

Improvised song endings in a developmental perspective: A mixed-methods study

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Abstract

The aim of this mixed-methods study was to investigate the development of children's improvised song endings over the course of two years, through researcher-led tasks. While quantitative data were used to examine the roles of age, biological sex, and music training on children's improvised song endings and pitch-matching skills, qualitative data were gathered to shed light on the musical contents of improvisations, the strategies used by children when improvising, and children's reactions to different improvisatory tasks. Although scores for both improvised song endings and pitch-matching skills increased with age ($p < .01$), there were no significant group differences between musically-trained children and their untrained peers. Additionally, girls outperformed boys in both improvisation and pitch-matching tasks ($p < .01$). Qualitative data offered six strategies that children used to improvise song endings, and suggested that engagement in improvisational tasks depends on a combination of children's musical skills and interests, and familiarity with the tasks.

Keywords

improvisation, improvised song endings, middle childhood, mixed methods, musical development

Improvisation is one of the most complex forms of human creativeness and invention (Beaty, 2015; McPherson & Limb, 2013). A form of musical thought (Azzara, 1993), improvisation has been a staple of musical cultures in the world and across time (Collins, 2010; Sawyer, 1999). As a movable signifier, improvisation is defined more or less strictly by practitioners of a given musical culture. Furthermore, while some improvisatory practices may be strictly attached to a structural framework – musical or poetical – others may emphasize openness and abstraction.

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While there is no consensual definition of improvisation, most scholars agree that it is a dynamic process marked by the interplay of several sub-processes, including the generation, assessment and performance of novel sequences of organized sounds such as melodies, rhythmic patterns, timbres and sound effects in real time (Beaty, 2015; Biasutti, 2015; Pressing, 1988). Unlike composition, which usually involves premeditated work and revision of ideas leading into a replicable product (Kratus, 1996), improvisation is marked by its spontaneity and irreversibility (Tafuri, 2006). Additionally, as Sparti (2016) suggests, in composition “the circumstances in which the finished work is produced, from conception through revision to completion, remain largely hidden from the eyes of the public” (p. 186), whereas improvisation is extemporaneous.

Aside from being a product of domain-specific learning, improvisation is also a complex skill that taps into domain-general processes, including divergent thinking and cognitive flexibility (Beaty, 2015). Improvisation is known to make demands on brain regions that are directly linked to executive functions such as controlled memory retrieval and pre-potent response inhibition (Beaty, 2015). When improvising, musicians often operate at the peak of their abilities and arousal (McPherson & Limb, 2013), a phenomenon known as flow (Csikszentmihalyi, 1990). As McPherson and Limb (2013) have stated, “creativity during a flow state becomes nearly effortless, in that the creators may not have to consciously think through or mediate their actions” (pp. 82–83). Musical improvisation provides, then, an optimal window into human cognition, as it offers direct and instant access into creative processes (Sloboda, 1985).

Remarkably, it has only been in the past few decades that musical improvisation gained substantial attention from the scholarly community. Improvisation has been studied from different perspectives and theoretical orientations (e.g., Beaty, 2015; Kartomi, 1991; MacDonald, Wilson, & Miell, 2012; Pressing, 1988; Solis & Nettle, 2009), with a main focus on adult improvisers such as jazz performers (Limb & Braun, 2008; Norgaard, 2011; Wesolowski, 2013), free improvisation musicians and pedagogues (Hickey, 2015), and clients in music therapy sessions (MacDonald & Wilson, 2014). Additionally, much effort has been put into understanding the skills of expert improvisers (e.g., Limb & Braun, 2008), as expertise is considered to be a determinant factor in the quality of musical improvisation (Kratus, 1996; McPherson & Limb, 2013). The developmental course of improvisation, however, is not clearly understood, particularly where children are concerned. This is surprising given the ubiquity of musical improvisation and invention in childhood (Bjørkvold, 1992; Kartomi, 1991; Moorhead & Pond, 1978).

Improvisation in a developmental perspective

Rudiments of musical improvisation are seen early in life. Even before they can actually imitate pitches, babies engage in vocal play and respond to expressive singing and speaking in improvised ways (see Malloch & Trevarthen, 2009). Around the second semester of postnatal life babies begin to engage in musical babble, or the production of musical vocalizations that are rich in continuous pitches and glissandi (Tafuri & Villa, 2002; Winner, 2006). Musical babble is a developmental milestone and is sometimes interpreted as the genesis of human song (Barrett, 2006). At around 18 months of age, toddlers begin to invent songs. Due to their unpremeditated and improvisational character, these songs, which are usually self-initiated, have been directly linked to musical play (Marsh & Young, 2016). As Kartomi (1991) has argued, children at play produce many improvisations that may quickly dissipate or turn into new songs. These vocal practices are a staple of early childhood (Bjørkvold, 1992; Moorhead & Pond, 1978) and are often taken as evidence of musical development (Raju, Vålja, & Ross, 2015). Improvised songs are said to submerge over the course of time (Barrett, 2006; Knudsen,

2008; Young, 2006), particularly with children's entrance into formal schooling, when "play-based provision gradually shifts in favor of a more product-oriented, skills-based approach to education" (Marsh & Young, 2016, p. 463).

The distinction between improvisation as a "natural", self-initiated and playful activity and that as a domain-specific skill is also reflected in developmental research. While some exceptions exist (Reinhardt, 1990), studies concerned with improvisation skills in early childhood have typically relied on self-initiated improvisations of young children, often documented in contexts of play (e.g., Young, 2004) and involving either vocal or instrumental experiences (Barrett, 2006; Moorhead & Pond, 1978). By contrast, studies conducted with school-aged children have been more commonly associated with formal music learning experiences in regular and specialized schools (e.g., Azzara, 1993), centering primarily on instrumental experiences (e.g., Paananen, 2007), and on improvisations produced in response to requests by a teacher or researcher (e.g., Brophy, 2005). Another point of divide relates to the foci in improvisation studies with young (i.e., preschoolers) versus older (i.e., school-aged) children. Whereas young children's improvisational experiences and products have been typically analyzed in light of their contents, functions in children's lives, and affective responses (Adachi & Trehub, 2011; Moog, 1976; Moorhead & Pond, 1978), studies conducted with school-aged children have usually highlighted children's knowledge of musical elements such as melody and rhythm (Azzara, 1993; Brophy, 2002, 2005). These contrasting approaches obviously offer different entry points into understanding children's developing improvisatory skills.

