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Musical learning as a contributing factor in the development of socio-emotional competence in children aged 4 and 5: an Exploratory study in a naturalistic context

Helene Boucher [a], Aimee Gaudette-Leblanc [b], Julie Raymond[b] and Valerie Peters[b]

[a]Music Department, Arts Faculty, University of Quebec in Montreal, Montreal, Canada; [b]Music Faculty, Laval University, Quebec, Canada

ABSTRACT

Research has shown that young children's socio-emotional development may benefit from participating in a music programme. In this study, we explored the association between participation in a general music programme and the development of socio-emotional skills in relation to the duration of the programme. Children aged 4 and 5 (*N*=50), from a low socio-economic neighbourhood, participated in an 8- or 15-week music programme. Children's social skills development and emotion comprehension were measured. Teachers reported an increase in the social interaction and independence skills scores of the younger children and a decrease in the cooperation skills scores of the older children. Additionally, the older children showed an increase in their comprehension of emotions. The duration of the programme, however, did not yield any significant effect. Results suggest that the association between participation in a music programme and the development of social-emotional skills may be influenced by the age of the children.

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KEYWORDS
Early childhood; music programme; music learning; socio-emotional development; naturalistic context

Introduction

Social and emotional competencies are now seen as very important skills influencing several social aspects of individual and societal well-being such as education, employment and income, health, and personal well-being (Chernyshenko, Kankaraš, & Drasgow, 2018). The research findings presented here are part of a larger project entitled 'How music learning acts as a protective factor, contributing to the development of socio-emotional competence for at-risk populations' that is investigating the association between musicking and well-being in three different populations: early childhood, youth and older adults. This article addresses socio-emotional development and music in the early years.

From infancy, young children are involved in social interactions through vocalizations, smiles, gestures, and physical contact (Milijkovitch et al., 2012). In the early years, through play, children experience discussion, conflict, and negotiation (Bukowski, Buhrmester, & Underwood, 2011) and develop many social and emotional skills (Kingery, Erdley, & Scarpulla, 2020). These skills are described as the foundation for the development of social and emotional competencies that will benefit children throughout their lives (Denham et al., 2003; Kingery et al., 2020; Rose-Krasnor, 1997; Rose-Krasnor & Denham, 2009).

The model of social competence proposed by Denham, Bassett, Zinsser, and Wyatt (2014) describes social development and is represented by the Prism Theoretical Model of Social–Emotional

CONTACT Helene Boucher boucher.helene@uqam.ca Music Department, Arts Faculty, University of Quebec in Montreal, 1440, rue St-Denis, Local F-4250, Montreal, Quebec H2X 3J8, Canada

Learning, which is composed of three levels. The first level, at the bottom of the prism, presents social and emotional skills (relational skills, responsible decision making, social awareness and emotion knowledge, and self regulation) influencing the young child's ability to develop and maintain positive relationships with peers and adults (Denham et al., 2014). Social skills include being interested in playing with others, initiating and maintaining conversations, listening, waiting one's turn and asking for help, while prosocial skills include behaviours such as helping, cooperating, sharing, approaching and comforting. Emotional skills include self-awareness (identifying emotions, prosocial responsibility), social awareness (perspective-taking, understanding emotions and caring for others) as well as self-regulation (managing emotions, cognition, and behaviour). The second level of the model presents indicators of social success, either related to the *Self* (achievement of personal goals, feelings of efficacy in interaction) or to *Others* (healthy relationships with peers and adults, group status). The third theoretical level, at the top of the prism, is related to social competence, defined as the ability to effectively interact with others, to engage positively and maintain interaction, and to use socio-emotional skills with peers, parents or teachers (Rose-Krasnor & Denham, 2009, p. 163).

Being socially competent influences child development and growth (Braungart-Rieker & Planalp, 2016), academic achievement and well-being (Denham & Brown, 2010, p. 667), and predicts 'better trajectories and psychological well-being over time' (Kamper-DeMarco, Shankman, Fearey, Lawrence, & Schwartz-Mette, 2020, p. 47). On the other hand, a lack of socio-emotional skills can lead to emotional adjustment problems, as well as being associated with a wide array of psychological disorders across the lifespan (Kamper-DeMarco et al., 2020, p. 59). In this regard, different types of interventions to support children's social-emotional development have been found to be effective in different contexts including universal intervention or targeted programmes with at risk populations (Murano, Sawyer, & Lipnevich, 2020).

Given the high rates of engagement and enjoyment demonstrated by children participating in an early childhood music programme offered in disadvantaged communities (Williams & Berthelsen, 2019), and considering that joint music making encourages children to adopt social behaviours that would be useful in different social contexts (Buren, Degé, & Schwarzer, 2019), music interventions should be considered as among the educational tools to use with young children. According to parents and practitioners, participation in an early childhood music programme would be beneficial to the social-emotional development of young children (Ho et al., 2020; Pitt & Hargreaves, 2017a, 2017b; Rodriguez, 2019; Savage, 2015). Indeed, a growing body of literature suggests that music has a social role (Trehub, Weiss, & Cirelli, 2019). Results of numerous studies conclude that sharing music with children may promote emotional regulation (Corbeil, Trehub, & Peretz, 2013; Costa-Giomi & Ilari, 2014; Williams & Berthelsen, 2019), affiliation behaviours (Cirelli & Trehub, 2018; Mehr, Song, & Spelke, 2016) and prosocial behaviours (Buren et al., 2019; Cirelli, Trehub, & Trainor, 2018; Cirelli & Trehub, 2018).

Many studies have documented that the participation in an early childhood music programme has shown benefits for a child's socio-emotional development when conducted with children under 2 years of age and involving the presence of the parent (Gerry, Unrau, & Trainor, 2012; Nicholson, Berthelsen, Abad, Williams, & Bradley, 2008; Siu & Cheung, 2016; Standley, Walworth, & Nguyen, 2009; Vlismas, Malloch, & Burnham, 2013). Some studies have addressed the contribution of a music programme on 3–5 year-olds' socio-emotional development with contradicting results (Brown & Sax, 2013; Ilari, Helfter, & Huynh, 2020; Rickard et al., 2013; Ritblatt, Longstreth, Hokoda, Cannon, & Weston, 2013; Schmitt, McClelland, Tominey, & Acock, 2015; Williams & Berthelsen, 2019). Fewer studies have measured the progress of those socio-emotional skills in relation to the duration of the music programme (Ilari et al., 2020; Winsler, Ducenne, & Koury, 2011).

