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〈原著論文〉

Musical Potential and Receptive ESL Ability of Native Japanese Speakers

Kent Hatashita[1], Toko Suzuki[2], Chiaki Asai[3]

Abstract

Established musical ability and its relationship to second language skills has become of interest recently (Chobert, & Besson, 2013; Moreno, et al. 2008; Nakata, 2002; Slevc, & Miyake, 2006; Tallal, Gaab 2006; Zeromskaite, 2014). Many studies have conflicting results as to music's influences with most concluding there is some correlation. However, one's musical potential—undeveloped musical skills one possesses regardless of musical training—and its relation to second language skills has not been researched. This study investigated whether native Japanese speakers' musical potential influenced their receptive phonology abilities in their L2, English. The results show that among 130 female first-year university students a positive correlation between them could not be demonstrated and acquired musical ability based on training, as described in other studies, is a more reliable predictor of receptive phonology ability. However, it was found that an upper limit in phonological recognition scores positively correlated with musical potential scores which indicates the need for further studies into this area of research.

要旨

確立された音楽能力と第二言語スキルとの関係は近年興味の対象となっている。確立された音楽能力の第二言語スキルへの影響に関する多くの研究結果は、対立点はあるものの、大部分は二つに関連があると結論している。しかし、音楽の潜在能力、音楽訓練の有無に関係なくある人がもつ未発達の音楽スキルと第二言語スキルとの関係はまだ調査されていない。この研究では、日本語の母語話者の音楽の潜在能力が第二言語としての英語の音韻受容能力に影響しているかどうかを調査した。130人の女子学生（1年生）の調査結果からは二つの能力の相関関係は明確には証明できなかった。他の先行研究が記述するように、訓練によって獲得された音楽能力のほうが、音韻受容能力の予測因子としては信頼性が高い。しかし、音韻受容能力の上限値は音楽の潜在能力の得点とはっきり関連することが実証され、音楽の潜在能力と第二言語スキルの領域におけるさらなる研究の必要性が示唆されている。

キーワード：musical potential, receptive phonology, second language, English
音楽の潜在能力，受容音韻学，第二言語，英語

1. Introduction

In recent years, there has been a growing interest in the influence of musical ability on the development of skills in various disciplines. This includes second language acquisition (SLA) where the influence of a learner's musical ability has been investigated in a variety of contexts (Chobert & Besson, 2013; Moreno et al., 2008; Nakata, 2002; Slevc & Miyake, 2006; Tallal & Gaab, 2006; Zeromskaite, 2014). With the aid of modern brain imaging technology, there are numerous studies that show that the same neural modules are involved in processing both music and language. They specifically have also shown a close relationship exists between phonological awareness, pitch awareness, and musical skills (MS) which are acquired through training (Jäncke, 2012; Tallal & Gaab, 2006; Dege & Schwarzer, 2011). MS are the skills one has acquired through training and can be estimated based on a person's musical

1　Kent HATASHITA　　千里金蘭大学　生活科学部　食物栄養学科
2　Toko SUZUKI　　元　千里金蘭大学　非常勤講師
3　Chiaki ASAI　　千里金蘭大学　生活科学部　児童教育学科

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accomplishments and length of training. However, as useful as these measurements are, they cannot provide insight into individual differences in ability. Many of these studies have looked into links between established MS and second language (L2) proficiency (Chobert & Besson, 2013; Marques, Moreno, Castro, & Besson 2007; Moreno, Marques, Santos, Santos, Castro, & Besson 2009; Nakata, 2002; Slevc & Miyake, 2006; Zeromskaite, 2014), but they have not investigated why two people who have identical musical backgrounds might have very different levels of musical ability.

This difference in ability has been attributed to one's musical potential (MP). Law and Zentner (2012) describe MP as one's undeveloped musical skills which manifest themselves after training has begun and can explain why some musicians advance more quickly than others (2012). MP and its relationship to SLA has not been studied. Until recently resources to reliably measure MP were not available. Most studies relied on standardized musical ability tests such as Wing's *Test of Musical Ability and Appreciation* (1948) and Seashore's *Measurement of Musical Talent* (1915), both of which were created over 60 years ago and are now considered obsolete (Brown & Jordanian, 2013; Carson, 1998; Law & Zentner, 2012; Murphy, 1999). However, with the creation of the Profile of Music Perception Skills (PROMS) test it is now possible to reliably estimate one's MP (Law & Zetner, 2012).