Developmental work on children's improvisation skills has also relied on different research methodologies. The small yet solid body of knowledge that exists to date stems from case studies, cross-sectional and longitudinal works that document the course of improvisatory skills over time and under different conditions (e.g., Brophy, 2002, 2005; Burnard, 2000; Paananen, 2007; Rowe, Triantafyllaki, & Anagnostopoulou, 2015), as well as works examining the impact of improvisation tuition on performance abilities (e.g., Azzara, 1993) and creative thinking in music (Koutsoupidou & Hargreaves, 2009). Together, these works suggest that improvisation skills may improve with music training and age (Baldi, Tafuri, & Caterina, 2002; Brophy, 2005; Paananen, 2007), although the latter is not completely deterministic. Other factors that are known to impact musical improvisation include educational and cultural contexts, children's motivation to improvise, and quality of engagement with the musical tasks (Adachi & Trehub, 2011; Burnard, 2000; Custodero, 2007; Kanellopoulos, 1999).

Even less is known about the development of children's vocal improvisations and invented songs beyond early childhood, despite the existence of a rich developmental literature on singing skills and song acquisition (Stadler Elmer, 2011; Welch, 2016). During middle childhood (or the period when children are between ages 6 and 14, see Eccles, 1999), children's singing of both conventional and improvised songs becomes more stable and discrete (Hargreaves & Zimmerman, 1992). Perhaps due to its implications for teaching (Ilari, 2014), the acquisition of conventional songs has received comparatively more attention than improvised and invented songs. Age, use of vocal registers, gender, language, cultural background, type of musical instruction, and singing configurations (i.e., singing in groups or alone) influence the development of singing skills (Ilari & Habibi, 2015; Rutkowski, 2015; Welch, 2016). These findings have emerged in studies on pitch-matching tasks and reproduction of conventional songs (e.g., children's songs, pop tunes), yet they may also apply to children's vocal improvisations.

Two recent studies suggest that culture, context and the nature of tasks impact children's vocal improvisations and invented songs (Adachi & Trehub, 2011; Raju, Vålja, & Ross, 2015). A question that remains to be answered is whether children's improvised songs change over the course of development, and if so, what is the nature of such changes and what influences them.

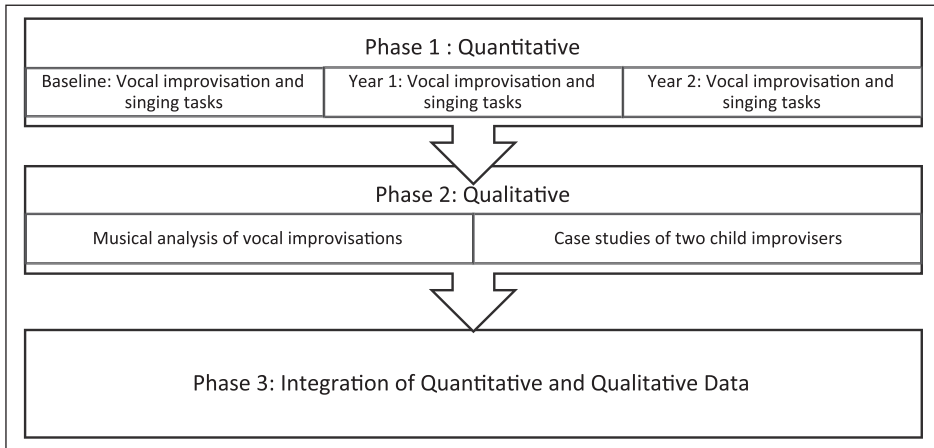


Figure 1. Study design.

Study aims

The aim of this mixed-methods study was to investigate the development of children's improvised song endings over the course of two years during middle childhood, in researcher-led tasks. Quantitative data were used to examine the roles of age, biological sex, and music training on children's improvised song endings. Qualitative data were used to shed light on the musical contents of improvisations, the strategies used by children when improvising, and children's responses to different improvisatory tasks.

Methods

Study design

This study made use of an explanatory sequential mixed-methods design (Creswell & Plano Clark, 2011). In this type of design, quantitative data are collected and analyzed first to examine general trends and to help determine the qualitative phase, which is aimed at explaining a particular finding in more depth. Both types of data are subsequently "mixed." In line with a pragmatist epistemology, in mixed-methods research the methodology is framed by the research problem (Egbert & Sanden, 2014; Fitzpatrick, 2014; Johnson & Onwuegbuzie, 2004). By combining deductive and inductive examinations of a problem, mixed-methods research maximizes strengths and minimizes weaknesses of each approach, offering results that engage dialogue across disciplines (Johnson & Onwuegbuzie, 2004). Figure 1 depicts the study design, which included a quantitative phase with three data collection points, a qualitative phase involving a musicological analysis and two case studies, and the third phase, where data were integrated and interpreted.

Ethical considerations

All study protocols were approved by the Institutional Review Board of the University of Southern California. Participating children were recruited by means of fliers and vocal announcements in their respective schools and community-based, after-school programs. The

study was explained in full to parents/legal guardians and children, who signed consent and assent forms, prior to the commencement of the study. Children received a small gift as a token of appreciation for their time and effort, and parents received monetary compensation.

Study phase I: Quantitative

Participants

Fifty-seven children aged 6–7 at baseline (22 girls, mean age at baseline = 81.6 months, $SD = 6.71$), taking part in a large-scale longitudinal research project on brain, cognitive and musical development (Habibi et al., 2014), and completing all tasks in the quantitative phase of the study were included in the final sample. Four participants completed the pitch-matching task at all years yet did not complete the improvisation task at all years. Therefore, data analyzed for the improvisation task is from a slightly smaller sample ($n = 53$, 22 girls, mean age at baseline = 81.5 months, $SD = 6.79$). Participants were recruited from community-based after-school music and sports programs and two local elementary schools within the same geographical region. Three groups were studied: music, sports, and school-only (control). The music group consisted of 18 children (7 girls), who were learning music in an El Sistema-inspired program that offers quality and free-of-charge, intensive music instruction (i.e., strings). Child musicians spent 10 weekly hours in the program, which consisted of group instrumental music classes, sectionals, orchestra rehearsals, theory instruction, and academic tutoring. Eighteen children (8 girls) who were engaged in after-school sports programs (i.e., soccer or swim team) composed the sports group. The soccer program met three times a week for one hour with an additional game on weekends. The swimming program met twice a week for one hour with additional recreational activities on the weekends. Like the music program, the sports programs catered to children from underserved communities in the same geographical area and were also free of charge. Children were admitted into the program on a first-come first-serve basis. Twenty-one children (7 girls), who were not involved in any systematic and intensive after-school programs at the time of the study, composed the control group.