Ilari et al. (2020) compared participation of 3- and 4- year olds in a formal music programme for different lengths of time. They found that time spent in the music programme was positively and moderately correlated with children's willingness to share. Additionally, Williams and Berthelsen (2019) introduced a bi-weekly music intervention with children about 5 years old, for eight weeks,

and they found positive intervention effects for emotional regulation reported by teachers. Moreover, Winsler et al. (2011) found that children aged 4, who had a greater exposure to a music programme, had better self-regulation skills. The authors suggest 'some evidence of a dosage effect' (p. 291). This raises the question of frequency and duration of exposure needed to demonstrate a significant association between participating in an early childhood music programme and socio-emotional gains.

The study

The goal of this study was to document less-explored factors that could contribute to the socio-emotional development of children aged 4 and 5 in a naturalistic context (music activities introduced once a week, in a childcare centre, with the presence of the children's teachers, respecting their daily schedule). More specifically, the study sought to document three research objectives:

(1) to explore whether participation in a general music programme in a childcare centre without the presence of the parents could be associated with socio-emotional gains;
(2) to examine if there might be a difference between children aged 4 and 5 regarding their socio-emotional development when participating in a music programme;
(3) to determine if the duration of a music programme might be associated with socio-emotional development.

Children were asked to participate in a weekly group music programme and to take three individual tests of their emotion comprehension. Each child's main educator was also asked to report observations of the child's social skills on three occasions.

To ensure that the results would be representative of children's multiple realities, the study was conducted in a setting that was as naturalistic as possible. This implies that the children were in their usual childcare centre, with the children and teacher they already knew, following a familiar schedule. Although this type of research requires more researcher flexibility (i.e. integrate the music workshops into the regular planned schedule, respect the unexpected, accept a lower level of control over certain variables such as absences or late arrival of the children or childcare teacher), we believe that these conditions result in a more representative portrait of the children's experience. A naturalistic context was deemed preferable to a laboratory setting, providing a higher degree of ecological validity.

To maintain coherence with our naturalistic context, we chose to use a music programme that is representative of many early childhood music programmes, rather than one that would be specifically designed to develop socio-emotional skills. Although several studies have examined the effect of a music programme on children's social-emotional development, most of them have implemented a programme specifically designed to support the interaction skills of parents and children (Colwell et al., 2014; Nicholson et al., 2008; Nicholson et al., 2008; Teggelove et al., 2019, Walworth, 2009; Williams et al., 2012). Fewer researchers have addressed participation in a general music programme and its association with socio-emotional development (Gerry et al., 2012, Illari et al., 2020; Winsler et al., 2011). We consider it important to know whether this effect can be observed as well in the context where a music education programme targeting a child's musical development is implemented. The programme *Music Together* was chosen as it is implemented in many early childhood settings in North America and has a specific module developed for childcare centres providing diverse musical experiences that are engaging for young children.

Method

This research project was approved by the Laval University Research Ethics Board. The ethics approval included participation in the group music programme, observations made by the educators

at three different times and individual interviews by the researchers with the children at three different times.

Participants

A childcare centre of 160 children aged 5 and under was recruited from a multicultural suburban area close to a large city in Canada. To respond to the larger research project's main objective which was to study at-risk populations, different centres based on a governmental list indicating low socio-economic index (determined by the mother's level of education and income) were contacted via email. This index is organized on a scale from one to ten, ten being the lowest. To be considered for the research, a childcare centre had to have received a rating of eight or higher. The choice of the centre was made on a first come, first serve basis. Two of the researchers met with the management of the childcare centre to introduce the study, discuss the schedule of the musical activities, and plan the best time to implement the different measures. Subsequently, one of the researchers met with the parents at the childcare centre to provide information regarding the study and informed consent was obtained including participation in the music programme, observations made by the educator, and individual interviews by the researchers with the children.

Fifty-five children between the ages of 3.5 and 5.3 years of age participated in a weekly music programme in their regular childcare setting. Data from five children were excluded from the analysis (one child with autism syndrome and four children whose level of language understanding was too minimal to complete the tests) for a final $N = 50$ (21 girls and 29 boys). The children were divided into two age groups; the younger ones aged 3.5 years to 4.4 years ($n = 23$, $m = 3.7$, $sd = .46$) and the older ones aged 4.5 years to 5.3 years ($n = 27$, $m = 4.9$, $sd = .3$). Half of the 4-year olds and half of the 5-year olds took part in the 8-week programme while the remaining children took part in the 15-week programme. A convenience attribution to the short or long programme was made in accordance with the specific needs of the childcare centre (scheduling, room availability).

Intervention Procedures

A facilitator (the second author), who is a music therapist, experienced educator and certified to implement the programme *Music Together*, visited the childcare centre weekly. *Music Together* focuses on the development of musical aptitudes that all children possess and is largely based in the work of Edwin Gordon's Music Learning Theory (Watts, 2018). It provides opportunities to experiment with music and movement through interactive musical activities (songs, movement, and instrument playing) that are proposed in a variety of tonalities, metres, and musical styles. Children took part in the musical activities in their regular group ($n = 6$), in the presence of their regular childcare teacher. Teachers sat with the children and participated with them but were not co-facilitators. Music workshops were provided once per week in the morning, as is typical of many early childhood music programmes. All groups were presented with the same music lessons. The length of the intervention was 40 min per week x 8 weeks for the short programme for a total 5.3 h and 40 min per week x 12 weeks for total of 8 h for the long programme.

