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What makes a child musical? conceptions of musical ability in childhood

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ABSTRACT

Tests of musical ability in children have relied on diverse conceptions of what musical abilities are. Recent investigations suggest that such conceptions can be seen as socially constructed and differ between cultures, sub-groups, and individuals. Based on a previous study on conceptions of adult musical ability, we designed a questionnaire targeting musical behaviours of 3–6-year-old children. 922 German adults who regularly spend time with children assessed how often a musical child would show these behaviours. Principal component analysis revealed four components of childhood musical ability: musical communication, enthusiasm and motivation, analytical understanding of music, and musical abilities in a narrow sense. The importance assigned to the components differed depending on musical expertise: Participants with higher expertise rated analytical music skills as significantly less important. Results suggest that ecologically valid tests of musical ability in childhood should cover a wide range of skills and observable behaviours.

Introduction

To investigate the development of musical abilities, various testing batteries and procedures have been devised and published over the course of the last century (e.g. Bentley, 1966; Gordon, 1965, 1989; Seashore, 1938/1967; Wing, 1981; the terms 'musical ability' and 'musicality' will be used interchangeably in the following). However, the available tests differ in their underlying conceptions of musicality (Shuter-Dyson, 1999). This has led to a great diversity of testing procedures that make it difficult to compare results across studies. To better understand how testing procedures relate to the manifold developmental processes that constitute musical development, it is useful to take a step back to review the concept of 'musical ability': Generally, musical ability is not assumed to be a natural and uniform trait, but a social construct with different meanings in different cultures, subgroups, and even individuals (Blacking, 1971; Hallam & Prince, 2003). It has been shown that everyday conceptions of adult musical ability are highly complex and comprise far more facets as normally included in test procedures (Hallam, 2010; Hallam & Prince, 2003). It has been suggested that common conceptions of *childhood* musicality are also broad and multiform (Haroutounian, 2000), but how accepted such broad conceptions really are has never been systematically investigated.

In the present study, we examined the conceptions of childhood musicality as perceived by different groups of people with a wide range of expertise related to this topic (music teachers, teachers, parents and carers) in Germany. Our aim was to identify traits, skills, and behaviours that were considered as important indicators of musical ability in 3–6-year-old children, and to compare them to conceptions of musical ability in adulthood. To this end, we adapted previously collected statements on musical ability (Hallam & Prince, 2003) and made them applicable to young children. These statements formed part of a survey that was distributed to musicians and music educators, non-music educators, and parents and carers.

Developing a robust concept of musical ability is a prerequisite for investigating the processes underlying musical development, and for adequate use of test batteries and observational research tools to quantify musical development in children.

Assessing musical ability in childhood

Music is a cultural universal and all humans possess a potential for developing musical abilities and competence. Yet, there is strong disagreement on what constitutes the core set of musical abilities and how these are related to one another.

Seashore (1938/1967) was among the first to argue that musical ability is not a monolithic human feature but results from the interaction of various independent abilities, i.e. advocating a multifactorial model. This is reflected in the Seashore Measures of Musical Talent (Seashore, 1919) which consist of a collection of auditory discrimination tasks that are only slightly associated with each other (Seashore, 1938/1967) and result in a profile of musical ability.

In contrast, Bentley (1966) and others assumed that musical ability is a holistic and self-contained ability that may be described by a general factor model. The Measures of Musical Abilities published by Bentley (1966) include tasks on pitch discrimination, tonal memory, chord analysis, and rhythmic memory that all feed into one overall score. Note, however, that Bentley admitted that whether musical ability was more adequately described as a single ability or a collection of multiple abilities was a matter of empirical investigation (Bentley, 1966).

The lack of a uniform theoretical concept of musical ability is not only reflected by the different test procedures, but has also motivated extensive criticism of existing tests. Gordon's strong emphasis on audiation has sparked controversial debate (e.g. Colwell & Abrahams, 1991; Woodford, 1996) which resembles the general criticism that many musicality tests focus too much on aural perception (Hallam & Shaw, 2002). Moreover, this is also reflected by mixed results on psychometric test criteria, in particular, low validity of many tests (e.g. Demorest, 1995; Gembris, 1998/2013; Hallam & Shaw, 2002; Schleuter, 1993). The lack of clarity about the construct to be measured results in music tests that measure only those sub-competencies that the test authors considered fundamental (Gembris, 1998/2013; Shuter-Dyson, 1999). Researchers choose to measure musical ability 'in whatever way they see fit' and adapt their measurement procedure to suit their needs (Ollen, 2006, p. 1). Furthermore, critics have argued that the existing tests cannot capture the true nature of musicality and its development since they ignore a number of important abilities (e.g. musical communication, musical understanding, motivation; Murphy, 1999).