Study participants, who were matched in age, cognitive abilities, and SES (see Habibi et al., 2014), were primarily of Latino ethnicity and were being raised in bilingual households. They attended schools that did not offer comprehensive music education programs for their students, and resided in urban areas marked by a high population density, high levels of poverty, lack of opportunities for youth, violence and gang activity, and a general sense of public neglect. The income level of 78% of participating families was \$16,000 – also the average for the current sample – brought in by a single breadwinner, and most parents held a high-school diploma.

Procedure

Four experienced researchers with extensive training in music engaged children in pitch-matching and vocal improvisation tasks. As noted, these tasks were part of a comprehensive battery involving cognitive, social-emotional, motor, and musical abilities, which was completed over several days (see Habibi et al., 2014). All singing tasks were completed in approximately 10 minutes. Child participants were tested individually, either at the university research lab or in a room at their after-school program sites. Testing took place prior to children's induction in the after-school programs (baseline), and again, after one (Y1) and two years (Y2). Testing sessions were recorded on a Sony ICD-PX333 digital voice recorder and on a Sony HDR-CX405B Camcorder, and subsequently transferred to a Macintosh computer for analysis.

Testing materials

Children completed two tasks: pitch-matching and improvising endings to a given melody, herein called *improvisation*. These tasks were based on components 6 (“sing back interval, triad, and scale”) and 7 (“improvise a song ending”) of the Advancing Interdisciplinary Research in Singing (AIRS) Test Battery of Singing Skills or ATBSS (Cohen, Armstrong, Lannan, & Coady, 2009), which is a comprehensive instrument designed for the collection of singing data from different age and cultural groups. The researcher sang each vocal prompt to the child using the neutral syllable “la” in all tasks. Children were prompted to use the neutral syllable “la” for the pitch-matching task, but were free to use any syllables or sounds when creating their own improvised song endings. Pitch-matching tasks always preceded the improvisation tasks, but the researchers could change the order of the items within each task. At baseline, children were tested on the original ATBSS components, but these were supplemented with additional scales and melodies created by the second and third authors (see Figure 2), to identify potential directions of change in children’s pitch-matching and improvisation skills over time. Additionally, as in Raju et al. (2015), the text found in the melodic prompt for the original improvisation task (component 7) prompted many children to make animal sounds instead of producing an actual song ending, and was dropped when children were tested again in Years 1 and 2.

Because both improvisation and singing are known to be contextual (Burnard, 2000; Custodero, 2007; Ilari & Habibi, 2015; Stadler Elmer, 2011), parents/legal guardians were also interviewed yearly. They were asked to provide information on demographics, family musical background, children’s everyday musical activities and motivation for music. These are reported elsewhere in a separate manuscript.

Data analysis

The improvisation task was scored using a scale ranging from 0 to 3 points, with a focus on melodic embellishment and melodicism or “the inclusion of a sequence of spontaneously organized melodic elements in an improvised solo: rhythm, motives, and attractive note choices that form an aesthetic whole” (Dean, n.d., p. 6). A score of 0 was given when children did not produce any response to the task. If a child imitated a few pitches or only part of the given melody, she received a score of 0.5. A score of 1 was given to a child who simply imitated the intact melodic phrase. Children received 2 points when they imitated the given melody yet varied it slightly (e.g., up to 3 notes). A score of 3 points was given to children who produced a song ending that varied by 4 or more notes from the given melody and was a completely novel response. For more information on the scoring for the improvisation task, refer to Appendix A in the Supplementary Materials online.

Pitch-matching tasks were scored using the Singing Voice Development Measure or SVDM (Rutkowski, 1998, 2015). SVDM is a well-known, robust and reliable measure of the development of the singing voice that makes use of a scale ranging from 1 (pre-singer: does not sing but chants the song text) to 5 (singer: exhibits use of consistent extended singing range, sings beyond the register lift), with seven sub-stages in-between. Although not part of Rutkowski’s (1998, 2015) original scale, a score of 0 was given to children who did not produce any response to each item in the pitch-matching task. For a detailed description of the SVDM, please see Appendix B in the Supplementary Materials online.

Six raters, all highly trained in music and used to working with children, scored the data. Four raters scored the pitch-matching tasks and two scored the improvisation task to promote consistency throughout the analysis. Because the pitch-matching and improvisation tasks

Pitch matching task (all years): Elements A, B, C, D, and E from component 6 of ATBSS (Cohen, 2012).

Two staves of musical notation in 4/4 time. The first staff contains three elements: A (C4 quarter, D4 quarter, E4 quarter, F4 quarter), B (C4 quarter, D4 quarter, E4 quarter, F4 quarter, G4 quarter, A4 quarter), and C (C4 quarter, D4 quarter, E4 quarter, F4 quarter, G4 quarter, A4 quarter, B4 quarter, C5 quarter). The second staff contains two elements: D (C4 quarter, D4 quarter, E4 quarter, F4 quarter, G4 quarter, A4 quarter, B4 quarter, C5 quarter) and E (C4 quarter, D4 quarter, E4 quarter, F4 quarter, G4 quarter, A4 quarter, B4 quarter, C5 quarter).

Pitch matching task (added to Years 1 & 2): Elements A', B', C', F, and G created by the authors (Fesjian & Ficek, 2013).

Two staves of musical notation in 4/4 time. The first staff contains three elements: A' (C4 quarter, D4 quarter, E4 quarter, F4 quarter, G4 quarter, A4 quarter, B4 quarter, C5 quarter), B' (C4 quarter, D4 quarter, E4 quarter, F4 quarter, G4 quarter, A4 quarter, B4 quarter, C5 quarter), and C' (C4 quarter, D4 quarter, E4 quarter, F4 quarter, G4 quarter, A4 quarter, B4 quarter, C5 quarter). The second staff contains two elements: F (C4 quarter, D4 quarter, E4 quarter, F4 quarter, G4 quarter, A4 quarter, B4 quarter, C5 quarter) and G (C4 quarter, D4 quarter, E4 quarter, F4 quarter, G4 quarter, A4 quarter, B4 quarter, C5 quarter).

