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The Effect of Ear-Training Approach on Music-Evoked Emotions and Music Liking

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Abstract

In this study, we examined differences in music-evoked emotions and music liking between two approaches to teaching ear-training in music school. Participants were 423 pupils (60% female; M_{age} = 10.55 years, SD_{age} = 0.92) in the third grade. In two ear-training lessons prepared either by the standard (STA) or the multimodal and interdisciplinary cognitive-emotional approach (CEA), pupils listened to a 2-minute excerpt from the 4th movement (Allegro con fuoco) of the Symphony no. 9 in E minor, Op. 95 ("From the New World") by Antonín Dvořák. The Geneva Emotional Music Scale (GEMS-9, Zentner et al., 2008) was translated and adapted to measure music-evoked emotions. Pupils also reported their music liking. In this study, the original three-factor structure of the GEMS-9 was not replicated, and instead a two-factor solution with factors labelled Activation and Calmness emerged. The results showed that in both groups the music evoked moderate to moderately high Activation and low Calmness. Pupils reported high music liking, however, those who participated in the CEA liked the music more than those who participated in the STA. The listening activities that enrich children's experiences of classical music in the classroom are discussed.

Keywords: music-evoked emotions, liking, ear-training, music school, children

Introduction

Exposure to music and the experience of listening to music in everyday situations shapes children's ability to recognise emotions conveyed by music and affects their emotional responses to music. The ability to identify emotions in music

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increases with age (Dalla Bella et al., 2001; Schubert & McPherson, 2015), and it stabilises by the age of 10–11 (Hunter et al., 2011; Vidas et al., 2018). A study comparing the identification of emotions in 1-min instrumental excerpts from Wagner's operas by 7- to 10-year-olds without musical training, adult musicians, and adult non-musicians, showed that children's responses did not differ from those of adult non-musicians (Andrade et al., 2017). In a recent study by Commodari and Sole (2020), 12- and 13-year-olds recognised simple, multiple, and mixed emotions in the music they listened to. Research also showed that music training was positively related to recognising emotions expressed in music (Castro & Lima, 2014). Accordingly, students who had experienced classical music emotionally in the past identified emotions expressed by classical music more accurately compared to students without such experiences (Woody & Burns, 2001).

Studies about music-induced emotions were predominantly conducted with adults, and children were rarely included as participants (Hallam, 2010; Plate et al., 2022). However, some examples can be highlighted. In a study by Plate et al. (2022), 5-6-year-olds were asked to listen to calm, sad, and scary music excerpts and to complete two tasks afterwards: to recognise the emotions conveyed in the music and to respond how the music made them feel. The results showed that recognition accuracy was above chance, as was the coincidence between music-evoked emotions and intended emotions. Herbert and Dibben (2018) asked 10-18-year-olds to write down their impressions (feelings, stories, pictures, etc.) while listening to music excerpts, demonstrating that younger listeners (10-12-year-olds) reported higher involvement in the music and music-evoked emotions. Other studies showed that classical music induced stronger emotions in children who previously experienced music-evoked emotions (Woody, 2004). Also, if an unfamiliar music piece evokes emotion(s) in a child listener, the probability that the child will like the piece during subsequent listening will increase (Woody, 2022).

Self-Reports About Music-Evoked Emotions

For pre-schoolers, pictorial scales can be used to examine the recognition of emotions conveyed in the music, and to assess how the music makes them feel (e.g., Dalla Bella et al., 2001; Mote, 2011; Plate et al., 2022). For older children, self-reports and open-ended questions can be used (Herbert & Dibben, 2018; Rodriguez & Webster, 1997).

Standardised self-report measures were developed to reliably assess the nature and specificities of music-evoked emotions (Coutinho & Scherer, 2017), given that nuanced vocabulary and taxonomy are needed to examine emotions elicited by music (Zentner et al., 2008). For example, joy induced by music is often related to the tendency to dance, which is unlike the common meaning of joy. On the other hand, sadness induced by music is not related to the aversive aspects of sadness that occur in everyday contexts. Listeners often enjoy listening to music that makes them feel

sadness (Sachs et al., 2021; Vuoskoski & Eerola, 2017). Finally, other unpleasant emotions (e.g., guilt, shame, jealousy, disgust, contempt, embarrassment, anger, and fear) are only rarely experienced in response to music (Juslin & Laukka, 2004; Zentner et al., 2008).

Zentner et al. (2008) developed a domain-specific model of music-evoked emotions and constructed the Geneva Emotional Music Scale (GEMS). GEMS measures the subjectively experienced feelings that arise when listening to music. It consists of 45 items representing emotions with observable behavioural or physiological manifestations and emotional states that do not necessarily have overt expressions, but nevertheless represent typical reactions to music (e.g., filled with wonder, mellowed, sentimental, agitated). The model consists of nine music-relevant dimensions of emotional experience, i.e. Wonder, Transcendence, Tenderness, Nostalgia, Peacefulness, Power, Joyful Activation, Tension, and Sadness. In addition to the nine primary factors, a higher level of organisation consisting of second-order factors can be used. In the three-factor solution, the first factor – Sublimity, includes Wonder, Transcendence, Tenderness, Nostalgia, and Peacefulness, the second factor – Vitality, includes Activation and Power, and the third factor – Unease, includes Tension and Sadness. Two shorter versions of the scale are also available, one containing 25 items, and the other containing 9 items. In a study by Zentner et al. (2008), the domain-specific model was shown to be more appropriate for measuring music-induced emotions than the basic and dimensional emotion models (for different findings, see Vuoskoski & Eerola, 2011).

