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The Effect of Music Training on Emotion Perception in Childhood

The Effect of Music Training on Emotion Perception in Childhood

A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Music in Music

By

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Abstract

Numerous studies found evidence that music training can enhance cognitive abilities both for children and adults. However, no evidence was found yet, whether music training can enhance abilities in emotion perception. I tested 8-9 year-old children on emotion perception in visual and musical contexts. The tests did not show significant difference between the musically trained and non-trained group neither in visual nor in musical context, however, when emotion scores were analyzed separately for each piece of music, musically trained children's responses reflected stereotypical modes of approaching emotional meanings in music, moreover, musically trained children's judgments were more uniform as there was less variability between their responses compared to the responses of non-trained children, which can be attributed to the common expressive rules whereby children learn to convey emotions through music during their music training.

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CHAPTER ONE: INTRODUCTION

Introduction

The effect of music training on nonmusical skills became a center of inquiry of numerous research studies during the past decades. Those who take music lessons regularly, develop other skills outside of the music domain, such as a tendency to perform better on IQ tests (Schellenberg, 2011), spatial tasks (Patston & Tippett, 2011; Stoesz, Jakobson, Kilgour, & Lewycky, 2007), auditory and visual memory tasks (Dege', Wehrum, Stark, & Schwarzer, 2011; Jakobson, Lewycky, Kilgour, & Stoesz, 2008), and verbal tasks (Dege' & Schwarzer, 2011; Moreno et al., 2011, 2009). Some studies found connection between musical training and high academic achievement (Fitzpatrick, 2006; Schellenberg, 2006; Wetter, Koerner, & Schwaninger, 2009). These findings were supported with brain imaging data, which showed structural differences in musicians' brain in auditory, motor and somatosensory areas, which can be accounted for the persistent and regular practicing (Hannon & Trainor, 2007; Schlaug, 2006). For example, (Gaser & Schlaug, 2003) found that professional keyboard players' brain has considerably more grey matter than amateur musicians or non-musicians in the primary sensorimotor cortex, which is functionally linked to the control of fine hand movements, and in the primary auditory cortex, which assists in discrimination of auditory signals.

The profound effect of music on emotions was acknowledged and investigated since the ancient Greece (Budd, 1985), and several studies found that the most common use of music is to influence emotions, such as enhance or change current mood, or release stress (Behne, 1997; Juslin & Laukka, 2004). As music is able to enhance emotions temporarily while listening, it is reasonable to conceive that regular music training that requires constant exposure and a more elaborative connection to music could enhance emotional abilities, but surprisingly little research has been made on it. Some studies attempted to find whether music training has an effect on

emotional intelligence, but these studies yielded inconsistent results. In these studies, emotional intelligence was measured either as a trait (Petrides, Niven & Mouskounti, 2006), or as an ability (Trimmer & Cuddy, 2008; Resnicow, Salovey, & Repp, 2004; Schellenberg, 2011). In the former studies, musically trained participants performed better than non-trained participants, while in the latter studies, no advantage was found for musically trained participants. These latter studies used the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT), which is a visual- and text-based test comprises four branches: *Perceiving emotions*, *Using emotions*, *Understanding emotions* and *Managing emotions*. The test does not include music or any listening task, which could yield some advantage for musically trained subjects. In other studies, musically trained participants tended to perform better than non-trained subjects on various listening tasks (Jakobson, Cuddy, & Kilgour, 2003; Kilgour, Jakobson, & Cuddy, 2000; Schellenberg & Moreno, 2010; Strait & Kraus, 2011; Tierney, Bergeson, & Pisoni, 2008; Williamson, Baddeley, & Hitch, 2010). A recent study found evidence for enhanced abilities for emotion comprehension, but this effect seemed to be mediated by intelligence, and, when intelligence was held constant, the effect disappeared (Schellenberg & Mankarious, 2012). Schellenberg and Mankarious applied a TEC (Test of Emotion Comprehension) test along with an abbreviated IQ (WASI-Wechsler Abbreviated Scale of Intelligence) test to investigate whether music training in childhood increases emotion comprehension skills. The TEC test is visual- and text-based, and primarily measures cognitive abilities (Albanese et al., 2010). Because the TEC test was used to measure emotional abilities, according to Schellenberg and Mankarious, it is possible that the high effect of intelligence on emotion comprehension was a result of the cognitive nature of the test. They suggest to use a rather emotion-based measure in future research, furthermore they propose that maybe the direct link between music and emotions

can be found in the music domain. To date, there is no study, which compared musically trained and non-trained subjects in their emotional abilities in music, therefore the direct link between enhanced emotional abilities and music has not been investigated yet. Finding the direct link between music training and emotional abilities could be of great importance for applications in music education and music therapy.

In the present study, I examined whether music training can enhance emotional abilities. I chose to test children because the association between music training and cognitive abilities can be seen better in childhood than in adulthood (Schellenberg, 2006), and therefore it can be conceived that the association between music training and emotional abilities follows the same developmental trajectory and it could be more evident in childhood than in adulthood. I tested 8-9-year-old children because by this age the difference between those who have musical training and those who do not first becomes pronounced. By this age, those who take formal music lessons, generally started from age 6, develop already some understanding about basic expressive elements of music, such as how to interpret a melody, or how to express basic emotions. To better see the difference in emotional abilities, I used musical excerpts for test materials that have a complex musical structure, which makes it more difficult for listeners to form a single, unified emotional response.