The researchers of the present study investigated the possibility of native Japanese speakers' MP, regardless of their MS, having any influence on their receptive phonological skills in their L2 (English). By investigating the possible links between MP and L2 proficiency, teachers could use this information to make better-informed decisions regarding how to most effectively improve their learners' listening skills.

2. Method

Participants

The participants of this study were 130 female native speakers of Japanese. All were first-year non-English majors at an all-women's university in Western Japan who had received at least 6 years of formal English education beginning in junior high school.

Participants took the Assessment of Communicative English (A.C.E) placement test which is developed by the Association for English Language Proficiency and has a maximum score of 300. Scores ranged from 246 to 63 with a mean score of 161. This is roughly equal to 350 to 370 on the Test of English for International Communication (TOEIC), which is classified as elementary proficiency.

Participants answered a questionnaire in Japanese to gather information regarding their musical training. Musical training was defined as any type of formal musical instruction, whether private, group, or in a school setting, of any musical instrument including vocal or singing lessons. Of the 130 participants, 41 (almost one-third) had no musical training (Group 1); 29 participants had less than 5 years (Group 2); 31 had 5 to 9 years (Group 3); and 29 had 10 years or more (Group 4).

Materials and Procedure

Receptive phonology was assessed at the word and sentence levels using an adaptation of Slevc and Miyake's minimal pairs (2006). Minimal pairs differed in phonemes that are particularly challenging for native Japanese speakers to hear in English. The word level was evaluated in Section 1. Twenty-four of Slevc and Miyake's original 26 minimal pairs were used while merry/mary and fit/feet were replaced with work/walk and sip/ship. The participants received an answer sheet with the minimal pairs, listened to a pre-recording of each answer being spoken twice by a native speaker of American English, and chose which word they heard. The 26 minimal pairs used at the sentence level, Section 2, were identical to Slevc and Miyake's and ensured the sentence would retain meaning. (e.g., I'm expecting my dad to give me a *car/call* soon.). Answer sheets contained the sentences with the minimal pairs. Subjects listened to a prerecording of each sentence being spoken twice by the same native speaker mentioned above and had to choose which word they heard (see Appendix A for examples).

Musical potential was assessed using the Mini-PROMS test ("Mini-PROMS", n.d.) which is considered a reliable stand-alone test that balances expediency and validity (Zentner & Strauss, 2017). It is comprised of four subtests that measure one's ability to determine melody, tuning, speed, and accent/rhythm (Strauss, Shakeshaft, Plomin, & Zentner, 2015; Zentner & Strauss, 2017) (see Appendix B for an example of Melody). All four aspects play vital roles in identifying musical composition. The same is true for language. One has to be able to identify the differences in sounds in order to identify which word is being uttered, attention to pitch and syllable stress to identify pronunciation, differences in pitch and tuning can be equivalent to differences in similar vowel and consonant sound, and rhythm and accents in music are the same as word stress.

The musical stimulus is played twice (reference, repetition), and then a third (comparison) to compare to the reference. Participants are asked to choose one of five answers; 1. definitely the same, 2. probably the same, 3. I don't know, 4. probably different, 5. definitely different. A correct response with the highest confidence of "definitely same" or "definitely different" is awarded 1 point; less confident correct responses "probably same" or "probably different" were awarded 0.5 points; all incorrect responses, whether highly or less confident and "I don't know" were not awarded points (Law & Zentner, 2012). Each section has maximum scores of 10, 8, 8, and 10 respectively (36 total).

Taking a receptive phonology test and PROMS mini-tests requires the same type of cognition. Both language and music are generative phrasing systems of sounds which collectively take on a larger meaning than the sum of their individual elements (Hauser, Chomsky, & Fitch, 2002). Hence, participants who score higher on PROMS should also have more sensitive listening skills and therefore higher marks in the receptive phonology test as some regions of the brain thought to be language-specific are also active when processing music (Levitin & Menon, 2003; Maess, Koelsch, Gunter, & Friederici, 2001; Tillmann, Janata, & Bharucha, 2006).

At the time of this study, the Mini-PROMS test was not available in Japanese. A bilingual native Japanese speaker was tasked with translation. Upon its completion, the translation was verified by another bilingual native Japanese speaker before being distributed to the subjects. Subjects reported it took over 30 minutes to complete.