The scale was translated and validated in several languages (e.g., Chełkowska-Zacharewicz & Janowski, 2021; Vuoskoski & Eerola, 2011). The consistencies that can be observed in different studies suggest that is applicable to be used with listeners of different ages (Pearce & Halpern, 2015) and in different music-listening contexts, including laboratory settings and live performances (e.g., Balteş & Miu, 2014; Coutinho & Scherer, 2017). However, the original three-factor structure was not always replicated (e.g., Aljanaki et al., 2016), and other solutions were also reported (e.g., Vuoskoski & Eerola, 2011). In studies that reported the original three-factor solution, the reliability of the Unease factor was low (e.g., Sachs et al., 2021), which also suggests that other factor-solutions may be more appropriate.

More recently, Coutinho and Scherer (2017) constructed the GEneva Music-Induced Affect Checklist (GEMIAC) to extend and complement the GEMS. This is a brief instrument containing 14 classes of feelings (filled with wonder/amazed, moved/touched, enchanted/in awe, inspired/enthusiastic, energetic/lively, joyful/wanting to dance, powerful/strong, full of tenderness/warmhearted, relaxed/peaceful, melancholic/sad, nostalgic/sentimental, indifferent/bored, tense/uneasy, and agitated/aggressive). Some of the classes were adapted from GEMS, and others that can be relevant for experiencing emotions as a response to listening to music were added. One example of the factor structure reported for emotions evoked by attending live performances suggested a three-factor solution,

which included factors labelled Positive Energy, Discomfort, and Wistful (O'Neil & Egerman, 2022).

For this study, the shorter instrument, GEMS-9, was translated to Croatian and adapted for use with children in classroom settings, where data have to be collected in a very short period of time.

Factors Related to Music-Evoked Emotions

It is well-documented that musical features (e.g., tempo, mode, loudness, complexity) and musical expressivity can influence music-induced emotions (e.g., Chen et al., 2020; Juslin et al., 2015). For example, happiness can be evoked by fast music in a major mode, and sadness by slow music in a minor mode (Ladinig & Schellenberg, 2012). Other factors related to music-evoked emotions include gender, familiarity with music, music liking, interest in the music being listened to, music expertise, the context in which music is being listened to, and contextual information about the music being listened to.

Gender differences in emotional reactions to (classical) music can be found in studies with adults. For example, in a study examining music-evoked emotions during a live opera performance of Puccini's Madama Butterfly, females felt more Unease and less Vitality measured with the GEMS than males (Balteş & Miu, 2014). In a study where emotional responses to 4-min excerpts of two Zelenka's pieces were examined, females reported stronger emotional reactions evoked by extra-musical features such as memories or mental images (Kiernan et al., 2022). Other studies did not find gender differences (e.g., Balteş et al., 2011; Vuoskoski & Eerola, 2012). Similarly, studies that examined emotional reactions in children did not find gender differences (Herbert & Dibben, 2018; Plate et al., 2022), although girls tend to more frequently listen to music emotionally or use music for mood regulation (e.g., Leipold & Loepthien, 2015; Saarikallio, 2008).

Familiarity with or repeated exposure to music can be beneficial for the liking of a piece of music (Madison & Schiölde, 2017), and liking can be related to experiencing emotions during listening (Freitas et al., 2018; Ladinig & Schellenberg, 2012; Witvliet & Vrana, 2007). Brattico et al. (2016) showed that emotion induction ratings were higher for music that participants liked. In addition, studies have highlighted that familiarity is a crucial factor influencing emotional engagement with music (Pereira et al., 2011; van den Bosch et al., 2013). A recent study by Fuentes-Sánchez et al. (2022) confirmed that musical preference and familiarity were positively correlated; however, they also showed that musical preference was the most important predictor of emotional responses. Kiernan et al. (2022) showed that interest in the musical style of the musical excerpt heard leads to increased emotional reactions related to musical aesthetics, expectancies, and induced memories and associations. At the same time, responses related to anxiety, fright, sadness, peace, and calm decreased.

Music expertise is also related to experiencing emotions during listening to music, and studies have shown that professional musicians experience more intense music-related emotions than amateurs and non-musicians (Kantor-Martynuska & Horabik, 2015; Mikutta et al., 2014). Emotional responses to music are influenced by the context in which the music is being listened to (Cotter et al., 2019). Listening to music within a group of listeners can facilitate specific emotions such as happiness, pleasure, and admiration (Juslin et al., 2008; Liljeström et al., 2013). On the other hand, listeners more often reported crying to music in solitude (Hanser et al., 2022).

Contextual information about the music being listened to, given in the programme notes, narrative descriptions of the music's original context or within the teaching context, can affect experiences during listening to music (Balteş et al., 2011; Kiernan et al., 2022; Vuoskoski & Eerola 2015). In the school context, if the learning activities are stimulating, liking of classical music can increase (Kährik et al., 2012). Similarly, more pupils reported liking the music when the listening context was broadened with biographical information about the composers, discussions about the circumstances in which the pieces were composed, storytelling, and other engaging activities (Vidulin & Plavšić, 2020). In music education, activities such as singing, playing, dancing, implementation of drama elements, and using multimedia, can increase emotional reactions to music (Fortuna & Nijs 2020; Woody 2004). Somewhat more pronounced music-evoked emotions were observed in 10-11-year-olds who participated in the multimodal and interactive approach to music listening known as the cognitive-emotional approach (CEA, Vidulin et al., 2020) implemented in Croatian general schools. Namely, musical and extra-musical activities increased pupils' active engagement during music lessons dedicated to different music pieces (e.g., Masquerade, Waltz by Khachaturian, or Wellington's Victory by Beethoven), and resulted in stronger pleasant and weaker unpleasant music-evoked emotions (Vidulin et al., 2019).