I tested how children perceive and infer emotions from different contexts. I administered two types of tests to compare emotion perception in two different domains: visual and musical, and attempted to find answers to the following questions: 1. Do musically trained subjects perform better than non-trained subjects in: a, emotion perception in music b, both visual emotion perception and emotion perception in music? 2. How do subjects who perform high in visual emotion perception perform in emotion perception in music?

I applied an additional empathy test to find whether emotional responsiveness to music is mediated by proneness to empathy. (Kreutz et al., 2008) investigated the ways people listen to music. They tested whether *Baron-Cohen's Empathizer-Systemizer-Theory (2005)* can be adapted to music listening. According to the theory, people can be classified as being either *empathizer* or *systemizer*. People in the former group are more sensitive to feeling states of others, while the ones in the second group are more attentive to objects and events. The study revealed that these two categories can be extended to music listening, as well.

Finally, I tested whether children who experience more intense emotions in music enjoy the music more.

CHAPTER TWO: METHODS

Methods

Participants

Twelve 8-9-year-old children participated in this study (9 boys, and 3 girls; mean age = 8.33, SD = 9 months) from Fayetteville, Arkansas. Children were considered musically trained if they had continuous music lessons other than music classes in primary school for at least 1 year ($n = 6$). All but one musically trained children's primary instrument was piano, and the length of formal music lessons ranged from 1 to 5 years. Children, who were not considered musically trained ($n = 6$), were primarily engaged in sports in their free time.

Measures

Demographic Survey

Demographic information was collected from parents in a form of a questionnaire including their age, ethnicity, child's and parents' first language, parents' level of education, annual family income, parents' marital status, child's and parents' musical history, child's primary out-of-school activity, child's frequency of music listening and the style of music the child listens the most. (See Appendix A) Both parents' level of education was measured in a 1-8 scale (1= *Grammar school*, 8=*Professional degree (MD, JD etc.)*), then, the two numbers were averaged per family. To see whether financial background has an effect on individual variables, annual family income was measured in a 1-9 scale (1= *Under \$10.000*, 9=*More than \$150.000*). Parents' musical background was assessed by summing the years of music lessons both parents had.

Music Questionnaire

Children were asked to fill out a music questionnaire after each music listening. (See Appendix B) The questionnaire consisted a list of 11 words that described different feelings and emotions. For helping them understand the meaning of the words, I wrote two-three synonyms in brackets next to the word. Additionally, besides the synonyms, there was an example sentence, which helped children better understand the word, but it did not have to do anything with the music. Children were offered the opportunity to ask the experimenter to help them explain the word better if they were still not sure about the word's meaning. After they fully understood the words, they had to indicate to what extent they perceived them in the music they just heard. Children were asked to use a scale to indicate how much they perceived each emotion while they were listening to the music (1=not at all, 2=a little, 3=moderately, 4=quite a bit, 5=extremely). For example, if they put a number 3 next to the word "happy" meant moderately happy. After completing the list, children were asked to indicate in a 1-5 scale how much they liked the music they heard (1=not at all, 5=extremely).

To test emotion perception in a complex musical structure, I used musical excerpts from the classical literature (Sinding: *Rustle of Spring*; Rachmaninoff: Prelude in C-sharp minor; Bartók: *Evening in the village*), which are typically taught in music schools in an advanced level. According to the Curriculum Guide of the Arkansas State Music Teachers Association, Bartók: *Evening in the village* is proposed to teach at Level 6 (which involves 8 years of piano lessons including the two introductory primary levels), Sinding: *Rustle of Spring* is proposed to teach at Level 8, and Rachmaninoff: Prelude in C-sharp minor is proposed to teach at Level 9 (Arkansas State Music Teachers Association, 2013). The curriculum was designed to build on children's age and acquired skills and the structural complexity of the proposed pieces increases with the

years of music lessons. These musical excerpts are so called *program music*, which refers that they were written about a particular event or a scene, which was often signaled in their title (e.g. *Rustle of Spring*) and the music incorporates tropes that can be understood as referring to the programmatic title of the piece. Children were not told about the title, neither about the program. To avoid instrument bias, all the three musical excerpts were presented on the piano.

For the word choices on the list of the music questionnaire I created eleven words, including distressed, excited, hopeless, scared, happy, angry, ethereal, relaxed, playful, nostalgic, sad, which fit the nine different categories of the Geneva Emotional Music Scales (GEMS) (The Personality Emotion and Music Laboratory, 2012). The GEMS is specifically designed to measure musically evoked emotions. Emotion perception was assessed through the word list obtaining an intensity score by summing up the scores for all indicated emotions. Liking was assessed in a Likert-scale for each piece of music from 1 (not at all) to 5 (extremely).

Visual task

The visual task consisted of 11 color photos of adult people. (See Appendix C) Each photo expressed one emotion among the 11 emotions from the word-list on the music questionnaire, therefore exactly the same 11 emotions were tested in both the musical and the visual context. Under each photo, there were 4 choices representing 4 words selected from the word-list of the music questionnaire, but there was only one word that matched the photo. According to the photo, children had to decide and answer the question *How is this man/woman feeling?* by putting an X next to the word that best fits, according to their judgments. Children received a 1 for each right answer and a 0 for each wrong answer on every question. Scores then were summed, with the highest possible score earned was 11.