Assessment procedures

To align with the Prism Theoretical Model of Social–Emotional Learning (Denham et al., 2014) presented earlier, we chose to use an assessment tool in which teachers report on the social skills of the children as well as an assessment of the children's understanding of emotions. Therefore, the two tests that were administered are *The Preschool and Kindergarten Behavioral Scale* (2nd ed.; PKBS-2; Merrell, 2003) and the *Test of Emotion Comprehension* (Pons & Harris, 2000). Data were collected three times for all the children whether they took part in the short or the long programme: (a) before the implementation of the music programme (b) at week 8; and (c) at week 15.

Measures

The *Preschool and Kindergarten Behavioral Scale* (2nd ed.; PKBS-2; Merrell, 2003) is a 76-item scale designed to measure social skills and problem behaviours of children aged 3–6. For the purposes of this study, only the PKBS-2 social skills scales are reported since we are focusing on the developing social skills of the children. This tool is designed to be completed by parents and/or teachers. For this study, the child's educator completed the measure, which took about ten minutes. Every educator completed the measure for their own group of children (8–10 children) before the start of the programme and after the music lesson of the 8th and 15th weeks. Three subscales make up the total social skills assessment scale: social cooperation, social interaction, and social independence. Each item is rated on a 3-point scale ranging from 0 *(never)* to 3 *(often).* The PKBS was developed based on a sample size of 3,313 children. This standardized tool has test – retest reliability that ranges from .62 to .87, inter-rater reliability from .36 to .63, and internal consistency reliability from .84 to .97. Cronbach's alphas for teachers were between .92 to .97 for the different sections.

The *Test of Emotion Comprehension* (Pons & Harris, 2000) is a tool designed to assess the understanding of emotions in children aged 3–11. The test contains nine elements organized in three categories: the nature of emotions (two components: recognition of basic emotions and understanding of the mixed nature of emotions); the causes of emotions (five components: the role of external causes, of remainders, desires, beliefs and moral values); and the possibility to control the expression of emotions (two components: distinguishing apparent and felt emotion, regulation of current experience). Each child was met individually by a one of the researchers who read a brief scenario and the child was asked to identify the emotional state of a same-sex protagonist by pointing to one of four illustrations of facial expressions. The test was administered during a normal day at the childcare centre and its administration lasted for a duration of approximately ten minutes per child. Baseline measures were taken by two of the authors, due to time limitations before the beginning of the music lessons. Both post tests were conducted by the same and third author. This test was initially administered to a sample of 100 British children aged 3, 5, 7, 9 and 11, uniformly distributed by age and sex (Pons, Harris, & deRosnay, 2004); the findings of this early research were largely confirmed by a further investigation conducted on 39 Indio Quechua children aged between 4 and 11 (Tenenbaum, Visscher, Pons, & Harris, 2004). The test's factorial structure and measurement invariance across age and gender were recently verified (Cavioni, Grazzani, Ornaghi, Pepe, & Pons, 2020).

Results

PKBS-2

For the social skills, the PKBS-2 test is comprised of three categories: cooperation, interaction and independence, with a composite score. To determine whether teachers' reporting of social skills was influenced by programme duration and age, a two-way repeated measures ANOVA was performed for each of the social skills, and the composite score. Test times (prior to the music programme, after 8 weeks, after 15 weeks), programme duration (long or short) and age (younger, older) were used as the independent variables. Post-hoc tests were then run separately for age group (younger, older) and programme duration (short, long) to identify simple effects. No significant main effects were found for any of the social skills or for the composite score.

For the teachers' report of the social cooperation skill, a significant interaction was found between test time, programme duration and age ($F = 3.985$, $df = 2$, $p < .05$, partial $\eta^2 = .078$). Figure 1 illustrates that younger children participating in the short programme were rated as having an increase in their cooperation scores at the end of the short programme (week 8) and a decrease after 15 weeks while the older children were rated with a decrease in cooperation scores at the end of the short programme (week 8) and a slight gain for the subsequent weeks. Figure 2 demonstrates that for the younger children participating in the long programme, teachers reported a decrease in their

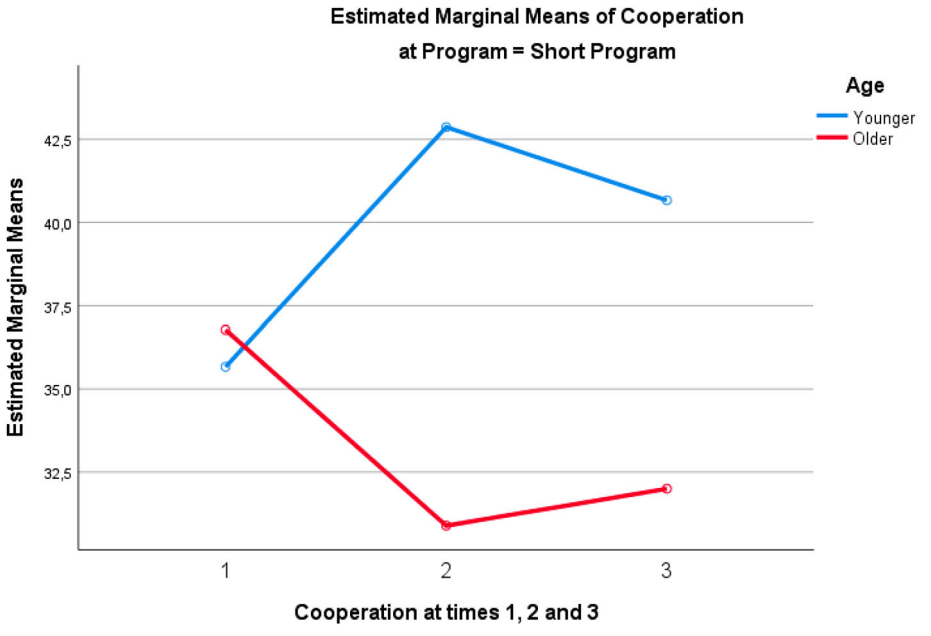

Figure 1. Teachers' reports of social cooperation for children enrolled in the short programme.

cooperation scores at the mid-point of the programme (week 8) and a return to a similar point after 15 weeks while the older children were assessed with a small increase in cooperation scores at week 8 and a decrease for the subsequent weeks.