Overview of the Study

In this study, we examined music-evoked emotions and music liking in children participating in ear-training based on two approaches. The study was conducted in the third grade of music school. We have chosen this context because children who attend music school are more in contact with classical music than children who attend only general school. Within the music school context, children play and sing classical music and sometimes listen to it during classes. They report a greater preference for art music and attend more art music concerts than children who do not attend music school (Šulentić Begić & Begić, 2022). Third graders in Croatian music schools are about 10–11 years old, although the age range in music school classes can be broader than in general school classes.

Two groups of children participated in the study. One group attended ear-training lessons where the standard approach (STA) to teaching was used, and the

other attended ear-training lessons where the CEA adapted for ear-training (Vidulin & Kazić, 2021) was used. In Croatian schools, ear-training lessons are aimed at the development of musical skills through auditory activities that include rhythmic contents, theoretical musical contents (intervals and chords), elements of musical forms, listening to music, and musical creativity (Curricula for primary music schools and primary dance schools [Nastavni planovi i programi za osnovne glazbene škole i osnovne plesne škole], 2006). The main goal of ear-training is achieving musical literacy, and the development of musical hearing is an important outcome. Listening to music is rarely implemented in the standard ear-training classes, although traditional and children's songs, as well as examples from musical literature, are sometimes included in the lesson. When the listening activity is implemented in the lesson, it is mostly analytical and related to musical elements as part of the content of the teaching unit.

The CEA involves music listening as an activity that occurs several times during one lesson, and it is used as a means for achieving the learning outcomes defined in the curriculum. During cognitive-emotional music listening, pupils have the opportunity to experience music, as well as to learn about musical components and master relevant ear-training skills through different tasks and multimodal activities related to the music piece listened to. Besides cognitive tasks, emotional tasks are also included so that children get to know the piece of music from multiple perspectives (Vidulin & Kazić, 2021). Both convergent and divergent listening is encouraged so that the experience can be meaningful for the listener. In general, repeated listening to music is a key factor for increasing familiarity (Conrad et al., 2019; Margulis, 2014), and broadening the listening context with relevant information can enhance attentive listening and increase likeliness that the information about the music will be remembered (Margulis et al., 2015). Various activities that enrich the listening context can result in stronger sensitivity, enjoyment, and/or emotionality during listening (e.g., Anderson, 2016; Johnson, 2020; Kratus, 2017). The CEA is implemented in ear-training to develop and improve pupils' (musical) competencies, together with experiencing and understanding music more intensively (Vidulin & Kazić, 2021).

In two subsequent music lessons, pupils listened to the 4th movement (Allegro con fuoco) of the Symphony no. 9 in E minor, Op. 95 ("From the New World") by Antonín Dvořák. Considering the musical characteristics of the piece, it could be expected that the piece would elicit feelings of power, tension, and wonder. Power could be elicited by the strong-sounding theme that is sharp and contains notes of longer durations that give stability, and a punctuated rhythm that confirms the forcefulness of the piece. Tension could be evoked because, until the very ending of the theme, it is difficult to predict when and how it will (musically) end. Wonder could occur because parts are alternating and complementing each other from the beginning to the end of the theme and/or excerpt. Although contrasting, the parts form an extremely melodious and harmonious whole. The induction of emotions,

especially tension and surprise, may be (further) encouraged by the articulation of the music lesson. Namely, as part of the CEA, activities that broaden the music listening context are used to increase pupils' interest in the music piece.

The aim of the study was to examine the effects of the lessons (first, second) and didactical approach implemented in the ear-training (STA, CEA), as well as their interaction on music-evoked emotions and music liking. We hypothesised that both music-evoked emotions and music-liking would be influenced by the lesson and the didactical approach to ear-training. We expected that higher music liking and stronger emotions, assumed to be evoked by the piece, would occur in the CEA, especially in the second lesson.

Method

Participants

Four hundred twenty-three third graders at music schools (60% female; age range 8-14 years, M = 10.55 years, SD = 0.92) participated in the study. The notice about the study was given at the Intercounty Music Theorists Council and all interested ear-training teachers could apply for the research. Seventeen teachers from 14 music schools (two from Zagreb, and one from Čakovec, Karlovac, Koprivnica, Labin, Marija Bistrica, Osijek, Pula, Rijeka, Sesvete, Slavonski Brod, Valpovo and Varaždin, respectively) applied. The study was conducted during the first semester of the 2021/2022 school year.

In Croatian music schools, each class has at least two groups – one in the morning and the other in the afternoon shift, and both groups are taught by the same teacher. For the purpose of this research, one group within the same class was experimental (CEA), and the other was the control group (STA). This ensured an equal distribution of children in two conditions (CEA, STA) within each school and, consequently, in the total sample. About half of the participants attended two CEA lessons (first lesson n = 202, 57% female; second lesson n = 177, 57% female), and the other half attended two STA lessons (first lesson n = 187, 64% female; second lesson n = 175, 67% female). Differences in the number of participants that attended both lessons arise from the usual fluctuations of children's attendance at school, which were somewhat intensified due to COVID-19 restrictions. Group sizes for both conditions varied from 5 to 25 pupils (M_{CEA} = 13.44, SD_{CEA} = 5.84, Mdn_{CEA} = 11.5; M_{STA} = 12.94, SD_{STA} = 5.89, Mdn_{STA} = 12), depending on the class size in each school. Classes of such sizes are common in Croatian music schools.

Pupils' parents signed an informed consent form before their children participated in the study. Consents for the research were also obtained from school principals, the Croatian Ministry of Science and Education, as well as the Research Ethics Committee at the Juraj Dobrila University of Pula, Croatia.

