interlocutors, but that remains to be explored empirically.

In sum, it appears that at least one source of variability in raters' judgments of L2 pronunciation lies in individual differences in raters' sensitivity to prosodic aspects of music and speech and, in particular, melody. A greater understanding of the role of musical ability not only

in acquiring an L2, but also in understanding L2 speech could help establish a more targeted role for music in L2 pedagogy and rater training.

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