Post-hoc tests revealed that for the older children, teachers' report of cooperation scores decreased significantly from time 1 to time 3 ($p < 0.5$) and from time 2 to time 3 ($p < 0.5$). Pairwise comparisons are presented in table 1. Post-hoc tests revealed no significant effect for programme duration.

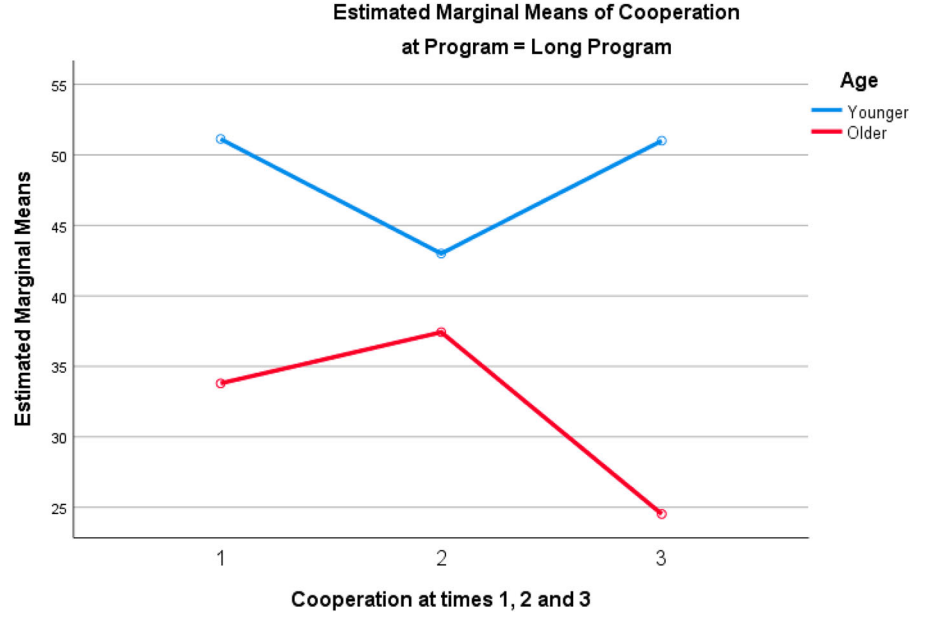

Figure 2. Teachers' reports of social cooperation for children enrolled in the long programme.

Table 1. Pairwise comparisons of teachers' reports of cooperation skill by test time.

Age	(I) Test Time	(J) Test Time	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a]	
						Lower Bound	Upper Bound
Younger	1	2	−1.870	3.275	.574	−8.661	4.922
		3	−3.217	3.964	.426	−11.439	5.004
	2	1	1.870	3.275	.574	−4.922	8.661
		3	−1.348	4.055	.743	−9.758	7.062
	3	1	3.217	3.964	.426	−5.004	11.439
		2	1.348	4.055	.743	−7.062	9.758
Older	1	2	−.571	2.705	.834	−6.121	4.978
		3	7.821*	3.491	.033	.659	14.984
	2	1	.571	2.705	.834	−4.978	6.121
		3	8.393*	3.102	.012	2.027	14.759
	3	1	−7.821*	3.491	.033	−14.984	−.659
		2	−8.393*	3.102	.012	−14.759	−2.027

Based on estimated marginal means
*The mean difference is significant at the. 05 level.
[a]Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

The second social skill measurement focused on social interaction. A significant interaction was found between test time, programme duration and age ($F = 3.742$, $df = 2$, $p < .05$, partial $\eta^2 = .074$). Figure 3 shows teachers' reports of the younger children participating in the short programme demonstrated an increase in the social interaction scores by the programme`s end (week 8) and a subsequent decrease after week 15 while the older children were rated with a decrease in social interaction scores at the end of the short programme (week 8) and a gain over the subsequent weeks. Figure 4 illustrates how the younger children participating in the long programme were assessed with an increase in their social interaction scores at the mid-point of the programme (week 8) and remained almost the same after 15 weeks while the older children were rated with a decrease in social interaction scores at week 8 and an additional decrease for the subsequent weeks.

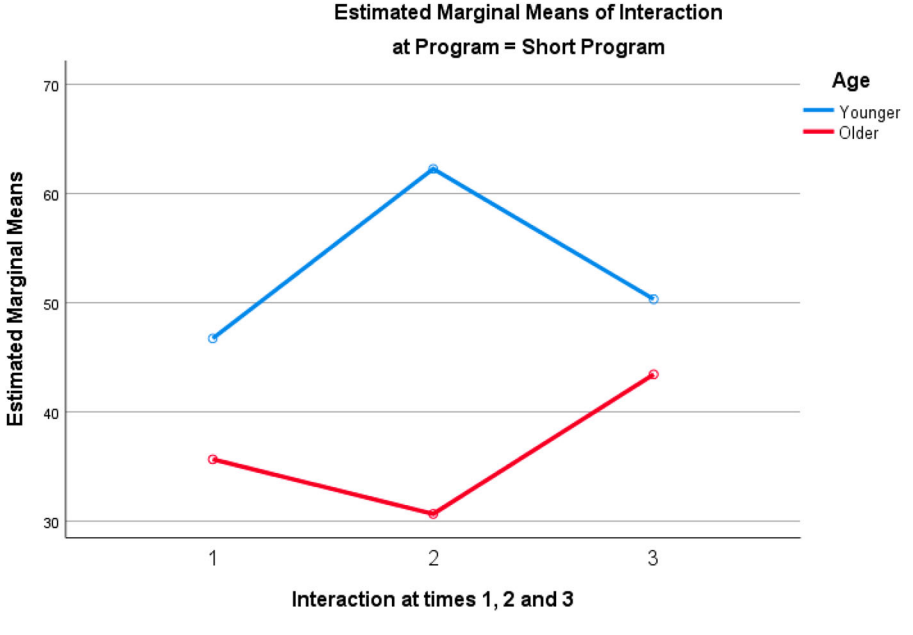

Figure 3. Teachers' reports of social interaction for children enrolled in the short programme.