Materials

Music. The 2-minute excerpt from the 4th movement (Allegro con fuoco) of the Symphony no. 9 in E minor, Op. 95 ("From the New World") by Antonín Dvořák was listened to in both music lessons. This symphony is Dvořák's last and best-known symphony (Döge, 2006). It is characterised by the richness of melody and contains themes inspired by the Native American musical culture intertwined with the Czech folk motifs (Andreis, 1989). The 4th movement brings a recognisable theme in brass instrumentation, pleasant-sounding melodies, and expressive rhythms that alternate and complement each other. All pupils indicated that they were not familiar with the piece.

The Geneva Emotional Music Scale (*GEMS-9*, Zentner et al., 2008) was used to assess music-induced emotions to the piece of music listened to. The 9-item version of the scale consists of primary factors (e.g., Wonder, Joyful Activation, Tension) and each factor is described by several emotion adjectives (example item: *Joyful Activation: joyful, amused, animated, bouncy*). The scale was independently translated by two authors of this paper and adapted to be appropriate for school age. Disagreements in the translations were discussed and both authors agreed on the final version that was back-translated to English by an independent translator. Participants rated each item by responding how the music made them feel using a 5-point scale (1 = *not at all*, 2 = *somewhat*, 3 = *moderately*, 4 = *quite a lot*, 5 = *very much*). The factor structure of the GEMS-9 was examined for data collected during two lessons.

For data collected in the first lesson, a principal axis factor analysis with Oblimin rotation was conducted on nine items of the GEMS-9. The Kaiser–Meyer–Olkin measure verified the sampling adequacy for the analysis, KMO = .73, and all KMO values for individual items were greater than .51. The analysis showed that two factors had eigenvalues over Kaiser's criterion of 1 and together explained 37.10% of the variance. One factor comprised emotions of Wonder, Transcendence, Power, Joyful Activation, and Tension. The other factor comprised emotions of Tenderness, Nostalgia, Peacefulness, and Sadness. We termed the factors Activation and Calmness, respectively. The observed factor structure did not replicate the originally reported solution (Zentner et al., 2008). The correlation between factors was weak and positive, $r = .12$, $p = .027$. The reliabilities were acceptable, with $\alpha = .73$ for Activation and $\alpha = .64$ for Calmness. Factor loadings are shown in Table 1.

For data collected in the second lesson, the same analysis was conducted to check if the factor structure was replicated. The Kaiser–Meyer–Olkin measure verified the sampling adequacy for the analysis, KMO = .76, and all KMO values for individual items were greater than .61. The analysis showed that two factors had eigenvalues over Kaiser's criterion of 1 and together explained 42.66% of the variance. The factor structure was consistent with the one obtained in the first lesson when GEMS-9 was administered for the first time. The correlation between factors was again weak and positive, $r = .11$, $p = .048$, and the reliabilities were similar as

reported for the first lesson, with α = .76 for Activation and α = .69 for Calmness. Factor loadings are shown in Table 1.

Table 1

Factor Loadings of the Pattern Matrices for the GEMS-9 Administered During Two Lessons

Item	Factor loadings			
	Lesson 1		Lesson 2	
	F1	F2	F1	F2
Wonder (cro. *Iznenađenje*)	.644	.134	.608	.124
Transcendence (cro. *Uzvišenost*)	.576	.130	.602	.145
Power (cro. *Snaga*)	.802	-.086	.821	-.078
Tenderness (cro. *Nježnost*)	.090	.659	.039	.807
Nostalgia (cro. *Nostalgija*)	.083	.531	.060	.590
Peacefulness (cro. *Smirenost*)	-.087	.742	-.160	.676
Joyful activation (cro. *Vesela pobuđenost*)	.573	.114	.714	-.020
Sadness (cro. *Tuga*)	-.007	.244	.045	.331
Tension (cro. *Napetost*)	.418	-.202	.519	-.094

Music liking was assessed using a two-item scale consisting of the items *How much did you like the music?* and *How much were you immersed in music while listening to it?* Participants gave their ratings on a scale ranging from 1 (*not at all*) to 5 (*completely*). The Spearman-Brown reliability coefficients appropriate for two-item scales (Eisinga et al., 2012) were ρ = .76 for the first lesson, and ρ = .75 for the second lesson.

Lesson plans. Two ear-training lessons were conducted. Lesson plans were made for purposes of the research. The teachers that applied for the study received detailed written instructions about the lessons from the researchers and were asked to follow the instructions strictly. The lessons are described shortly below. Comprehensive lesson plans in Croatian for the CEA are available in Vidulin (2023), and those for the STA are available upon request from the second author. Each lesson consisted of an introductory, central, and final part.

The first lesson concerned the E natural minor scale. In the STA, at the beginning of the lesson, the E natural minor scale was introduced. In the central part of the lesson, pupils wrote a melo-rhythmic dictation with the theme from the 4th movement "From the New World". In the final part of the lesson, pupils listened to the 2-minute excerpt from the 4th movement "From the New World" and were given basic information about the piece and the composer.

In the CEA lesson, pupils first listened to the excerpt. The first listening was followed by a conversation about the piece and the pupils' experiences. In the central part, pupils learned more about the composer and broadened the discussion, after which they sang Dvořák's theme by ear, analysed the melody, and established the E natural minor scale. In the central part, the excerpt was listened to again twice and

the context was further broadened by analyses of the formal structure of the piece and a discussion about music-evoked emotions. In the final part of the lesson, the pupils listened to the piece once more.