3. Results

Years of Musical Training and Receptive Phonology

Receptive phonology test results based on years of musical training are summarized in Graph 1. Group 2, who had up to 5 years of training, scored the highest with a mean score of 69.4% for Section 1 and 65.0% in Section 2. Group 3, who had 5 to 9 years of musical experience, scored the lowest averaging 64.4% correct on Section 1 and 62.2% correct on Section 2. Overall, the mean scores for all participants were 67.4% in Section 1, 61.8% correct in Section 2, and 64.6% correct responses in total.

Receptive Phonology Scores vs. PROMS Scores

Graph 2 summarizes the PROMS results based on receptive phonology scores. No subjects who scored 70 to 79.9% in receptive phonology scored 28 or higher on PROMS, 4 scored between 23 and 27.5, 11 scored between 18 and 22.5, 9 scored up to 17.5. For the 3 participants who performed the best on the receptive phonology test (80% and higher), one each was in the 3 lower PROMS scores.

Mean receptive phonology scores for both sections and the total score grouped by PROMS results are represented in Graph 3. Participants (n=50) who scored up to 17.5 and the seven participants who scored in the excellent range, 28 or higher, had the same overall mean score of 63.7%. While those who scored 18 to 22.5 and those who scored 23 to 27.5 had almost the same total mean scores of 65.4% and 65.3% respectively.

4. Discussion

Participants with 1 to 4 years of musical training performed the best in both sections of the receptive phonology test and therefore overall as well. (See Graph 1) These findings suggest that having only a basic understanding of music, 1 to 4 years of formal training, could improve second language receptive abilities. It seems a basic understanding of music is enough to enhance the ability to react to any pitch and rhythm of sounds.

All participants scored higher on Section 1 than on Section 2 of the receptive phonology test regardless of years of musical training. This could illustrate how the brain processes music and language syntax within its same regions while it processes language semantics and music differently (Donnay, Rankin, Lopez-Gonzalez, Jiradejvong, & Limb, 2014; University of Helsinki, 2017). If the subjects were unfamiliar with sentence semantics in Section 2 of the receptive phonology test, this could have caused cognitive interference and would explain the above findings. It could also explain PROM scores as related to receptive phonology scores. Almost 80% of participants, including all seven participants who scored in PROM's outstanding range, scored 69.9% or less on the receptive phonology test. The possibility of cognitive interference was not within the scope of this study but could provide more insight into these results.

Analysis of receptive phonology mean scores based on the results of the 4-PROMS test categories revealed no significant correlation (see Graph 3). Whereas previous studies have shown musical training to positively influence language abilities because of shared cognitive areas within the brain that process syntax (Johns Hopkins Medicine, 2014; Milovanov & Tervaniemi, 2011), merely having MP did not yield the same results.

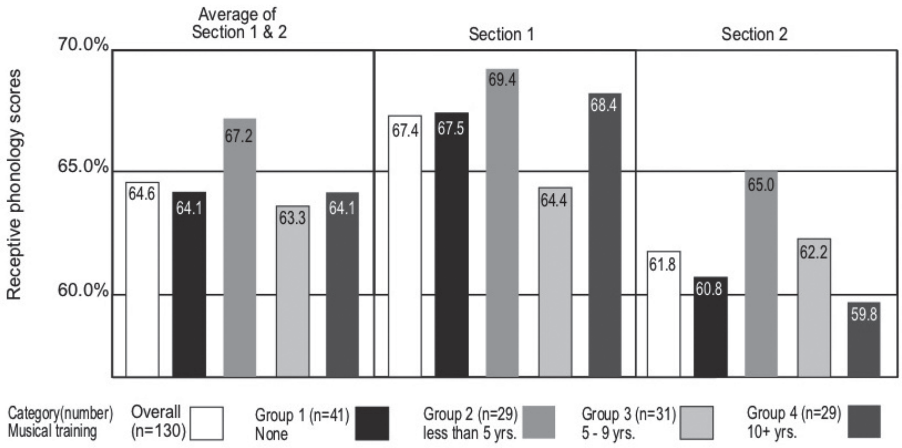
Regardless of the length of musical training, it has the potential of increasing the learner's receptive phonetical accuracy. Musical activities in the classroom could be used to enhance second language listening skills and has the potential of increasing the learner's phonetical awareness of what they are hearing. Therefore, musical activities, such as chanting and singing songs can be effective learning procedures to memorize correct pronunciation and phrase structures. Phonics should be emphasized during these activities. With music, learners can focus on sounds, specifically pitch, rhythm, stress of the words and phrases, more carefully and therefore it may improve their phonological skills.