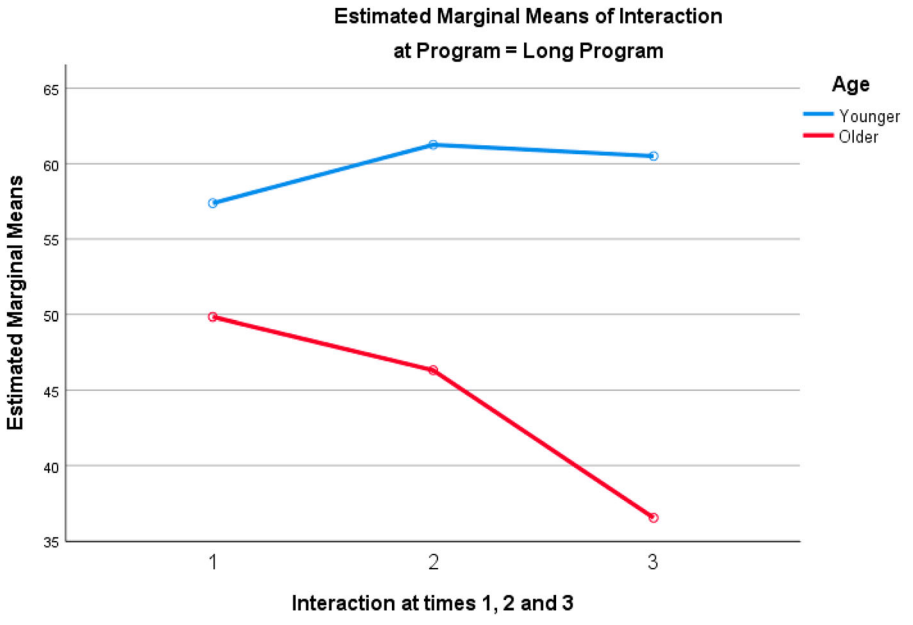

Figure 4. Teachers' reports of social interaction for children enrolled in the long programme.

Post-hoc tests re`vealed that for the younger children, teachers' report of social interaction scores increased significantly from time 1 to time 2 ($p < 0.5$). Pairwise comparisons are presented in table 2. Post-hoc tests revealed no significant effect for programme duration.

The third social skill measurement was social independence. A significant interaction was found between test time and age ($F = 3.766$, $df = 2$, $p < .05$, partial $\eta^2 = .076$). Figure 5 demonstrates how the younger children were rated with an increase in their social independence scores at week 8 followed by an increase at week 15 while the older children were rated with a decrease in social independence scores at week 8 and an additional decrease at the end of week 15.

Post-hoc tests revealed that for the younger children, teachers' reports of independence skills scores increased significantly from time 1 to time 3 ($p < 0.5$). Pairwise comparisons are presented in table 3.

Table 2. Pairwise comparisons of teachers' reports of social interaction skill by test time.

						95% Confidence Interval for Difference[a]	
Age	(I) Test Time	(J) Test Time	Mean Difference (I-J)	Std. Error	Sig.[a]	Lower Bound	Upper Bound
Younger	1	2	−11.478*	4.046	.010	−19.868	−3.088
		3	−3.435	2.999	.264	−9.655	2.785
	2	1	11.478*	4.046	.010	3.088	19.868
		3	8.043	4.340	.077	−.957	17.044
	3	1	3.435	2.999	.264	−2.785	9.655
		2	−8.043	4.340	.077	−17.044	.957
Older	1	2	4.000	3.659	.284	−3.508	11.508
		3	6.536	5.269	.226	−4.276	17.347
	2	1	−4.000	3.659	.284	−11.508	3.508
		3	2.536	4.470	.575	−6.636	11.708
	3	1	−6.536	5.269	.226	−17.347	4.276
		2	−2.536	4.470	.575	−11.708	6.636

Based on estimated marginal means
*The mean difference is significant at the 05 level.
[a]Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

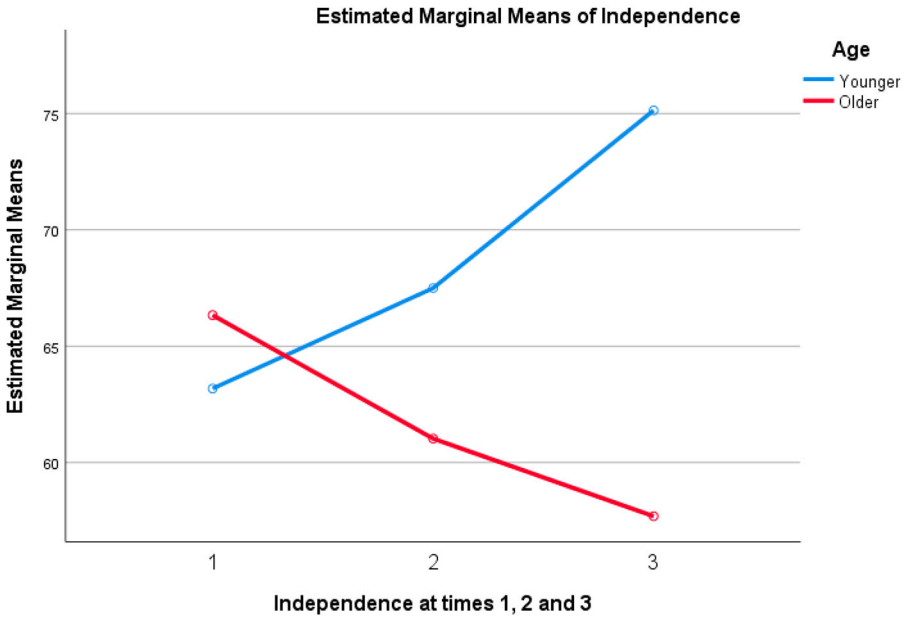

Figure 5. Teachers' reports of social independence by age.