The second lesson focused on rhythmic elements and duration. In the introductory part of the lesson based on the STA pupils repeated the scale and sang the theme that they learned in the previous lesson. The central part was dedicated to mastering the rhythm of the theme by performing several rhythmic activities (e.g., rehearsing the rhythm by clapping). The next activity consisted of writing a rhythmic dictation and performing it. The final part of the lesson was the same as in the first lesson, i.e. pupils listened to the same excerpt and repeated basic information about the piece and the composer.

In the CEA lesson, pupils first listened to the excerpt followed by a discussion about recognition of the piece, its musical elements, and the emotions that it both expresses and elicits. The central part was dedicated to broadening the discussion about the context in which the piece was composed. The second listening, enriched with activities related to recognising the theme and determining the emotions the piece conveyed, was followed by mastering the rhythm of the theme by performing several rhythmical activities, which led to creative outcomes. The final part of the lesson was dedicated to repeating what has been learned (e.g., information about the composer, rhythmical elements, and durations). Finally, the pupils listened to the excerpt and performed the rhythm upon hearing the theme.

Procedure

Pupils attended two music lessons – the first one was about the E natural minor scale, and the other was about rhythmic elements and duration. The order of the lessons was fixed, and they were held one week apart. One group of children attended CEA lessons, and the other attended STA lessons. Pupils were not informed about the two approaches being implemented. The researchers had no contact with the pupils, only with the teachers. The same teachers taught both versions of the lessons (CEA, STA), one version for each group of the same class. Each lesson lasted for 45 minutes, and 15 extra minutes were devoted to filling out the questionnaires. Immediately after listening to the music piece in the final part of both lessons, the pupils responded how the music made them feel by giving ratings in the GEMS-9, after which they filled out the short questionnaire about music liking. In both lessons they proceeded to answer questions about demographic data, share their experiences regarding the attended lesson and fill out the short knowledge test. Data about experiences regarding the lessons and knowledge tests will be reported elsewhere.

Results

The results are presented in two sections. In the first section, descriptive data and correlational analyses are shown. The effects of the lessons and ear-training approach on music-evoked emotions and music liking are presented in the second section. The analysis of skewness and kurtosis revealed that all distributions were approximately normal or within the accepted range of ±2 (George & Mallery, 2019; Hair et al., 2022). Gender differences were tested as part of preliminary analyses and were not found in any (sub)scale ($ts < 1.61$, $ps > .05$).

Descriptive Data and Correlational Analyses

Descriptive data for music liking and music-evoked emotions in two lessons conducted using two different ear-training approaches (CEA, STA) are shown in Table 2. Pupils in both approaches and in both lessons liked the music piece they had listened to. In both approaches and in both lessons, Activation evoked by the music was moderate to moderately high, and Calmness was evoked only weakly.

Table 2

Descriptive Data for Music-Evoked Emotions and Music Liking in Two Ear-Training Lessons based on the CEA and the STA

		CEA			STA		
		N	*M*	*SD*	*N*	*M*	*SD*
Lesson 1	Music liking	202	4.37	0.73	187	4.06	0.91
	Activation	189	3.77	0.83	173	3.55	0.88
	Calmness	188	2.19	0.85	166	2.21	0.89
Lesson 2	Music liking	176	4.39	0.75	175	4.20	0.76
	Activation	170	3.66	0.96	168	3.60	0.88
	Calmness	162	2.18	0.94	163	1.96	0.75

Note. CEA = cognitive-emotional approach; STA = standard approach.

Correlations between music liking and music-evoked emotions were calculated separately for the two ear-training approaches and are shown in Table 3. Moderate positive correlations were observed for the same measures in two consecutive music lessons, showing that pupils' responses were consistent. Similar patterns of relationships between music liking and music-evoked emotions were observed for both lessons using the two ear-training approaches. Music liking was moderately positively related to Activation in both ear-training approaches and in both lessons, while the only significant low positive correlation with Calmness was observed for the second CEA lesson.

Table 3

Correlations between Music Liking and Music-Evoked Emotions in Two Ear-Training Lessons based on the CEA (Above Diagonal) and the STA (Below Diagonal)

	1	2	3	4	5	6
1. Music liking (Lesson 1)		.54**	.09	.67**	.54**	.15
2. Activation (Lesson 1)	.57**		.10	.47**	.64**	.15
3. Calmness (Lesson 1)	.09	.15		.07	.01	.65**
4. Music liking (Lesson 2)	.54**	.38**	.04		.64**	.16*
5. Activation (Lesson 2)	.41**	.59**	.06	.57**		.12
6. Calmness (Lesson 2)	.09	.07	62**	.09	.09	

Note. $^{*}p < .05$; $^{**}p < .01$.

The Effects of Lessons and Ear-Training Approach on Music-Evoked Emotions and Music Liking

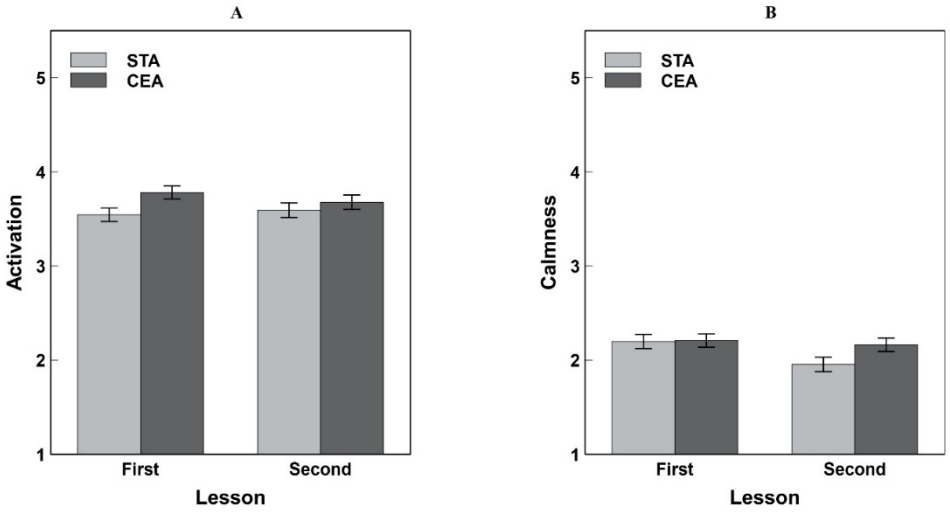
To examine the effects of music lessons and ear-training approach on emotions evoked by music, we performed two two-way mixed ANOVAs with the lessons (first, second) as a repeated measure factor and ear-training approach (CEA, STA) as a between-subjects factor.