Improvisation task (all years): Improvisation prompt from component 7 of ATBSS (Cohen, 2012).

Musical notation in 4/4 time with lyrics: o mcu ca chor ro faz au au / um di nos sau ro no meu quintal

Improvisation task (added to Years 1 & 2): Created by author (Fesjian, 2013).

Three numbered musical staves in 4/4 time. Staff 1: C4 quarter, D4 quarter, E4 quarter, F4 quarter, G4 quarter, A4 quarter, B4 quarter, C5 quarter. Staff 2: C4 quarter, D4 quarter, E4 quarter, F4 quarter, G4 quarter, A4 quarter, B4 quarter, C5 quarter. Staff 3: C4 quarter, D4 quarter, E4 quarter, F4 quarter, G4 quarter, A4 quarter, B4 quarter, C5 quarter.

Figure 2. Pitch-matching and improvisation tasks.

Table 1. Means and standard deviations for expert ratings of improvisation and pitch-matching tasks in all years.

Group	Improvisation (<i>n</i> = 53)			Pitch-matching (<i>n</i> = 57)		
	Baseline	Y1	Y2	Baseline	Y1	Y2
<i>Music</i>						
Girls	1.357 (0.85)	1.704 (0.54)	2.144 (0.69)	3.671 (0.59)	4.464 (0.53)	4.428 (0.45)
Boys	1.778 (0.83)	1.554 (0.81)	1.572 (0.94)	2.959 (1.49)	3.295 (1.15)	3.545 (1.12)
All	1.594 (0.84)	1.620 (0.69)	1.822 (0.86)	3.236 (1.25)	3.750 (1.10)	3.889 (1.00)
<i>Sports</i>						
Girls	2.109 (0.99)	2.066 (0.51)	2.136 (0.30)	3.350 (0.93)	3.719 (0.88)	3.719 (0.63)
Boys	0.639 (0.53)	1.718 (0.44)	1.766 (0.79)	2.850 (1.23)	3.075 (1.27)	2.700 (1.10)
All	1.331 (1.07)	1.882 (0.49)	1.940 (0.63)	3.072 (1.11)	3.361 (1.13)	3.153 (1.04)
<i>Control</i>						
Girls	1.607 (0.69)	1.807 (0.91)	2.306 (0.44)	3.464 (0.82)	3.893 (1.74)	3.964 (0.92)
Boys	1.596 (1.04)	1.839 (0.49)	1.918 (0.64)	2.421 (1.17)	2.875 (1.09)	3.071 (1.16)
All	1.600 (0.92)	1.828 (0.65)	2.054 (0.60)	2.769 (1.16)	3.214 (1.38)	3.369 (1.14)
<i>Total</i>						
Girls	1.710 (0.88)	1.868 (0.66)	2.193 (0.48)	3.489 (0.77)	4.011 (1.14)	4.023 (.072)
Boys	1.371 (0.96)	1.721 (0.58)	1.773 (0.77)	2.713 (1.28)	3.064 (1.14)	3.114 (1.15)
All	1.512 (0.94)	1.782 (0.61)	1.948 (0.69)	3.012 (1.17)	3.430 (1.22)	3.465 (1.09)

had multiple items, each item was scored individually and then averaged into a composite score. Inter-rater reliability between scorers was high (ranging from $r = .903$, $p < .001$, to $r = .948$, $p < .001$) for all pairs of raters in the pitch-matching tasks, in all years. Likewise, inter-rater reliability scores for improvisation tasks were also correlated, but were slightly lower than those for pitch-matching (ranging from $r = .825$, $p < .001$, to $r = .894$, $p < .001$).

Results

Means and standard deviations (in parentheses) for expert ratings of improvisation and pitch-matching tasks in all years are summarized in Table 1. Children who refused to sing received a score of zero for each item in each task. Therefore, pitch-matching scores could range anywhere from 0 to a perfect score of 5, and improvisation scores from 0 to a perfect score of 3. The scores in Table 1 reflect the average scores for all items within each task (see Figure 2). Because sex differences have been found in earlier studies on singing in childhood (e.g., Ilari & Habibi, 2015; Mang, 2006; Welch, Sergeant, & White, 1997), we also examined its effects on children's improvisation and pitch-matching skills.

A three-way ANOVA with repeated measures was performed for the scores for pitch-matching with year (baseline, Y1, Y2) as the within-subjects factor, and group (music, sports, control) and sex (male, female) as between-subject factors. Mauchly's test indicated that the assumption of sphericity was not violated. There was no significant main effect of group, $F(2, 51) = 1.877$, $p = .163$. However, there was a significant between-subjects effect of sex, favoring girls, $F(1, 51) = 14.956$, $p < .001$, $\eta_p^2 = .227$, as well as a significant within-subject effect of year, $F(2, 102) = 4.504$, $p = .013$, $\eta_p^2 = .081$. Post-hoc comparisons using Fisher's Least Significant Difference (Fisher's LSD) showed significantly higher scores at Y1 ($p = .03$) and Y2 ($p = .01$) than at baseline. None of the other interactions were significant.

In order to assess the difference in magnitude of improvement between groups independent of their baseline performance, a one-way ANOVA with pitch-matching score differences between baseline and Y2 as the dependent variable with group as the between-subjects factor was also performed. There was no significant difference between the groups in terms of improvement, $F(2, 54) = 1.233, p = .299$.