Test of emotional comprehension (TEC)

The Test of Emotional Comprehension provided the following information: the nature of emotions (external), the causes of emotions (mental), the possibility to control the expression of emotions (reflective), and a composite score. Average scores by age group and test sections are presented in Table 5. Children displayed an improvement on each component with age. Just over half of the younger children answered the first component of the test (nature of emotions) successfully, whereas 75% of the older children were able to recognize the different emotions. Although the older children did better than the younger ones on the second and third sections of the test, the scores remain mostly under the 50% success rate. There is only a slight variation between the three test times for each of the components, with the exception of the second section of the test for the older children, where there is an increase in the understanding of the causes of emotions (mental) Table 4.

In order to determine whether emotional comprehension was associated with programme duration and age, a two-way repeated measures ANOVA was performed for emotional comprehension scores with test times (prior to the music programme, after 8 weeks, after 15 weeks), programme duration (long or short) and age (younger, older) as the independent variables. No significant main effects or interactions were found for external and reflective aspects or for the composite score. For the TEC mental, a significant interaction was found between test time, programme duration and age ($F = 5.804$, $df = 2$, $p < .01$, partial $\eta^2 = .104$). Figure 6 shows how the younger children participating in the short programme demonstrated an increase in the TEC mental at the end of the short programme (week 8) that remained stable after 15 weeks while the older children demonstrated an increase in TEC mental at the end of the short programme (week 8) and a diminution at week 15. Figure 7 shows how the younger children participating in the long programme demonstrated a significant linear decrease in TEC mental from baseline to week 8 and 15 while the older children demonstrated a significant linear increase in TEC mental from baseline to week 8 and 15.

Post-hoc tests revealed that for the older children, emotional comprehension increased significantly from time 1 to time 2 ($p < 0.5$) and from time 1 to time 3 ($p < 0.5$). Pairwise

Table 3. Pairwise comparisons of teachers' reports of independence skill by test time.

						95% Confidence Interval for Difference[a]	
Age	(I) Test Time	(J) Test Time	Mean Difference (I-J)	Std. Error	Sig.[a]	Lower Bound	Upper Bound
Younger	1	2	−6.087	4.314	.172	−15.033	2.859
		3	−14.261*	5.988	.026	−26.679	−1.843
	2	1	6.087	4.314	.172	−2.859	15.033
		3	−8.174	4.347	.073	−17.189	.841
	3	1	14.261*	5.988	.026	1.843	26.679
		2	8.174	4.347	.073	−.841	17.189
Older	1	2	6.407	4.997	.211	−3.864	16.679
		3	11.000	5.494	.056	−.292	22.292
	2	1	−6.407	4.997	.211	−16.679	3.864
		3	4.593	4.592	.326	−4.847	14.032
	3	1	−11.000	5.494	.056	−22.292	.292
		2	−4.593	4.592	.326	−14.032	4.847

Based on estimated marginal means
*The mean difference is significant at the, 05 level.
[a]Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Table 5. Pairwise comparisons for the Test of Emotional Comprehension (mental) by test time.

						95% Confidence Interval for Difference[a]	
Age	(I) Test Time	(J) Test Time	Mean Difference (I-J)	Std. Error	Sig.[a]	Lower Bound	Upper Bound
Younger	1	2	−.333	.197	.103	−.740	.073
		3	−.167	.238	.491	−.660	.326
	2	1	.333	.197	.103	−.073	.740
		3	.167	.253	.517	−.357	.690
	3	1	.167	.238	.491	−.326	.660
		2	−.167	.253	.517	−.690	.357
Older	1	2	−.300*	.145	.048	−.597	−.003
		3	−.433*	.184	.025	−.809	−.058
	2	1	.300*	.145	.048	.003	.597
		3	−.133	.142	.354	−.423	.156
	3	1	.433*	.184	.025	.058	.809
		2	.133	.142	.354	−.156	.423

Based on estimated marginal means.
*The mean difference is significant at the, 05 level.
[a]Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Table 4. Averages in percentages, by age group and test sections of the Test of Emotional Comprehension.

	Younger Children			Older Children		
	Prior to programme	Week 8	Week 15	Prior to programme	Week 8	Week 15
External	57	53	51	76	73	75
Mental	28	29	32	36	47	52
Reflective	22	31	30	37	33	38
Composite	45	45	44	62	61	63

comparisons are presented in Table 5. Post-hoc tests revealed no significant effect for programme duration.

Discussion

The aim of this research was to investigate less-explored factors that could influence young children's socio-emotional development through participation in a general music programme. Teachers reported an increase over time of the social interaction (T1 to T2) and independence skills (T1 to T3) of the younger children and a decrease of the cooperation skills (T1 to T3 and T2 to T3) of the older

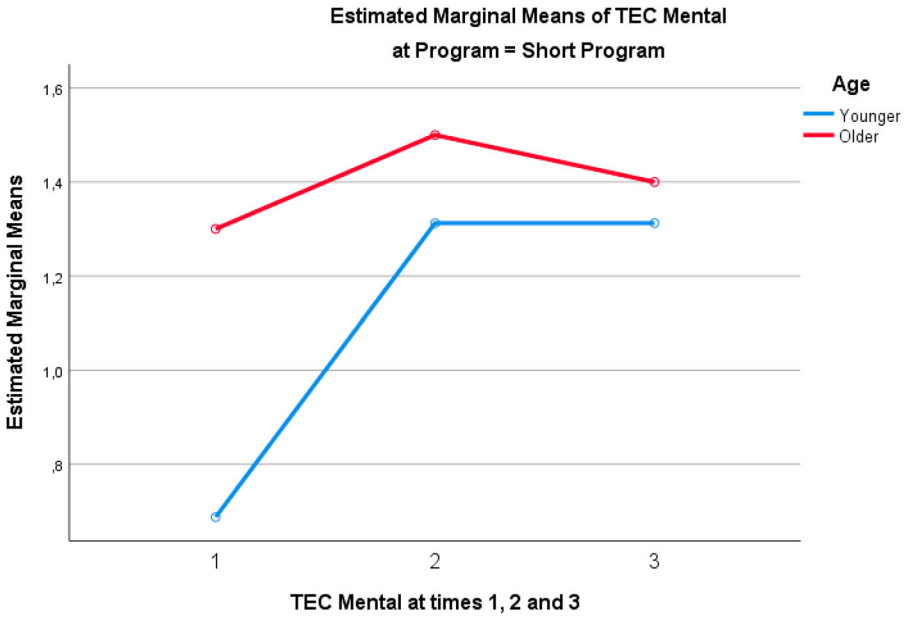

Figure 6. Test of Emotion Comprehension (section 2, TEC mental) for children enrolled in the short programme.