Although phonetical accuracy may improve through musical activities, by themselves, they may have little to no effect regarding semantical knowledge. The benefits of a learner's musical training have on second language receptive skills are skewed towards phonetical accuracy. Any activities that utilize music to improve receptive language skills should also be supplemented with other exercises focused on the semantics of what learners are hearing. Incorporating vocabulary exercises into musical activities to counter balance the semantical shortcomings of musical exercises is one such example.

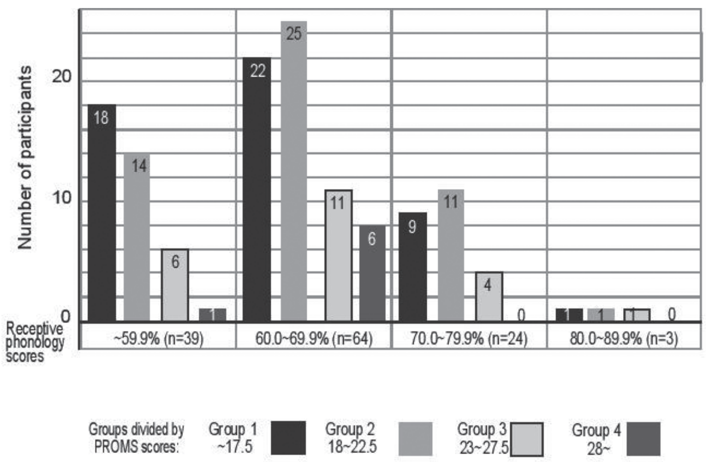
Research into musical aptitude and second language ability has become of interest to those involved in teaching language and music, and those interested in neuroscience. We endeavored to add to this growing body of research by investigating native Japanese speakers' MP and its relation to receptive phonology ability in their second language, English. Based on our results, we could not conclude MP has a positive correlation with second language receptive phonological skills. We have however identified a threshold regarding receptive phonology skills scores of up to 69.9% (Graph 2) and 18 to 22.5 (Good) on PROMS. The causes of this finding are beyond the scope of this paper and constitute the need for more research in this field.

GRAPHS

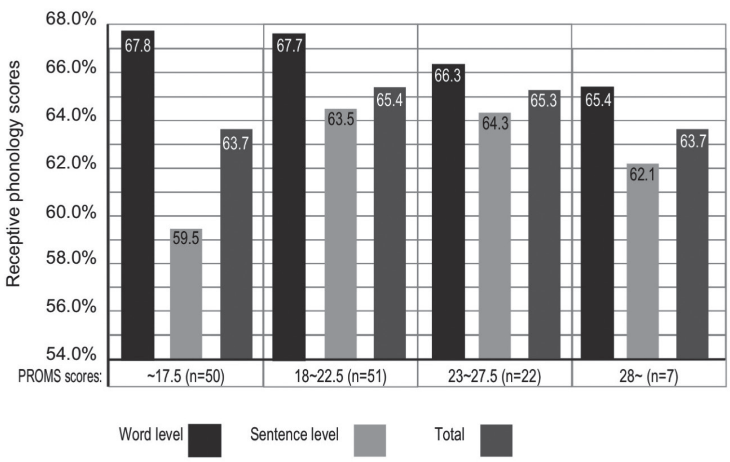
Graph 1- Years of Musical Training and Receptive Phonology Test Scores Averages



Graph 2- Receptive Phonology Scores and PROMS Score Averages



Graph 3- PROMS Scores and Receptive Phonology Average Scores



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Appendix A

Section 1 Examples-

1. choke chalk	2. late rate	3. glow grow
4. land lend	5. river liver	6. thing sing

Section 2 Examples-

1. Even though the show has only been playing for a week, it's already created a big stir. / star.
2. The millionaire was so paranoid about his greedy relatives that he put all his money in the well. / will.

Appendix B

Melody

An easy trial consists of a tonal melody (upper part) as opposed to a complex trial, which is atonal (lower part). ◌Represents the alteration in the comparison-stimuli. (Law & Zentner, 2012). In order to give a correct answer, one needs to remember melody relatively well, and notice slight changes in a pitch.