For Activation, neither the main effects of the lessons, $F(1, 283) = 0.38$, $p = .538$, $\eta_p^2 = .001$, the ear-training approach, $F(1, 283) = 2.99$, $p = .085$, $\eta_p^2 = .010$, nor their interaction, $F(1, 283) = 2.73$, $p = .100$, $\eta_p^2 = .010$, reached significance. Contrary to the hypothesis, Activation induced by the music did not differ with regard to the ear-training approach ($M_{CEA} = 3.73$, $SE_{CEA} = 0.07$; $M_{STA} = 3.57$, $SE_{STA} = 0.07$) or music lessons ($M_{L1} = 3.66$, $SE_{L1} = 0.05$; $M_{L2} = 3.64$, $SE_{L2} = 0.05$). The results are shown in Figure 1A.

For Calmness, the main effect of the ear-training approach was not significant, $F(1, 267) = 1.34$, $p = .249$, $\eta_p^2 = .005$. There was a significant main effect of the lessons, $F(1, 267) = 10.36$, $p = .001$, $\eta_p^2 = .037$, and a significant lesson x approach interaction, $F(1, 267) = 5.00$, $p = .026$, $\eta_p^2 = .018$. Duncan's post hoc test revealed that, for the CEA, Calmness reported in the first ($M = 2.21$; $SE = 0.07$) and in the second lesson ($M = 2.16$; $SE = 0.07$) did not differ. For the STA pupils reported weaker Calmness after listening to music in the second lesson ($M = 1.96$; $SE = 0.08$) compared to the first lesson ($M = 2.20$; $SE = 0.08$), $p < .001$. The results are shown in Figure 1B.

Figure 1

Music-Evoked Emotion, (A) Activation and (B) Calmness, in Two Ear-Training Lessons based on the STA and the CEA

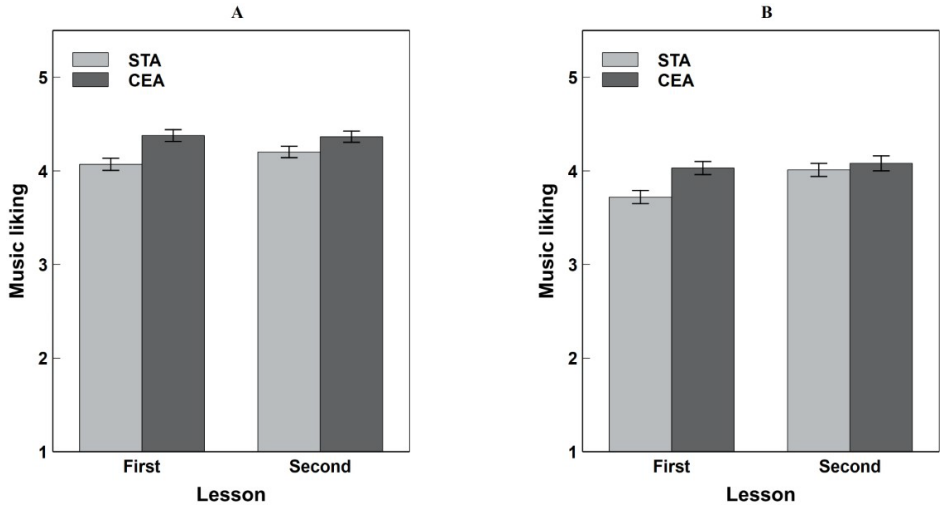


To examine the effects of music lessons and ear-training approach on music liking, we performed a two-way mixed ANOVA with the lessons (first, second) as a repeated measure factor and the ear-training approach (CEA, STA) as a between-subjects factor. There was a significant main effect of the ear-training approach, $F(1, 317) = 8.94$, $p = .003$, $\eta_P^2 = .027$. As expected, pupils who attended the CEA ($M = 4.37$; $SE = 0.06$) liked the music more than pupils who attended the STA ($M = 4.14$; $SE = 0.06$). Contrary to expectations, the main effect of the lessons, $F(1, 317) = 2.26$, $p = .134$, $\eta_P^2 = .007$, did not reach significance, and neither did the lesson x ear-training approach interaction, $F(1, 317) = 3.28$, $p = .071$, $\eta_P^2 = .010$. The results are shown in Figure 2A.