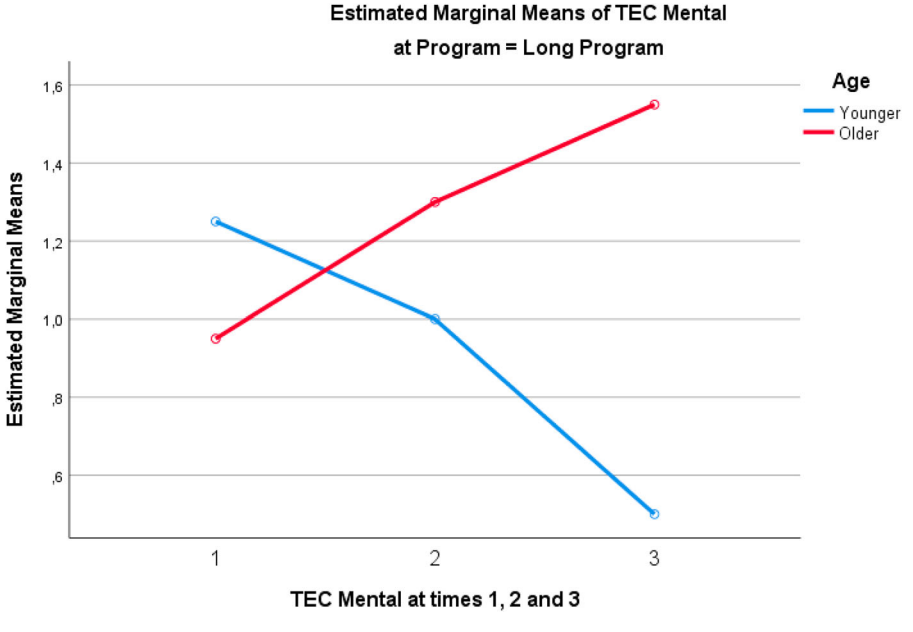

Figure 7. Test of Emotion Comprehension (section 2, TEC mental) for children enrolled in the long programme.

children. Additionally, the older children demonstrated an increase of their comprehension of emotions over time (T1 to T2 and T1 to T3). The duration of the programme however did not yield any significant effect.

In this study, we implemented a general music programme that had not been designed specifically to support children's socio-emotional growth. Our results show that teachers reported an increase in social interaction and independence skills for the younger children and a better

comprehension of emotions for the older children. These results are interesting since pre-schoolers with higher social and emotional competence tend to have more friends and better interactions with their parents, teachers and peers (McCabe & Altamura, 2011; Rose-Krasnor, 1997). In addition, the results align with Rabinowitch and Meltzoff (2017) who suggested that since most music is made of repetitive rhythmic patterns, with an underlying beat, voices and bodies usually synchronize to the underlying beat of the music. This process seems to be 'especially effective in tapping interpersonal similitude and coordination' which can encourage increased social interactions (Rabinowitch & Meltzoff, 2017).

In relation to the cooperation skills, teachers did not report any significant changes for the younger children. One explanation could be attributed to the developmental process. As presented by Murano et al. (2020), it seems plausible that some skills, like communication, would develop earlier than other capacities that are in connection with the metacognitive thinking such as self-regulation. Cooperation is a skill that requires emotional regulation (Denham & Brown, 2010; Shields et al., 2001), therefore this might explain why teachers did not witness its increase for the younger children.

Our results also show that teachers' perception of cooperation skills decreased from T1 to T2 and T1 to T3 for the older children. It is possible that teachers may have had higher expectations for the older children. Children aged 5 are expected to show social skills that are more developed, and cooperation is perceived as an important skill to develop for school readiness. It is associated with predicting first-grade academic success (Denham, 2006) and children`s school adjustment (Denham & Brown, 2010). Therefore, as the year was advancing, teachers may have perceived that the 5-year olds' cooperation skills were not at the level they wished they had been to allow a positive transition from childcare to kindergarten.

The results to the *Test of Emotion Comprehension* (Pons & Harris, 2000) are in line with the test's validation results presented in Pons et al. (2004). During the current study, children displayed on average an improvement with age on each component. Just over half of the younger children answered the first component of the test (nature of emotions) successfully, whereas 75% of the older children were able to recognize the different emotions. For the second and third sections of the test (respectively the causes of emotions and the possibility to control the expression of emotions), although the older children did better than the younger ones, the scores remain mostly under the 50% success rate, with the exception of the second section of the test for the older children, demonstrating an increase in the understanding of the causes of emotions between the three test times (36%, 47%, 52%). One explanation for this might be developmental readiness. It might be possible that children would benefit more from musical activities when they happen at key points of their emotional development. Murano et al. (2020) also suggest that some social and emotional skills might be more receptive to intervention at some specific time in the child's development.

To determine if the duration of a music programme might be associated with socio-emotional development, we compared an 8 week-long and a 15 week-long programme. No significant difference was associated with programme duration. Some researchers have observed a significant improvement in socio-emotional development with music programmes including as few as four to seven music sessions (Standley et al., 2009; Vlismas et al., 2013). In the previously cited studies, the children were all much younger, 3–18 months old, and parents took part in the musical activities. It is likely that the parents' or tutors' participation might have an important effect on socio-emotional development. In addition, an intervention at a younger age might have a greater influence at the very beginning of such development, whereas by ages 4 and 5, individual and contextual differences are very likely to have already been established, as explained by the Rose-Krasnor and Denham's model (2009). This is also supported by Kawase, Ogawa, Obata, and Hirano (2018) who found that children participating in group music activities beginning when they were 1 year old showed greater empathy at age 4, better communication at age 4 and 5, and more empathy and extraversion by age 6 and 7. More research is needed to better understand the influence of the duration of a musical intervention.