Bryant's Empathy Index (Bryant, 1982)

This measure was designed specifically for school-aged children. (See Appendix D) It consists of 22 statements related to emotional situations of children's life (*It makes me sad to see a girl who can't find anyone to play with.* or *Girls who cry because they are happy are silly.*). Children had to indicate with a Y or an N if they agreed or disagreed with the statement, respectively. The test was scored dichotomously, 1 for yes and 0 for no. Negative statements were scored inversely. Scores then were summed and averaged.

Procedure

Consent forms were obtained from both children and parents, then, children were tested in a classroom setting, while parents completed the demographic questionnaire. The 3 musical excerpts were presented first in the following order: Sinding: *Rustle of Spring*; Rachmaninoff: *Prelude in C-sharp minor*; Bartók: *Evening in the village*. After each playing, children had 3 minutes to fill out the music questionnaire. The above order was determined according to the length of the musical pieces to avoid attention fatigue, thus, the longest piece was in the middle, and the shortest was the last. Then, the visual and the empathy tests were administered in random order. The whole session took 30 minutes. At the end of the session, participants were debriefed and children received \$5 cash for their participation, which was sponsored by the Music Department of the University of Arkansas, Fayetteville.

CHAPTER THREE: RESULTS

Results

Demographic variables

Performance on visual emotion perception was positively correlated with parents' education, $r = .593$, $N = 12$, $p = .042$. Empathy scores did not show significant correlation neither with family income, $r = -.120$, $N = 12$, $p = .711$, nor with parents' education, $r = .482$, $N = 12$, $p = .112$. Age did not seem to be correlated with neither visual emotion perception, $r = -.038$, $N = 12$, $p = .907$, nor with musical emotion perception, $r = -.131$, $N = 12$, $p = .684$, nor with empathy, $r = .199$, $N = 12$, $p = .536$. The frequency of music listening was constant among all children, as all children were listening to music daily. Finally, parents' musical background did not seem to be correlated with children's musical emotion perception, $r = -.277$, $N = 12$, $p = .383$.

Music Training and Visual Emotion Perception

Musically trained and non-trained children performed equally in visual emotion perception with only a little bigger difference in SD for musicians, with musically trained children ($M = 9.83$, $SD = 1.16$), and non-trained children ($M = 9.83$, $SD = .98$). Children were able to perceive emotions in pictures with 89 percent accuracy, which can be conceived high-level visual emotion perception proficiency. Furthermore, the majority of the misperceptions happened with the same emotion picture, namely, distressed, which can be attributed to the lack or rare use of this word in children's vocabulary.

Music Training and Emotion Perception in Music

A one-way ANOVA did not reveal significant difference between musically trained children ($M = 87.5$, $SD = 19.75$) and non-trained children ($M = 93.16$, $SD = 23.14$), $F(1, 10) = .208$, $p = .658$. As a post hoc test, I analyzed emotion scores separately for each piece of music to explore whether there is a profile in the responses of musically trained versus untrained children. First, mean scores were obtained per emotions for each piece of music for the two groups, musically trained and non-trained children, separately. Then, mean scores per emotions per music were arranged in a table for the two groups separately. According to (Lehmann et al., 2007), as a result of the music training, musicians learn expressive performance rules, whereby emotions are conveyed through music, such as how to articulate a melody or change loudness, and these strategies are quite uniform in the Western music education. To see whether these strategies have an effect on musically trained children's responses, I compared the mean scores of the two groups (musically trained versus non-trained) to the analyses of professional musicologists about the given musical pieces. I considered two-three different analyses for each piece of music from musicologists who specialized in the given composer. For Sinding: *Rustle of Spring*, the highest mean scores for the music group were shown for happy ($M = 4$ $SD = 1.26$), excited ($M = 3$ $SD = 1.89$) and ethereal ($M = 3$ $SD = 2.09$), whereas the highest mean scores for the non-music group were shown for excited ($M = 4$ $SD = 1.54$), happy ($M = 3.83$ $SD = 1.60$), and relaxed ($M = 3.66$ $SD = 1.03$). For Sinding's *Rustle of Spring*, I used the analyses of Victor Herbert and Edward B. Perry. Victor Herbert (1913) summarizes the overall character of the piece:

Just as the rustling silk skirts of a lady's dress in approaching a room announce her coming, so before spring comes, there seems a curious lull in Dame Nature, as though she yawned before awakening; there is a dreamlike rustling in the air, before men can say: Spring is come!...Another feature is the ample use of the pedal

which gives effect to the aforementioned rustling. (p. 146)

Edward B. Perry (1910) describes the music:

His impatient approach, accompanied by rushing winds and rustling leaves, the ripple of glad waters and the murmur of welcoming forests, is represented in this composition... It literally imitates the gusty rush of spring-winds, the chatter of wayward brooks, the all-pervading stir and rustle and murmur, which tell of the quickening of all new life throughout nature, the thrilling of her pulses at the revivifying kiss of spring; while the warm emotional character of the melody and the rich, sensuous harmonies... suggest the vague, half mystical, half passionate longings, the indefinable unrest, the subtle blending of joy and sadness, which wake and stir and swell and surge in the human heart at the voice of spring. (p. 146)

Both analyses point out an excited and happy character to the music, which is reflected in the words frequently mentioned in the analyses, such as “rustling”; “impatient”; “ripple”; “gusty rush”, and “glad waters” and “joy” respectively. Both musically trained and non-trained children’s responses were well in line with these characters. However, the relaxed character, which was scored the third highest in non-trained children’s responses seems to contradict with the overall excited character in the interpretation of the musicologists.