A total of 101 pupils (STA $n = 43$, CEA $n = 58$) gave the highest possible rating of liking in the first lesson. In an additional two-way mixed ANOVA, we focused on pupils who did not give the highest rating in the first lesson, to further examine the expected positive effect of repeated exposure to music on liking. The main effects of the lessons, $F(1, 216) = 10.46$, $p = .001$, $\eta_P^2 = .046$, and the ear-training approach, $F(1, 216) = 4.60$, $p = .033$, $\eta_P^2 = .021$, as well as their interaction reached significance, $F(1, 216) = 5.84$, $p = .016$, $\eta_P^2 = .026$. Duncan's post hoc test revealed that pupils who attended the STA reported liking the music more in the second ($M = 4.01$; $SE = 0.07$) than in the first lesson ($M = 3.72$; $SE = 0.07$; $p < .001$). On the other hand, there was no difference in music liking in pupils who attended the CEA ($M_{L1} = 4.03$; $SE_{L1} = 0.07$; $M_{L2} = 4.08$; $SE_{L2} = 0.08$; $p = .563$). When compared to the STA, they liked the music more in the first lesson ($p = .015$). The results are shown in Figure 2B.

Figure 2

Music Liking for the (A) Total Sample and (B) Subsample in Two Ear-Training Lessons based on the STA and the CEA



Discussion

Music-evoked emotions are rarely examined in children (Hallam, 2010; Plate et al., 2022) and this study adds to the literature by examining emotions conveyed by classical music in children attending music school. Listening experiences, including music-evoked emotions and music liking, were compared between two ear-training approaches, one being predominantly cognitively or analytically oriented and the other being a recently developed multimodal and interdisciplinary cognitive-emotional approach.

Activation and Calmness Evoked by the Music

To measure music-evoked emotions, GEMS-9 (Zentner et al., 2008) was translated and adapted to be appropriate for school-aged children. The obtained factor solution is different from the three-factor solution proposed by the authors of the scale, with dimensions of Sublimity, Vitality, and Unease. In this study, two factors emerged, labelled Activation and Calmness. Activation included emotions of Wonder, Transcendence, Power, Joyful Activation, and Tension (i.e. two emotions from the original Sublimity and Vitality factors, and one from the Unease factor). Calmness included emotions of Sadness, Nostalgia, Peacefulness, and Tenderness (i.e. three emotions from the Sublimity and one from the Unease factor). Other studies showed that participants frequently reported the latter four feelings to be

evoked by sad music (Taruffi & Koelsch, 2014) or experienced Sadness, Nostalgia, and Peacefulness as a response to listening to sad music (Vuoskoski et al., 2012). The reported results confirm that Sadness, Nostalgia, Peacefulness, and Tenderness can be linked in response to music. Other studies also suggested that different factor solutions from the one originally reported may be more appropriate, depending, for example, on the music being listened to (Aljanaki et al., 2016; Vuoskoski & Eerola, 2011).

As expected, the 4th movement "From the New World" induced moderate to moderately high Activation. Feelings of power, tension, and wonder expected to be evoked by the music are part of the Activation dimension. Contrary to our expectations, children attending the CEA lessons did not report stronger Activation in comparison with children attending the STA lessons. The sensitivity of music school children to the characteristics of classical music could be the reason for the observed result given that the music piece conveys such expressivity. On the other hand, Calmness was evoked only somewhat in all children; however, pupils participating in the STA reported less Calmness after listening to the music in the second lesson.

Somewhat different results were observed in the general school context, where emotional responses to several music pieces (Masquerade, Waltz by Khachaturian, Wellington's Victory by Beethoven, Scheherazade, The Sea and Sindbad's Ship by Rimsky-Korsakov, and Pavane by Fauré) were also examined in music lessons according to the STA and the CEA. Music lessons in which the listening activity was based solely on the cognitive paradigm usually implemented in the STA (including recognising musical components such as dynamics, tempo, character/mood, pitch, melody, rhythm, performers, musical forms, etc.), weakly or moderately elicited emotions as a response to the music pieces listened to. When musical (e.g. singing, playing instruments) and extra-musical elements (e.g. historical background of the music piece, acting) were added to the cognitive elements within the CEA, listening to music induced slightly stronger joy, surprise, hope, and/or excitement, and slightly reduced anger, hatred, and/or sadness. Pupils' active engagement in multimodal activities characteristic of the CEA, which were implemented in the general school music lessons, influenced their experiences (Vidulin et al., 2019). In general, multimodality can be beneficial for different aspects of experiences in music learning contexts (Fortuna, 2017; Juntunen, 2020; Todd & Mishra, 2013). In the ear-training lessons included in the present study, engaging activities were used in both approaches. Multimodality is inevitably part of each ear-training lesson, which is different from the general school music teaching context. Also, the proneness of music school children to experience feelings during listening to classical music may be different in comparison to their peers with far less music education.

An experiment with adults investigating emotional responses to an excerpt from Tosca by Puccini showed that music-evoked emotions (as well as their physiological correlates) were influenced by including multimodality in the listening conditions

(Balteş et al., 2011). Participants in the experimental group first listened to the excerpt, then read the summary of the plot, then listened to the music again, and finally listened to the excerpt for the third time while watching the recorded performance. The control group only listened to the excerpt three times. The results showed that emotional response did not change because of the repeated listening itself. On the other hand, in the experimental group, reading the plot resulted in decreased Peacefulness and Joyful Activation, and increased Sadness, while watching the performance increased Wonder and Transcendence. Broadening the listening experience with content, contextual, social-emotional, and visual cues influenced music-evoked emotions.

To date, studies that examined changes in the music-evoked emotions within multimodal contexts used different music pieces with very diverse expressivities (Balteş et al., 2011; Balteş & Miu, 2014; Scherer et al., 2019; Vidulin et al., 2020). Together with the differences that certainly emerge from specific natural circumstances where the music is being listened to, be it in school, at a concert, or at the theatre, this makes it difficult to generalise the results.

In this study, music-evoked Activation was moderately positively correlated to music liking corroborating the positive relationship between the intensity of emotional response to music and music liking observed in studies with adults (Brattico et al., 2016; Ladinig & Schellenberg, 2012; Naser & Saha, 2021).