Likewise, a three-way ANOVA with repeated measures was performed for the improvisation scores with baseline, Y1, and Y2 as the within-subjects factor, and group (music, sports, control) and sex (male, female) as between-subject factors. Mauchly's test indicated that the assumption of sphericity had not been violated. There was no significant main effect of group, $F(2, 47) = .384, p = .683$. There was, however, a significant between-subjects effect of sex, $F(1, 47) = 4.278, p = .044, \eta_p^2 = .083$, in favor of girls. There was also a significant within-subjects effect of year, $F(2, 94) = 7.658, p = .001, \eta_p^2 = .140$. Post-hoc comparisons using Fisher's LSD showed significantly higher scores at Y1 than at baseline approaching significance ($p = .051$), significantly higher scores at Y2 than at baseline ($p = .001$), and significantly higher scores at Y2 than at Y1 ($p = .038$). While there was no significant year by group interaction, $F(4, 94) = .708, p = .588$, year by sex interaction, $F(2, 94) = .784, p = .460$, or group by sex interaction, $F(2, 47) = 1.809, p = .175$, there was a significant year by group by sex interaction, $F(4, 94) = 3.8, p = .007$. Post-hoc comparisons using Fisher's LSD showed that boys in the sports group performed significantly lower than the boys in music ($p = .007$) and control group ($p = .014$) at baseline.

In order to assess the difference in magnitude of improvement between groups independent of their baseline performance, a one-way ANOVA with improvisation score differences between baseline and Y2 as the dependent variable and group as the between-subjects factor was also performed. There was no significant group difference, $F(2, 53) = .743, p = .481$.

To ensure that our results were not influenced by the addition of items to the original AIRS tasks in Years 1 and 2, we performed two three-way ANOVAs with repeated measures for ratings of the original AIRS tasks alone, with baseline and Y2 as levels of within-subjects factor, and group and sex as between-subject factors. For the original AIRS pitch-matching task, there was a within-subjects effect of year, $F(1, 51) = 7.091, p = .01, \eta_p^2 = .122$, with significantly higher scores at Y2, as well as a significant between-subjects effect of sex, $F(1, 51) = 12.625, p = .001, \eta_p^2 = .198$, with girls outperforming boys. Similarly, for the original AIRS improvisation task, there was a within-subjects effect of year, $F(1, 51) = 15.249, p < .001, \eta_p^2 = .230$, with significantly higher scores in Y2 than at baseline, and a between-subjects effect of sex approaching significance, $F(1, 51) = 3.942, p = .052, \eta_p^2 = .072$, in favor of girls.

Subsequently, we calculated correlations between pitch-matching and improvisation for the full sample. There were significant correlations between pitch-matching and improvisation at baseline, $r(56) = .285, p = .033$, and Y2, $r(57) = .537, p < .001$. The correlation between pitch-matching and improvisation at Y1 was approaching significance, $r(54) = .249, p = .069$.

Discussion of quantitative findings

Results from the quantitative phase of this study are consistent with previous work that suggests a developmental course for both improvisation (e.g., Brophy, 2002, 2005) and singing skills (Rutkowski, 2015; Welch, 2016). Children in all groups showed enhanced pitch-matching and improvisation skills over the course of two years, irrespective of the group they were in. The fact that children in the music group did not outperform their musically untrained peers in the improvisation tasks is not completely surprising, particularly if one takes into account the nature of the music program, which had as a main focus the development of instrumental skills, reading music notation and ensemble experience, and not improvisatory skills. As

Lehmann and Davidson (2006) have argued, musical skills are “rather specific” (p. 231) and require a fair amount of specialized training. Nevertheless, children’s use of the singing voice (i.e., vocal range), as measured by SVDM (Rutkowski, 2015), was comparable to results found in earlier studies that were conducted with more affluent children (e.g., Ilari & Habibi, 2015; Levinowitz et al., 1998; Rutkowski & Miller, 2003), who tend to have more opportunities to enroll in formal music lessons. Consistent with findings from these earlier studies, by Y2 (i.e., age 8–9), the average scores for the pitch-matching tasks indicated that the voices of most child participants could be placed somewhere between *limited range singer* (3) and *initial range singer* (4) in Rutkowski’s (2015) SVDM. This finding is important given the scarcity of developmental music research on populations other than Caucasian, middle-class children.

Earlier studies have found significant correlations between instrumental improvisation and other musical skills such as performing (Azzara, 1993) and playing by ear (McPherson, 1996). In this study, improvisation and pitch-matching scores were correlated at baseline and Y2, and approaching significance at Y1. Overall, these correlations make sense when one considers the treatment of data in this study. The rating scales that were used to evaluate both improvisation and pitch-matching tasks focused on singing range and melodic embellishment. Unsurprisingly, both are common “first steps” in the study of vocal improvisation (Weir, 1993). Furthermore, it is almost intuitive that individuals with a larger vocal range are possibly more likely to use a larger variety of notes when improvising vocally than individuals who have a limited singing range. In terms of the differentiated correlational findings across the years, the addition of items to both the improvisation and pitch-matching tasks in Y1 made the tasks longer and more challenging, particularly for the improvisation tasks (see Figure 2). When the same tasks were repeated in Y2, child participants were not only more mature, but also were already familiar with them. This might have been the cause for the “approaching significance” correlation between improvisation and pitch-matching in Y1.

Our results also lend support to earlier studies that found sex differences in children’s musical skills and behaviors (e.g., Mang, 2006; Welch, Saunders, Papageorgi, & Himonides, 2012), as girls outperformed boys in both tasks. Female researchers administered most singing tasks and this may have influenced children’s performance. Yet, child participants also interacted with male researchers when completing other non-music-related tasks in our study, and no sex differences emerged (see Habibi et al., 2014; Ilari, Keller, Damasio, & Habibi, 2016). Thus, our results could perhaps be explained in terms of sex differences in brain maturation (see Koelsch et al., 2003), self-discipline with impact on achievement (Duckworth & Seligman, 2006), beliefs of self-efficacy in music (Eccles, Wigfield, Harold, & Blumenfeld, 1993), or even the nature of experimental tasks that may favor one of the sexes (Leighton & Lamont, 2006). Considering the idea that some experimental tasks may favor one of the sexes, as suggested by Leighton and Lamont (2006), it is possible that boys in our study perceived vocal improvisation as an offshoot of singing, that is, as a feminine skill (Warzecha, 2013), which impacted their responses to the task. Pressure to conform to socially-valued, sex-stereotyped roles is known to be particularly strong in middle childhood (Ey, 2014). This could explain the fact that boys in our study were more likely to refuse to complete the improvisation and singing tasks than girls. We suggest that this be further examined by future research, especially since musical improvisation is often viewed as a masculine activity (Wehr-Flowers, 2006).