For Rachmaninoff: Prelude in C-sharp minor, the highest mean scores for the music group were shown for distressed ($M = 3.16$ $SD = 2.04$), scared ($M = 3.16$ $SD = 2.04$), nostalgic ($M = 3$ $SD = 1.78$), angry ($M = 2.83$ $SD = 1.60$) and excited ($M = 2.83$ $SD = 1.72$), whereas the highest mean scores for the non-music group were shown for hopeless ($M = 3.66$ $SD = 1.03$), excited ($M = 3.66$ $SD = 1.63$), nostalgic ($M = 3$ $SD = 1.26$), ethereal ($M = 2.83$ $SD = 1.16$), and relaxed ($M = 2.83$ $SD = 1.72$). For Rachmaninoff: Prelude in C-sharp minor, I used the analyses of Robert Cummings, Theodor W. Adorno and Karen M. Bottge. Robert Cummings summarizes the music:

The Prelude begins with ominous descending chords that lead to one of the composer’s most melancholy and memorable themes. Its slow lilting character, conveyed in big gloomy chords, is reminiscent of tolling bells on a dark wintry night, an image which accounts for its nickname, “The Bells of Moscow.” The

theme offers no consolation in its dire gloom, but instead proceeds to proudly proclaim its beguiling pessimism. The middle section is restless and tense, not breaking the dark mood, but offering livelier and more driven music before returning to the chordal theme with doubled intensity.

Theodor W. Adorno (1998) discusses about the dark character of the piece:

The somber mood of destruction which the Slav idiom of the piece simultaneously threatens and glorifies, arouses in every listener the certainty that in the foreboding gloom he too could easily smash the piano to pieces. (p. 39)

Karen M. Bottge (2011) comments Adorno pertaining to the movements of the performer required to play the theme in the opening:

These deliberate opening physical movements, in combination with the *lento* tempo, minor mode, descending contour (A – G# – C#), and low pitch range with attenuated higher partials lend immediately to this Prelude's powerfully "foreboding" effect."... "This affect is further intensified with the entrance of the counter-voice, whose narrow melodic range, occurrence of minor seconds in the soprano (E – D# – D – C#), dissonant melodic intervals (diminished 3rd, D – B# – C#), and straightforward rhythms exploit the musical properties conventionally associated with negatively-valenced emotions (e.g., mournful, sad, tragic, serious, melancholy, etc.).

About a later return of the theme she writes: "It is this passage of "thundering chords" in particular that seems to elicit a type of aestheticized narcissistic pleasure with thoughts on annihilation." She further points out that the music conveys a passive capitulation to fate: "...there's nothing to be done, but just stand back and watch the flames." For those trained in analyses and interpretation of romantic instrumental music, the piece clearly incorporates an image on melancholy and gloom according to the synonyms frequently mentioned in the analyses, such as: "mournful"; "sad"; "tragic"; "serious"; "melancholy"; "tense", and expressions, such as: "thoughts on annihilation"; "passive capitulation to fate"; "beguiling pessimism"; "dire gloom". This dark and tense character is well reflected in musically trained children's responses (distressed, scared, nostalgic, angry, excited), whereas non-trained children's responses display some ambiguity (hopeless, excited, nostalgic, ethereal, relaxed).

Finally, for Bartók: *Evening in the village*, the highest mean scores for the music group were shown for happy ($M = 4.5$ $SD = .83$), nostalgic ($M = 3.16$ $SD = 1.47$), excited ($M = 3.16$ $SD = 1.47$), and ethereal ($M = 3.16$ $SD = 1.47$), whereas the highest mean scores for the non-music group were shown for relaxed ($M = 4$ $SD = .89$), nostalgic ($M = 4$ $SD = 1.54$), ethereal ($M = 3.5$ $SD = .83$), and happy ($M = 3.3$ $SD = 1.5$). For Bartók: *Evening in the village*, I used László Somfai and David Yeomans analyses. László Somfai (1996) discusses about the piece's performance options:

With minimum rubato this is a lovely piece for a child... With Bartók's rubato this is a great piece of music: confession about his musico-national identity about his immense respect for the creative world of his beloved peasants, a transfiguration in which he becomes one with the people, with accumulated experience of generations and centuries. (p. 293)

Rubato style refers to a freedom in phrasing for increased expressivity. (Yeomans, 2000) discusses the two characters of the piece, which build its structure: "...the free, narrative *parlando-rubato*, or Old Style (A), and the dance-like *tempo giusto*, or New Style (B). The A sections portray vocal melody, the B sections the peasant flute." Both musically trained and non-trained children's responses similarly showed two different characters of the piece, therefore they were in line with the standard interpretive approaches by analysts trained in Western music. The finding that non-trained children performed similarly to musically trained children could be the consequence of that according to the state curriculum, Bartók's piece is recommended to learn at middle level (Level 6), which is closer in age to the participants in this study than the other two pieces, which are typically learnt at high level, therefore Bartók's piece could be more easily interpretable for them.