Strengths, limitations, and futures directions

The strengths and limitations presented in the following section should be considered for future research directions. First, we chose to work in the naturalistic context of an existing childcare centre in which music activities were offered. This meant that we to adjust our research protocol to respect the context of our participants. Therefore, we were unable to proceed with a random group attribution for the duration of the programme as we had to work with some specific groups of children, at specific times, in accordance with the childcare centre's daily routines. For this reason, even though our overall sample size (N=50) was acceptable to yield statistical results, when divided into sub-groups according to age and programme duration, the groups were rather small. The smallest group consisted of eight younger children participating in the long programme. Furthermore, no control group was included in this research. Although, this would have been a preferable research design, the number of children in the childcare setting did not allow for it. To do so, we would have had to include children from a different context, adding an additional variable. Doing a follow-up test for the children in the long programme, seven weeks after its completion, would have provided a more balanced research design to compare the aftereffects of both programme durations. However, due to resource availability, this was not a possible option. Overall, the challenge of maintaining a naturalistic environment, while creating the conditions of a laboratory environment, proves difficult to accomplish. For example, the presence of an external observer may have influenced children's behaviour and responses to the tests and might have affected the results. A future study including a greater number of participants and a control group would result in findings that are more robust.

Second, we used a teacher-rated observational tool (PKBS by Merrell, 2003). Different evaluation methods have been used to assess the effectiveness of the interventions targeting the socio-emotional development of young children. Rating scales show a variety of advantages, including quantifiable data, the use of multiple informants, little time and training required (Erdley & Jankowski, 2020). Childcare teachers are considered appropriate informants, although there is a possibility of bias, either an overly negative or positive perception of the child. Using validated, normed rating scales in early childhood facilitates developmentally sensitive assessment of socio-emotional functioning (Godoy, Chavez, Mack, & Carter, 2019). The tool we chose (PKBS-2) responded to the above-mentioned criteria. The educators ($n = 6$) completed the measure before the start of the programme and then retrospectively, during the days following the 8th and 15th music lessons. They were therefore relying on recall of the children's behaviour which constitutes a limit regarding the use of this instrument. This test has been used by Ritblatt et al. (2013) in a study to assess the impact of music on school readiness with children aged 3–5 years old. They used a pre/post-test design with a four to eight-month delay between the two test times. Their analysis revealed that the teachers report of total social skills scores for the music intervention group increased from time 1 to time 2. However, the parents' report did not yield significant results. The use of this tool by the teachers was therefore chosen since it had shown results under similar conditions.

In addition, we used a tool that measured the performance of the children regarding their comprehension of emotions, the *Test of Emotional Comprehension* (TEC) developed by Pons and Harris (2000). As presented earlier, this test was administered individually. Baseline measures were taken by two of the authors, due to time limitations before the beginning of the music lessons, and both post tests were conducted by the same and third researcher. Although this could generate a bias, the decision was made to proceed this way to allow the study to go forward in the allotted time. Since the test has a clear procedure with a written scenario being read to the children, and given that all researchers were given sufficient time to familiarize themselves with the scenarios and the visual documents, including discussions among researchers to explain any aspect that might have been unclear, we considered that the risk was limited. Additionally, our results are similar to those of other studies using the test (Cavioni et al., 2020; Pons et al., 2004; Tenenbaum et al., 2004; Schellenberg & Mankarious, 2012). Schellenberg and Mankarious (2012) used this test

to measure correlations between one-on-one private music lessons, intelligence and emotion comprehension with children aged 7 and 8. Even though trained children scored higher on IQ tests and on the TEC, differences in TEC scores disappeared when IQ scores were held constant. To our knowledge, the current study was the first to use this test to measure the effects of group music activities on emotional comprehension with 3- and 4-year olds.

In sum, future research would need to consider different factors to create a better understanding of how music might support socio-emotional development. A random control trial, comparing participation in a music programme at different ages would be useful. In addition, researchers need to pay closer attention to the duration and frequency of such activities to determine more clearly the minimal exposure needed to yield positive results.

Conclusion

Early participation in a group music programme and the development of socio-emotional skills are being studied in different related fields such as music education, music therapy, developmental music psychology, and the evolutionary psychology of music (Ilari et al., 2020). In our study, we chose to explore factors that had been less studied such as participation in a general music programme and programme duration. The findings suggest that children's socio-emotional development was different in relation to the age of the participants. Given that better socio-emotional skills are associated with better mental health and well-being in children and adolescents (Kamper-DeMarco et al., 2020; Robins & Rutter, 1990; Rubin, Bukowski, & Parker, 2006), and that employing a music programme might be a contributing factor, it is certainly worth developing a better understanding of the role of musical activities during early childhood.

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Notes on contributors

Hélène Boucher is a professor of Music Education at University of Quebec in Montreal. She taught music in elementary and pre-school before completing her doctoral degree at McGill University. Her research focuses on the adaptation of the Kodaly method in French, on performance anxiety in children and on music and socio-emotional development in young children.

Aimee Gaudette-Leblanc holds a bachelor's degree in music therapy and a master's degree in music education. She is currently completing her doctoral studies in music education at Laval University. Her research aims to document the contribution of formal and informal musical practice on parent–child bonding and the socio-emotional development of young children.

Julie Raymond is currently pursuing doctoral studies in music education at Laval University. She is interested in developing the language skills of children with intellectual disabilities through musical practice. She is also involved in projects focusing on music and socio-emotional development.

Valerie Peters is a professor music education at Laval University in Quebec City. She completed a Ph.D. in music education at Northwestern University after teaching music in secondary school in Montreal. Her current research programme investigates the association between music learning, well-being and the development of socio-emotional competence in three different populations: early childhood, youth and older adults.

ORCID

Helene Boucher http://orcid.org/0000-0002-5738-8064
Aimee Gaudette-Leblanc http://orcid.org/0000-0002-8065-3719

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