Study phase 2: Qualitative

Once determined that there were developmental changes in children’s improvised song endings over the course of two years, a subsequent goal was to understand the qualitative nature of

such changes, as well as to probe children's engagement with improvisation tasks more deeply. To accomplish these goals, first we conducted a thorough musical analysis of all improvised products to uncover children's thinking strategies as they improvised song endings. Next, we examined how two child participants, who had scored high on improvisation and pitch-matching tasks in the quantitative phase, responded to a wide variety of improvisation tasks. These bounded cases (Creswell, 2014) also served the purpose of probing more deeply the strategies used by children that were detected in the analysis of their earlier improvised products.

Musical analysis

All invented song endings produced by child participants were analyzed by two expert musicians for their musical contents, particularly in relationship to melody, rhythmic structure, and overall conformity to the Western tonal system. Rather than creating analytical categories for pitch and rhythmic developments a priori, as done earlier (e.g., Brophy, 2002, 2005; Paananen, 2007), categories emerged from the data, as is typical of qualitative research (Creswell, 2014).

The musical analysis of 477¹ sung renditions showed that children employed the following six strategies to improvise their song endings, listed here in a random order: (A) copying the experimenter's melody exactly as it is; (B) copying the experimenter's melody with a slight variation (but very close), in time, and ending on the tonic; (C) creating a short, novel melody by playing with form yet maintaining some characteristic from the experimenter's melody; (D) creating long or short melodies with no clear aims or connections to the experimenter's melody; (E) creating long, novel melodies that return to the tonic and keep in time; (F) potpourri, or developing the experimenter's melody so as to connect it to one or more clearly recognizable familiar songs. Musical examples for each strategy are depicted in Figure 3.

When these strategies were analyzed in relationship to year of emergence, some interesting findings surfaced. Strategies A and B were more common at baseline, while strategies C and E were not seen at baseline, yet appeared in Y1 and Y2. Strategy C was the most common to all years. By contrast, strategies D and F were the least common, with strategy F appearing rarely and exclusively in Y2, and strategy D emerging primarily in Y1 (and occasionally in Y2).

Following the musical analysis, it was important to determine whether children's improvisational strategies were specific to improvising song endings or would also apply in other contexts. Adopting the notion of case studies as units in a bounded system (Creswell, 2014), we explored how children from a specific El Sistema-inspired program responded to different vocal and instrumental improvisation tasks ranging in levels of constraint. Tasks included improvising song endings vocally as done in the quantitative phase (i.e., more constrained) and improvising using the voice or instruments in response to images and written text (i.e., less constrained).

Two case studies

Case studies were carried out with Julián and Alberto (pseudonyms), two instrumentalists from the music program, who had taken part in the quantitative phase of the study. Musically trained children were selected for this portion of the study based on the assumption that they would have a larger musical lexicon (see Flowers, 2003) to engage in conversations about their improvisation processes and products than their non-trained peers. Julián and Alberto were recruited through purposeful sampling (Creswell, 2014), based on their scores in the pitch-matching tasks and the quality of their improvised song endings during the quantitative phase, along with personal characteristics (i.e., being outspoken), availability and willingness to participate.

Example melody creations

Experimenter 2-measure beginning followed by subject creation

A copying the exact melody

I have a cat and it goes "meow meow" and it's cute and it sleeps with me

B slight variation, in time, ending on tonic

C playing with form but maintaining much from the original

I have a dog and it goes "bark bark" I have a dog that goes "bark bark"

"bark bark" "bark bark" I have a dog that goes "bark bark"

D long (or short) creations, apparently with no aim, no real connection to the given material

E long or complex creations in time and key, ending on tonic

F potpourri (e.g., turns into Joy to the World)

A sport at baseline; B sport at Year 2; C control at baseline; D control at Year 1; E music at Year 2; F music at Year 2.

Figure 3. Six strategies used by children to improvise song endings.

Each child met individually with a researcher for 20–25 minutes in a room at the music program facility, where they were interviewed about their everyday experiences with music and art (i.e., drawings, spontaneous movements to music, etc.), and engaged in eight different improvisation tasks: (1) vocal improvisation without any prompts; (2) vocal improvisation based on words (i.e., rainbow, spaghetti, rubber band, octopus, or clouds); (3) improvising a song ending to two pop tunes; (4) improvising a song ending, and then reversing the process by creating a beginning of a song for the researcher to complete; (5) vocal improvisation inspired by “Acrobatic Dancers” (Joan Miró, 1893–1983); (6) instrumental improvisation without any prompts; (7) the child’s choice of improvisation; (8) listening to and talking about their own vocal improvisations from Year 2. Because the researcher followed a semi-structured protocol (Creswell, 2014), tasks 2–7 were presented in random order, following the natural course of the interview. Task 8, however, was presented at the end of the session in both cases. A second researcher was present during the interviews and served as an observer. To establish trustworthiness of data (Shenton, 2004), a third researcher, who had both tested the children in earlier years and analyzed singing data, assisted in the analysis of interview data in the form of videos, audio files, and researcher notes. Parental interview data from all years were also used to assist in the analysis of the two cases. A summary of the children’s responses to each task is presented in Appendix C in the Supplementary Materials online, followed by a short commentary on each individual child.

Julián. Julián was a 9-year-old violist, who also played piano and danced ballet in a local program. A confident singer, Julián’s scores for both pitch-matching (i.e., baseline = 4.05; Y1 = 4.75; Y2 = 5.0) and improvisation (i.e., baseline = 1; Y1 = 2.10; Y2 = 2.65) in earlier years were continuously on the rise. Julián had an interesting sense of humor and an advanced vocabulary for his age. His mother portrayed him as an intelligent child who became easily bored and disengaged with tasks both in school and at home. This was her explanation for his occasional disruptive behavior in the music program.

At the beginning of the interview, Julián was rather shy and seemed uninterested in the tasks. When asked to sing, he immediately offered, “I don’t want to sing,” and continued to reply, “I don’t know,” until the researcher turned off the audio recorder, leaving only the video-camera on. Julián continued to look disinterested until the researcher talked about drawing, to which he replied, “The first thing I see, I just draw it.” His enthusiasm for drawing and visual images soon carried over to the improvisation tasks. Miró’s painting sparked some enthusiasm and motivated Julián to improvise vocally (and later on the piano):

15’ 37”

- R. – How about I show you this picture? Can you make something to that? Any little tune?
 J. – Ok.
 R. – Yeah. Whenever you are ready.
 [Sings in 4/4 tempo and in the same key of the band playing in the adjacent room. He made use of an ascending arpeggio and a descending scale in a major key.]
 R. – That was cool. So what were you thinking about when you did that?
 J. – There was this guy here (points to the picture), he was talking to this guy here (points again).