Finally, I tested variability in scores per group to see how much agreement was in the responses within groups. Mean scores were first calculated for each piece of music for each

subject. Secondly, subject scores were arranged into two tables related to the two groups. Comparing the two groups' variances yielded that for the Rachmaninoff and the Bartók pieces, musically trained children's responses were more consistent, than non-trained children's responses, as there were less variability in scores for these two pieces in the music group ($s^2 = .354$ and $s^2 = .520$ respectively) compared to the non-music group ($s^2 = .594$ and $s^2 = .693$ respectively). However, Hartley's F-max test did not show significant difference between the variances of the two groups.

Music Training and Proneness to Empathy

A one-way ANOVA did not reveal significant difference between musically trained children ($M = .63$, $SD = .11$) and non-trained children ($M = .55$, $SD = .21$), $F(1, 10) = .558$, $p = .472$. However, there was a significant gender difference, as girls exhibited significantly more empathy ($M = .77$, $SD = .09$) than boys ($M = .53$, $SD = .14$), $F(1, 10) = 6.53$, $p = .029$.

Music Training, Visual and Musical Emotion Perception and Empathy

There was a significant negative correlation between music perception test and visual test, $r = -.640$, $N = 12$, $p = .025$. However, correlation between music perception test and empathy test did not yield significant results, $r = -.371$, $N = 12$, $p = .235$.

Liking and Intensity

Liking for each piece of music was measured in a Likert scale. There was a significant positive correlation between liking and music perception scores with $r = .679$, $N = 12$, $p = .015$, which suggests that the more intense emotions children experienced while listening to music, the

more they liked the music. Correlation between intensity scores and empathy scores did not yield significant results, $r = -.371$, $N = 12$, $p = .235$.

Emotion Perception in Complex Musical Structure

All children tended to agree in the general character of the musical pieces, however, there was a disagreement for the Rachmaninoff piece, as they tended to interpret the music, either sad or happy. They showed more consistency in identifying emotions in the Sinding and Bartók pieces. Despite that the Bartók piece is based on a Hungarian folk-melody, and participants were all American, it did not seem to affect neither emotion perception nor liking the music.

CHAPTER FOUR: DISCUSSION AND CONCLUSION

Discussion

The small number of participants was a serious limitation of the study. More sessions need to be conducted, in order to have sufficient amount of data and obtain more reliable results. Present results did not show significant difference in emotion perception neither in visual nor in musical domain, however, when emotions were analyzed separately, there was a little difference between musically trained and non-trained participants, as musically trained subjects responded more similarly than non-trained subjects to the analyses of professional musicologists. This result is not too surprising as musically trained children go through the same standardized music education as the trained analysts. Comparison of variances showed that musically trained children were more consistent in their responses than non-trained children, although this difference was not significant. The result that musically trained children's responses were more similar to the professional analyses and more consistent may reflect that musically trained children already acquired some pre-learned strategies, which predisposed them to perceive emotions according to the expressive performance rules, such as how to articulate a melody or change the loudness to express emotions, they learnt during their musical training (Lehmann et al., 2007). One reason why no overall difference was found between musically trained and non-trained children can be that the questionnaires contained complex emotions, which are subtle, therefore it is more difficult to perceive them in an abstract context, such as music. (Lehmann et al., 2007) found that adult musicians can reliably identify and produce basic emotions in music. To test whether emotion perception links to the domain itself, future studies need to be restricted to basic emotions, such as happy or sad. Another possibility for the lack of difference in emotion perception between the two groups may be that emotion perception is a matter of emotional intelligence. For example, when undergraduate students were tested on emotion perception in

melodic utterances, students with high emotional intelligence performed better, and no advantage was found for musically trained students (Trimmer & Cuddy, 2008). Alternatively, as in previous studies musically trained participants performed better when emotions were tested as a trait (Petrides, Niven & Mouskounti, 2006), to see the difference between musically trained and non-trained people, a different kind of measurement may be necessary.

Children performed equally in visual emotion perception, however there seemed to be a misperception of the emotion “distressed” in the visual test, as it was often misidentified as “scared”, probably because of the lack or rare use of this word in children’s vocabulary. There was a significant negative correlation between visual emotion perception and musical emotion perception. This relationship needs to be further investigated in future studies. It is nevertheless possible that visual emotion perception does not require intense emotions. In previous research (Schellenberg & Mankarious, 2012), musically trained children performed better on visual based emotion intelligence test (TEC), but when IQ was held constant, no difference was found between musically trained and non-trained children. This finding suggests that better performance on visual emotion intelligence test was a result of intellectual abilities, which was not measured in the present study. Another study (Schellenberg, 2011) found similar results for emotional intelligence on a different visual test (MSCEIT).

Musically trained children and non-trained children did not differ significantly in proneness to empathy, however, girls seem to be more empathetic than boys. (Kreutz et al., 2008) found contradictory results in their two studies, as in one study, music training seemed to have an influence on music empathizing, whereas in another study this effect did not show up. Similarly, they found sex differences in music empathizing, as musically trained women exhibited a significant change in the level of empathizing from one study to another, while men

retained the same level.

Emotion perception in complex musical structure did not show any advantage for musically trained children. Because the understanding of high-order musical structure, such as developing a large-scale conception about the entire piece of music involves high-order cognitive processing associated with long-term memory (Snyder, 2000) it can be conceived that emotion perception in complex context could be associated with intelligence, though intelligence was not measured in this study. Future research needs to address this issue.