Music Liking

In this study, pupils reported liking the 4th movement "From the New World" a lot. In general, music liking is higher for familiar music (Fuentes-Sánchez et al., 2022; Hunter & Schellenberg, 2011), and it was shown to be influenced specifically by familiarity with the musical style of the piece listened to (Madison & Schiölde, 2017). Music school children gradually become familiar with the classical music repertoire. Third graders that participated in our study initially were not familiar with this particular music piece, however, they devoted their free time to playing classical music. Although both groups of pupils involved in this study reported high levels of liking the piece, those exposed to the CEA liked it more, confirming our predictions. When further analysing music liking only for pupils who initially had not reported the highest possible level of liking, two findings emerged. In pupils participating in the STA, liking increased from the first to the second lesson, confirming the beneficial effects that repeated listening showed to have on liking (e.g. Madison & Schiölde, 2017). In pupils participating in the CEA, liking did not increase from the first to the second lesson, however, in the first lesson it was already at the same level as reported for the STA in the second lesson. The CEA familiarised pupils with the piece in a shorter time than the STA by having them listen to it multiple times. During the CEA lessons, pupils become familiar not only with the music, but also with different musical (e.g., analysis of the structure of the piece) as well as non-musical

(e.g., information about the composer and the societal context in which the piece was composed) information related to the piece (Vidulin & Kazić, 2021). Moreover, divergent listening to music was encouraged by questions directed toward pupils' unique experiences of the music (Kratus, 2017; Vidulin et al., 2022) in terms of liking and emotionality. The activities included in the CEA promote attentive listening to music that can be beneficial for music liking.

Limitations of the Study and Recommendations for Future Research

In this study, only one music piece was explored. It was intentionally chosen because of its clear expressive elements. The theme was used as a musical example of appropriate complexity for mastering ear-training skills in the third grade of music school, be it for the melodic-rhythmic dictation, an example for singing, or for performing rhythmical activities. Accordingly, music-evoked emotions observed in this study are specific for the piece listened to and its musical characteristics. Different levels of Activation and Calmness observed in the present study confirm that the Croatian adaptation of the GEMS-9 for children samples differentiates between classes of feelings evoked by music. This result also suggests that the GEMS-9 can be used as a content-reliable measure in studies concerning emotional reactions to music with children as participants. Future studies should use music pieces of different expressivities and intended emotions to further explore music-evoked emotions in children. Moreover, future studies should further explore the appropriateness of the Croatian translation of the GEMS-9 and emerging factor solutions with other examples of the Western classical repertoire as well as with other musical genres, with samples of younger and older children, adolescents, and adults. Also, comparing music-evoked emotions in children who attend and do not attend music schools would provide additional insights.

Another limitation of the present study is that we used quasi-experimental design with no random assignment of participants to one of the two experimental conditions, since it is impossible to study the effects of different ear-training approaches with a true experiment. However, to have better control over the experimental effects, about half of the pupils from each class were included in one of the two experimental conditions, and pupils in both groups were taught by the same teacher.

In this study, the number of times a piece of music was listened to was not the same for both teaching approaches. Listening to the music more than once in the STA lessons would violate the structure of the ear-training teaching typically carried out in Croatian music schools. We wanted to preserve the coherence of the teaching for each approach. The idea behind the CEA was to broaden children's learning experience by either changing, adding, or removing some of the elements that are typical for the STA. The CEA and STA do share some common elements: they provide an explanation about the topic, they involve practice, and listening to the

music excerpt. The differences are that STA involves more practice (more examples), while the CEA includes listening to the same music excerpt more than once, talking about the emotions and reflections that the music induced, as well as talking about the composer. Therefore, different results arising from the implementation of these two approaches cannot be ascribed to a single element, but rather to various elements and their mutual interaction.

The multitude of listening could have influenced the results in that it further increased the music liking and enhanced the emotionality in the group that was exposed to the music more than once. At the same time, higher liking was indeed obtained with the CEA, but not a stronger emotional experience. Future research should examine how solely repeated listening, without the characteristics of cognitive-emotional listening (which would correspond to the STA with an enhanced listening component), affects children's experiences. Also, discussing emotions as part of the CEA could enhance emotional experience, but the results showed that Activation reported by the pupils did not differ between the two approaches. A future direction for research could be testing the long-term effects of the CEA approach. So far, the single or double implementation of a new didactic approach yielded some positive effects, yet these could be ascribed to novelty. It would be worth exploring the CEA's effect when implemented throughout a semester or a whole year.

Conclusions

Music school children reacted emotionally to the excerpt from the 4th movement "From the New World" that they listened to and they liked the music. Music-evoked Activation was similar for pupils attending the STA and the CEA lessons, but pupils attending the CEA lessons liked the music more. In music school, listening activities could be implemented in the lessons to enrich the learning context, and bring together rehearsing ear-training skills together with experiencing and learning about classical music. The long-term aim would be to increase the likelihood that musical competencies are improved together with the improvement of pupils' cultural and artistic worldview. Meaningful experiences can be enhanced with listening contexts that resemble natural listening situations and spark children's interest in music by participating in activities that enrich their knowledge (Johnson, 2020; Kratus, 2017; Madison & Schiölde, 2017; Vidulin et al., 2020; Vidulin & Kazić, 2021). The CEA, as well as engaging activities included in the STA (e.g., rhythmical activities related to the theme of the music piece listened to, followed by listening to the piece), can both provide such experiences. School children regularly listen to music emotionally in their free time (e.g., Leipold & Loepthien, 2015; Saarikallio, 2008), and including this type of music listening in the learning context would reduce the differences in functions that children ascribe to music listening at home and in school.

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