A few minutes later, when given the choice to improvise freely, Julián chose to do it on the piano, not on the viola or with his voice, and used Miró’s image as a source of inspiration. Following a similar idea as in the vocal improvisation to the image, he alternated hands and

registers to depict two different “guys” in the picture. He made use of the staccato articulation in both the right and left hands, playing single notes. Julián seemed to intentionally use the minor mode in the right hand (C minor) and the major mode in the left (C major), separately, adding a few notes in the left hand that were not in the same key (e.g., D sharp). The rhythm of the repeated notes was fast and he used a two-bar phrasing that is standard in Western music. Although he did not make use of dynamics, his improvisation spanned over an octave in the melody.

Without much enthusiasm, Julián completed all other tasks except for improvising to a selected word, which he refused to do. As seen in Appendix C in the Supplementary Materials online, his improvisations were based on previously learned harmonic, melodic, and rhythmic patterns. He also made use of patterns when varying, even if slightly, the researcher’s prompts, following strategies B, C, and E (Figure 2). When improvising on the piano, the instrument he felt most accomplished in, he made use of recognizable forms and articulation, and experimented with mixed modes and wider ranges, whereas this was not the case for the voice.

Julián showed little interest when asked to reflect on his own improvisational products. His instant enthusiasm for drawings and to improvise to Miró’s picture had clearly waned.

Alberto. Alberto, an effusive 10-year-old violinist, was very enthusiastic when speaking about playing and creating music. Alberto was one of the top students in the program, who was liked by all teachers and students. His mother described him as a straight-A student, who was self-motivated and hard working. Alberto was also a confident singer, whose scores for pitch-matching (baseline = 4.55; Y1 = 5; Y2 = 4.75) and improvisation (baseline = 3; Y1 = 1.56; Y2 = 2.90) were very high from the start. In Y1, when additional improvisation tasks were added, Alberto’s scores decreased, only to increase again in Y2.

Unlike Julián, Alberto engaged with the improvisation tasks from the start. When asked to improvise a melody based on a word, Alberto chose “clouds.” He sang in 4/4, starting out with two bars of an ostinato-like accompaniment figure, and then moved to a dramatic melody in a minor key using the syllable “ta.” The melody was spread over two short phrases and ended on the tonic. When asked about his thoughts while improvising, he offered:

4’ 22”

A. – [I was thinking about] someone flying through the clouds.

Later on, he used the same word as a source of inspiration to improvise on the violin. The end result was a legato piece with long notes, sounding somewhat like a lullaby in G major that ended on the third. He stated:

11’ 06”

A- [I was thinking about] the same thing that I did with my voice; thinking of people flying through the clouds.

The two improvisations for “clouds,” however, were very distinct. Whereas the vocal improvisation was more dramatic in character and purpose-driven, the improvisation on the violin sounded more peaceful and “floaty.”

It was also interesting that, in the beginning of the interview, Alberto was not comfortable in improvising to Miró’s image. However, later in the interview he produced an improvised melody

on the violin, including sections in short staccato followed by running notes in step-wise motion. He reported thinking about the corners and shapes in the picture, which to him were “very stiff,” and he portrayed this in the music.

Overall, Alberto used improvisation to express the “feel of the music” through rhythm, meter, articulation and modes. He was imitative in nature, as his ideas were based in large part on the researcher’s prompts. His improvisations also conformed to the Western tonal system. Although Alberto completed all tasks, he appeared to be more comfortable when improvising on the violin than with the voice, conveying different ideas with each of them as when improvising to the word “clouds,” and showing more expressive features. Given Alberto’s quick responses to the researcher’s vocal prompts, it was clear that his planning took place simultaneously with the production of music. Yet when Alberto was asked to create something without any given prompts (i.e., open task), his improvised products were less structured. Alberto used all strategies, except for strategies D and F.

It was also interesting to see how articulate Alberto was when reflecting on his own improvised products. He listened to each improvised song ending from Y2 with an undivided attention, showing different facial reactions like smiling, nodding or frowning. Alberto spoke of specific musical genres (e.g., march, dance), musical periods (e.g., Middle Ages), and emotional states (e.g., sad, happy and “jumpy”).

Discussion of qualitative findings

Findings from the qualitative phase suggest that children used different strategies to improvise endings to songs, and that their choice of strategies depended on several factors including familiarity with the musical materials. As an example, it was interesting that the two boys only used strategy A (i.e., copying the exact melody from the experimenter) when the prompt was the melody of the pop tune “What makes you beautiful.” Both repeated the experimenter’s melody because, as one of them stated, “that is how the original song goes.” But this is not to say that a familiar tune will necessarily hinder children from creating new musical materials. This was evident when the experimenter sang a phrase from “What a wonderful world,” to which Julián responded with a long and elaborate ending (strategy E), despite showing recognition of it. Alberto, in turn, appeared to “quote” the initial motif of a piece that he knew (Mignon’s “Gavotte”) when improvising on the violin, although the researchers agreed that the passage was too short to be considered a potpourri (strategy F). Both boys used strategies A, B, C, and E to create their improvisations. Strategies D and F, however, were not seen in their improvised products. The fact that strategy F did not emerge in the case studies was not completely surprising. Strategy F was also rare in the quantitative phase, emerging only in the improvised products of three children (two of them girls). This strategy is arguably more challenging than the others, as it requires the musician to establish connections between the melodies, implied harmonies and rhythmic structures of a familiar tune and the new creation. Still, the fact that strategy D (i.e., creating long or short melodies with no clear aims or connections to the experimenter’s melody) did not surface in the case studies suggests that the boys were engaged in the tasks. This finding is also consistent with the musical analysis, which revealed strategy D being used predominantly in Y1 and occasionally in Y2.