Liking and music perception were positively correlated, which suggests that the more intense emotions participants felt, the more they liked the music. This is consistent with the finding that people use music commonly for emotion regulation (Behne, 1997; Juslin & Laukka, 2004; Sloboda & O'Neill, 2001; Zillman & Gan, 1997).

Previous studies found evidence that music training enhances fine motor skills related to hand movements, and auditory capacities (Gaser & Schlaug, 2003; Jakobson, Cuddy, & Kilgour, 2003; Kilgour, Jakobson, & Cuddy, 2000; Schellenberg & Moreno, 2010; Strait & Kraus, 2011; Tierney, Bergeson, & Pisoni, 2008; Williamson, Baddeley, & Hitch, 2010). (Schellenberg & Mankarius, 2012) found that musically trained children performed better than non-trained children in the emotional intelligence test (TEC), but this effect was attributed to the cognitive nature of the test, therefore they suggested a rather emotion based measure, and testing directly in the music domain. Present study measured emotions directly, and testing was made in different domains, including music. However, the direct link between music training and emotion perception abilities did not reveal. Present study did not find evidence that music training enhances emotional abilities in childhood, but there seemed to be a sign for an effect of music training in musically trained children's responses as they tended to perceive emotions in

music similarly than professional musicologists. Whether emotion perception in music is the result of pre-learned strategies or the extensive exposure to music remains to be studied.

Conclusion

The present study offers an alternative to previous studies' measurements of emotions to examine whether formal musical training in childhood leads to enhanced abilities in emotion perception. This study further examined whether emotion perception differs across different domains, such as visual and musical. Both the musically trained and non-trained group performed equally in visual emotion perception as they were able to match words express emotions to pictures in fairly high agreement ($SD_{\text{musicians}} = 1.16$, $SD_{\text{non-musicians}} = .98$), which suggests that children at ages 8-9 are already capable to successfully identify emotions, even complex ones, in visual stimulus, such as pictures. Interestingly, emotion perception in music was more diverse with quite low agreement ($SD_{\text{musicians}} = 2.65$, $SD_{\text{non-musicians}} = 3.39$). This result can be due to the different nature of the two tests. Emotion perception in pictures is easier than in an abstract domain, such as music. Moreover, as emotion perception in music is more subjective than emotion perception in pictures, it can result in the diverse responses for emotion perception in music. Thirdly, since the measurement of emotions in music was restricted to the word list I created, in future studies a more objective and more accurate measurement is necessary, which relates directly to the music in the test. Although no significant difference was found between musically trained and non-trained participants, there appeared to be a sign of the effect of music training, as musically trained children tended to respond to music in ways similar to those of professionally trained music critics. Future research needs to be conducted with adults, which compares musically trained versus non-trained participants. If the study would find that

musically trained adults are in close agreement with professional musicologists, it still raises the question of whether this effect is due to rule-based, pre-learned expressive strategies upon which musical performers practice to convey emotions in music (Lehmann et al., 2007), or it is due to general maturation or longer exposure to music listening. Alternatively to previous studies, present study examined whether proneness to empathy has an effect on emotion perception. Because musically trained children did not exhibit significantly more empathy, as far as this study concerned, empathy does not seem to be a mediator in emotion perception in music. In future studies, more participants needed to investigate this question more thoroughly.

Future research should use a greater pool of participants to obtain more reliable results. Furthermore, because in previous studies, intelligence mediated emotional intelligence scores and emotion comprehension (Schellenberg, 2011; Schellenberg & Mankarious, 2012) it is reasonable to hypothesize that intelligence could account for emotion perception in music, as well. The inclusion of IQ test scores in future research could explain emotion perception better. Emotion perception in music is a very sensitive and subjective experience, which is difficult to measure. Future studies need to apply a more accurate measurement for evaluating emotion perception in music. Present methods of study did not show significant difference for musicians. In order to find whether there is an advantage for musically trained participants in emotion perception, a different, more integrated method is necessary.

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APPENDIX A

Demographics

1. Your gender (please circle one): Male Female

2. Your child's gender (please circle one): Male Female

3. Your age: _____

4. Your child's age: _____

5. Your relationship with the child (please circle one):

 Father
 Mother
 Other: _____

6. Your ethnicity (please circle all that apply):

 White/Caucasian
 Black/African American
 Asian/Asian American
 Pacific Islander
 Hispanic/Latino
 Native American
 Other

7. Your first language: _____

8. Your child's first language: _____

9. Your highest level of education (please circle one):

 Grammar school
 High school or equivalent
 Vocational/technical school (2 years)
 Some college
 Bachelor's degree
 Master's degree
 Doctoral degree
 Professional degree (MD, JD etc.)

10. Total annual family income (please circle one):

- Under \$10.000
- \$10.000-19.000
- \$20.000-29.000
- \$30.000-39.000
- \$40.000-49.000
- \$50.000-74.000
- \$75.000-99.000
- \$100.000-150.000
- More than \$150.000

11. Your marital status (please circle one):

- Single
- Married
- Divorced
- Widow/er

12. Did you receive formal musical training? (please write Yes or No): _____

13. If yes, the number of years you received formal musical training: _____

14. Your child's primary out-of-school activity: _____

15. Frequency of your child's music listening at home (please circle one):

- Very rarely
- Sometimes
- Daily
- Most of his/her time

16. The style of music your child likes to listen the most (please circle one):

- Classical music
- Opera/Musical
- Popular music

Fill out this section only if your child is taking or had been taking music lessons!

17. Number of years your child is taking formal music lessons: _____

18. Your child's primary instrument: _____

APPENDIX B

This list consists of a number of words that describe different feelings and emotions. Read each item and then write in a number in the space next to that word. Make sure you understand each word. For helping you understand their meaning, we wrote you some synonyms (words with the same meaning) in brackets. Additionally, besides the synonyms, there is an example sentence, which helps you better understand the word, but it does not have to do anything with the music. If you are still not sure about the word's meaning, feel free to ask me to help you explain them better. After you fully understood the words, indicate to what extent you perceive them in the music you just heard. Use the following scale to indicate how much you perceived each emotion while you were listening to the music. For example, if you put a number 3 next to the word "happy" means moderately happy.

1	2	3	4	5
not at all	a little	moderately	quite a bit	extremely

_____ distressed (worried, upset, tormented) *I was distressed at the news of the exam.*

_____ excited (emotional, pumped up) *An excited crowd awaited the arrival of the famed rock group.*

_____ hopeless (helpless, unfortunate) *With each passing day the position for poor people becomes more hopeless.*

_____ scared (fearful, afraid) *The more you know about snakes, the less scared you will be.*

_____ happy (cheerful, glad) *I am happy that we can go for playing.*

_____ angry (mad, furious) *How long do you stay angry after you've had a fight?*

_____ ethereal (heavenly, airy, fairy) *Nicole looked ethereal with her veil floating, like a vision in white.*

_____ relaxed (calm, cooled off) *A small town has a more relaxed feel than a city.*

_____ playful (funny, teasing) *One morning Ashley seemed extremely playful she even climbed a tree.*

_____ nostalgic (longingly remembering, longing) *It was a nostalgic moment, when all the memories from my grandmother came to my mind.*

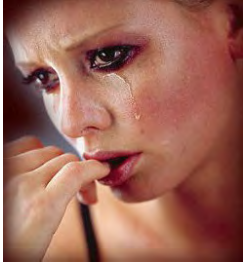
_____ sad (unhappy, depressed) *Sad farewells at the end of the day.*

How much did you like the music you just heard?
(Circle one number on the scale below.)

1	2	3	4	5
<-----	-----	-----	-----	----->
not at all	a little	moderately	quite a bit	extremely

APPENDIX C

1. How is this woman feeling? (Put an X next to the word that BEST fits.)



_____ happy (cheerful, glad) *I am happy that we can go for playing.*

_____ relaxed (calm, cooled off) *A small town has a more relaxed feel than a city.*

_____ angry (mad, furious) *How long do you stay angry after you've had a fight?*

_____ sad (unhappy, depressed) *Sad farewells at the end of the day.*

2. How is this man feeling? (Put an X next to the word that BEST fits.)



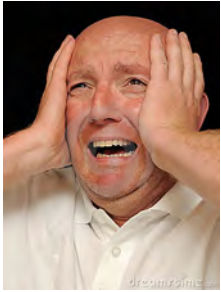
_____ hopeless (helpless, unfortunate) *With each passing day the position for poor people becomes more hopeless.*

_____ scared (fearful, afraid) *The more you know about snakes, the less scared you will be.*

_____ happy (cheerful, glad) *I am happy that we can go for playing.*

_____ angry (mad, furious) *How long do you stay angry after you've had a fight?*

3. How is this man feeling? (Put an X next to the word that BEST fits.)



_____ distressed (worried, upset, tormented) *I was distressed at the news of the exam.*

_____ excited (emotional, pumped up) *An excited crowd awaited the arrival of the famed rock group.*

_____ hopeless (helpless, unfortunate) *With each passing day the position for poor people becomes more hopeless.*

_____ scared (fearful, afraid) *The more you know about snakes, the less scared you will be.*

4. How is this woman feeling? (Put an X next to the word that BEST fits.)



_____ playful (funny, teasing) *One morning Ashley seemed extremely playful she even climbed a tree.*

_____ angry (mad, furious) *How long do you stay angry after you've had a fight?*

_____ ethereal (heavenly, airy, fairy) *Nicole looked ethereal with her veil floating, like a vision in white.*

_____ hopeless (helpless, unfortunate) *With each passing day the position for poor people becomes more hopeless.*

5. How is this man feeling? (Put an X next to the word that BEST fits.)



excited (emotional, pumped up) *An excited crowd awaited the arrival of the famed rock group.*

hopeless (helpless, unfortunate) *With each passing day the position for poor people becomes more hopeless.*

scared (fearful, afraid) *The more you know about snakes, the less scared you will be.*

happy (cheerful, glad) *I am happy that we can go for playing.*

6. How is this man feeling? (Put an X next to the word that BEST fits.)



scared (fearful, afraid) *The more you know about snakes, the less scared you will be.*

happy (cheerful, glad) *I am happy that we can go for playing.*

angry (mad, furious) *How long do you stay angry after you've had a fight?*

ethereal (heavenly, airy, fairy) *Nicole looked ethereal with her veil floating, like a vision in white.*