Children’s individual characteristics and preferences also impacted their engagement with the improvisation tasks. When improvising, whereas one child was clearly inspired by a visual prompt, the other was motivated by a word. Individual differences were also seen in children’s reactions to their own improvised song endings, which was suggestive of many forms of improvising – ranging from “a kind of pre-reflective playful impulse” (Burnard, 2000, p. 232) to

intentional means of demonstrating stylistic competence and other forms of musical knowledge. Thus, case study data suggested that there were both commonalities (e.g., type of strategies used; preference for instrumental over the voice in a free improvisation task) and differences (e.g., preferences for specific tasks) in children's approaches to different improvisation tasks.

Study phase 3: Integration of quantitative and qualitative findings

This mixed-methods study investigated the development of children's improvised song endings over the course of two years. Quantitative data have confirmed findings from earlier studies that suggest a developmental course to vocal improvisation skills, whilst reiterating the fact that improvisation is a separate skill that needs to be nurtured to reach expert levels. Quantitative data have also underscored the role of biological sex on children's vocal improvisation in middle childhood and have helped to pinpoint some strategies that children use when improvising song endings. Through qualitative data, it was possible to examine some of the strategies that children use when improvising song endings in more detail, including in tasks with varied levels of constraint. Qualitative data also shed light on the combination of individual differences, the nature of tasks and children's strategies when approaching improvisation tasks.

When asked to improvise song endings over the course of two years, musically trained and untrained children seemed to move from imitation or repetition (strategy A) to variation (strategies B, C, D, E, F). Variations ranged from the simple inclusion of a few sounds into a familiar melody to elongated and more sophisticated creations. This is not only consistent with earlier research (Baldi et al., 2002), but also aligns with the earlier levels of improvisation proposed by Kratus (1996) and Paananen (2007), as well as with pedagogical approaches to vocal improvisation (see Weir, 1993). As the case studies suggested, musically trained children can use different strategies to improvise. While strategies are selected extemporaneously, they appear to be based on acquired musical knowledge, preferences for instruments and multiple sources of inspiration.

Taken together, quantitative and qualitative findings call into question the methodologies that are typically employed in studies of children's improvisational skills. An important hint came from the bounded cases. Although both boys were competent singers, when given a choice, they chose to improvise on their instruments and not on the voice. Furthermore, child participants showed preferences for different sources of inspiration when improvising. Thus, it is possible that some of the child participants who scored low on the improvisation tasks in the quantitative phase might have scored higher, had we asked them to complete a variety of tasks. We suggest that researchers give serious consideration to this issue when studying improvisation. The need to document and contrast children's instrumental, vocal and gestural improvisations by sex, age and musical training, and in light of their own motivations and sources of inspiration, is clear.

Girls in this study outperformed boys in the vocal improvisation tasks in the quantitative phase. As discussed earlier, this could be a maturational issue, a social issue, or both. One limitation of our study was the fact that it was not possible to interview girls at the time when the qualitative phase was carried out. This is a gap that could be filled by future research; a more thorough examination of girls' improvisation skills following different tasks might reveal other sex differences not captured in this study. This is very important, as such findings could help dispel the notion of improvisation as a "masculine" activity (Wehr-Flowers, 2006).

Whereas the literature on improvisation has largely neglected the developmental course of vocal improvisation, this mixed-methods study underscores its importance. The fact that

children's improvised song endings became more sophisticated over the course of time and irrespective of music training, offers some insights into the development of improvisation in childhood. It is possible that the improvised vocalizations that characterize the early years of life (Barrett, 2006) may not disappear completely as children move through the middle childhood years, but remain "dormant," awaiting opportunities to flourish. This is a question that merits further investigation. Researchers could focus on the investigation of children's singing in naturalistic settings over time from early to middle childhood, by means of cross-sectional and longitudinal designs.

In sum, our findings not only reinforce the notion that improvisation is a complex and specific skill (Burnard, 2000; Hickey, 2012; Lehmann & Davidson, 2006; Sawyer, 1999; Sparti, 2016) that needs nurturing, but further suggest that its development during childhood is predicated on the existence of ample opportunities for engagement with different improvisatory tasks and in different environments, whilst honoring children's social and cultural environments, personal characteristics, musical preferences, and acquired musical skills. Had we not integrated qualitative and quantitative results, the takeaway message from our study would probably center much more on group differences (or lack thereof) than on the many factors that may influence the development of vocal improvisation in middle childhood.

Conclusion

As Collins (2010) argued, "improvisation has always been an essential part of musical culture – composition, as we know it from European 'art' music, has been the exception, rather than the rule" (p. 7). Musical improvisation is known to be a unique form of human creativeness that is also ubiquitous to childhood (Kartomi, 1991), given its links to play (Sawyer, 1999). Yet, as seen earlier, there is little integration between studies conducted with expert improvisers and studies on the improvisatory skills of young children. While the study of improvisation in experts may offer important insights into human cognition, creativity, and inventiveness, a complete understanding of the phenomenon can only emerge through an in-depth understanding of its developmental course over the lifespan.

To fully understand how improvisation develops in childhood, not only is more research needed, but there is also a need for researchers to consider their own epistemologies and conceptions of child and childhood. Because developmental research in music has typically followed conceptions of children as either "being" or "becoming" (Young, 2015), that is, with music in early childhood usually viewed as a category of being and school-aged children as undergoing a "process of becoming" (Ilari & Young, 2016), the integration of developmental research findings is challenging. Perhaps part of the problem lies in the boundaries between these categories. We suggest that rather than being mutually exclusive, conceptions of children as "being" or "becoming" are part of a continuum that exists within a confluence of personal characteristics and motivations, contextual issues, experiences and affordances, and time (as proposed by Bronfenbrenner & Morris, 1998). Middle childhood is a pivotal period of musical development (Gembris, 2006; Lamont, 2016), and likely a time when "being" and "becoming" intersect. Future research needs to determine whether this is accurate, and if so, help to ascertain what influences children's transitions from one category to the other, including the role of formal music education. Answers to these questions will not only contribute to current theorizing in musical development and human creativeness and invention (see Lamont, 2016; Sawyer, 1999; Webster, 2016), but may also draw important implications for educational policy and practice.

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Note

1. The total of 477 sung renditions refers to 53 improvised song endings at baseline, plus 212 improvised song endings in Y1 and an additional 212 improvised song endings in Y2.

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