7. How is this man feeling? (Put an X next to the word that BEST fits.)



_____ excited (emotional, pumped up) *An excited crowd awaited the arrival of the famed rock group.*

_____ hopeless (helpless, unfortunate) *With each passing day the position for poor people becomes more hopeless.*

_____ scared (fearful, afraid) *The more you know about snakes, the less scared you will be.*

_____ happy (cheerful, glad) *I am happy that we can go for playing.*

8. How is this woman feeling? (Put an X next to the word that BEST fits.)



_____ relaxed (calm, cooled off) *A small town has a more relaxed feel than a city.*

_____ playful (funny, teasing) *One morning Ashley seemed extremely playful she even climbed a tree.*

_____ nostalgic (longingly remembering, longing) *It was a nostalgic moment, when all the memories from my grandmother came to my mind.*

_____ sad (unhappy, depressed) *Sad farewells at the end of the day.*

9. How is this woman feeling? (Put an X next to the word that BEST fits.)



_____ ethereal (heavenly, airy, fairy) *Nicole looked ethereal with her veil floating, like a vision in white.*

_____ relaxed (calm, cooled off) *A small town has a more relaxed feel than a city.*

_____ playful (funny, teasing) *One morning Ashley seemed extremely playful she even climbed a tree.*

_____ nostalgic (longingly remembering, longing) *It was a nostalgic moment, when all the memories from my grandmother came to my mind.*

10. How is this man feeling? (Put an X next to the word that BEST fits.)



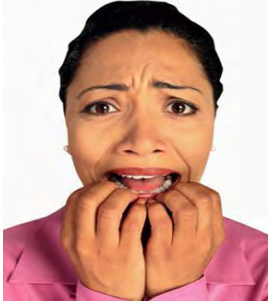
_____ relaxed (calm, cooled off) *A small town has a more relaxed feel than a city.*

_____ playful (funny, teasing) *One morning Ashley seemed extremely playful she even climbed a tree.*

_____ nostalgic (longingly remembering, longing) *It was a nostalgic moment, when all the memories from my grandmother came to my mind.*

_____ sad (unhappy, depressed) *Sad farewells at the end of the day.*

11. How is this woman feeling? (Put an X next to the word that BEST fits.)



_____ hopeless (helpless, unfortunate) *With each passing day the position for poor people becomes more hopeless.*

_____ scared (fearful, afraid) *The more you know about snakes, the less scared you will be.*

_____ happy (cheerful, glad) *I am happy that we can go for playing.*

_____ angry (mad, furious) *How long do you stay angry after you've had a fight?*

APPENDIX D

Next to each sentence write a Y if you agree, or an N if you disagree.

1. It makes me sad to see a girl who can't find anyone to play with. _____
2. People who kiss and hug in public are silly. _____
3. Boys who cry because they are happy are silly. _____
4. I really like to watch people open presents, even when I don't get a present myself. _____
5. Seeing a boy who is crying makes me feel like crying. _____
6. I get upset when I see a girl being hurt. _____
7. Even when I don't know why someone is laughing, I laugh too. _____
8. Sometimes I cry when I watch TV. _____
9. Girls who cry because they are happy are silly. _____
10. It's hard for me to see why someone else gets upset. _____
11. I get upset when I see an animal being hurt. _____
12. It makes me sad to see a boy who can't find anyone to play with. _____
13. Some songs make me so sad I feel like crying. _____
14. I get upset when I see a boy being hurt. _____
15. Grown-ups sometimes cry even when they have nothing to be sad about. _____
16. It's silly to treat dogs and cats as though they have feelings like people. _____
17. I get mad when I see a classmate pretending to need help from the teacher all the time. _____
18. Kids who have no friends probably don't want any. _____
19. Seeing a girl who is crying makes me feel like crying. _____
20. I think it is funny that some people cry during a sad movie or while reading a sad book. _____
21. I am able to eat all my cookies even when I see someone looking at me wanting one. _____
22. I don't feel upset when I see a classmate being punished by a teacher for not obeying school rules. _____

APPENDIX E



UNIVERSITY OF ARKANSAS

November 14, 2012

MEMORANDUM

TO: Emese Maroti
Elizabeth Margulis

FROM: Ro Windwalker
IRB Coordinator

RE: New Protocol Approval

IRB Protocol #: 12-10-177

Protocol Title: *CEPM*

Review Type: EXEMPT EXPEDITED FULL IRB

Approved Project Period: Start Date: 11/14/2012 Expiration Date: 11/08/2013

Your protocol has been approved by the IRB. Protocols are approved for a maximum period of one year. If you wish to continue the project past the approved project period (see above), you must submit a request, using the form *Continuing Review for IRB Approved Projects*, prior to the expiration date. This form is available from the IRB Coordinator or on the Research Compliance website (<http://vpred.uark.edu/210.php>). As a courtesy, you will be sent a reminder two months in advance of that date. However, failure to receive a reminder does not negate your obligation to make the request in sufficient time for review and approval. Federal regulations prohibit retroactive approval of continuation. Failure to receive approval to continue the project prior to the expiration date will result in Termination of the protocol approval. The IRB Coordinator can give you guidance on submission times.

This protocol has been approved for 40 participants. If you wish to make *any* modifications in the approved protocol, including enrolling more than this number, you must seek approval *prior to* implementing those changes. All modifications should be requested in writing (email is acceptable) and must provide sufficient detail to assess the impact of the change.

If you have questions or need any assistance from the IRB, please contact me at 210 Administration Building, 5-2208, or irb@uark.edu.