As a step forward, more recent studies (Hallam & Prince, 2003; Levitin, 2012; Murphy, 1999; Müllensiefen, Gingras, Musil, & Stewart, 2014) have proposed a more integrative concept of musical ability, in order to take into account the complexity of the phenomenon. This is meant to do justice to the broad repertoire of behaviours that can be described as musical (Levitin, 2012). Comprehensive concepts of musicality should not only cover the diverse skill sets of professional musicians (e.g. composing, arranging, conveying musical emotions, musical creativity), but also of amateur musicians or other music professionals (e.g. DJs, music critics; McPherson, 1995; Müllensiefen et al., 2014).

Taken together, applying a new perspective by *viewing musical ability as a social construct* could be a helpful step towards a better understanding of how test procedures, observable music-related

behaviours, and their development are related to each other. Assessing the conceptions of musical ability held by the general population, musicians, and music educators takes into account culture-specific features as well as social change. This allows to grasp the facets of the concept of musical ability in a way that reflects the actual experience of music.

Conceptions of musical ability

In a series of studies (Hallam, 2010; Hallam & Papageorgi, 2016; Hallam & Prince, 2003; Hallam & Shaw, 2002), Hallam and colleagues investigated conceptions of musical ability in the UK. Their starting point was a qualitative study of musical ability in adults. 415 individuals with varying musical backgrounds (musicians, non-musicians, young adults with and without musical involvement) completed the statement 'Musical ability is … ' in writing. Their written statements were then analysed in an iterative process of categorization. From this analysis emerged the following six super-ordinate themes and 21 sub-categories: (1) aural skills (e.g. having a musical ear), (2) receptive responses (e.g. listening to and/or understanding music, being actively responsive to music), (3) generative activities (e.g. being able to play or sing), (4) integration of a range of skills (no subcategories), (5) personal qualities (e.g. metacognition, motivation), (6) the question whether musical ability is innate or learned.

These complex categories reflect how differentiated the view of musicality is in the general population. While conceptions were dominated by active musical engagement (72% of the statements included a reference to singing or playing an instrument), participants also mentioned receptive abilities. Definitions became more complex the more actively involved in music participants were. Closest to conceptions of musicians were those of educators. However, educators placed greater emphasis on appreciation of music while musicians emphasized motivation, personal involvement and learning skills, metacognition, emotional expression and communication skills.

In a next step, these spontaneously self-generated statements were used to quantify how widespread the different notions of musicality were. 77 statements from the qualitative study (Hallam & Prince, 2003) were presented to 660 participants (musicians, educators, amateur musicians, children with and without musical engagement) who indicated their level of agreement to each statement. In this study, musical ability was most strongly associated with *having a sense of rhythm*, reflecting traditional conceptions relating to aural abilities. Further important categories were: *being able to understand and interpret music*, *express oneself through sound*, and *being able to communicate through sound*. Personal factors also seemed to be important: the *motivation to engage with music*, *personal commitment to music* and the *ability to musically engage with others* received the highest mean scores. A principal component analysis revealed six components of musical ability: (1) Playing an instrument or singing, (2) musical communication, (3) valuing, appreciating and responding to music, (4) composition, improvisation and related skills, (5) commitment, motivation, personal discipline and organization, (6) rhythmic ability, pitch and understanding. The generative skills (1) explained the highest proportion of variance, whereas aural skills (6) were rated as less important indicators of musical ability. Participants' musical background led to different points of emphasis: Musicians emphasized the importance of musical communication, while educators stressed the importance of creativity, and amateur musicians and non-musicians believed aural skill and motivation to be indicative of musical ability.

In sum, Hallam's studies have shown a rich and polymorphic view of musical ability in adults, containing typical facets like aural skills and less typical ones like motivation. This goes far beyond what is usually assessed in musical ability tests. However, assumptions and beliefs about *how* the different facets of musicality *develop and apply to young children* have not been empirically investigated yet. Are the same facets present in children, just to a lesser degree, or do children acquire some of these facets (e.g. motivation, responsiveness to music) earlier than others (e.g. performance skills)? Empirical research on the conceptions of musical ability in younger children is scarce. Instead, beliefs about musical ability in childhood are often approached in terms of retrospective studies on the

development of musical ability (Davidson, Howe, Moore, & Sloboda, 1996; Howe, Davidson, Moore, & Sloboda, 1995) or the identification of musical talent (Haroutounian, 2000).

Haroutounian (2000) explored *observable indicators* of musical talent, with the intent to provide a scientifically proven framework for identifying musically gifted children. Based on an analysis of talent descriptors found in nomination forms, rating scales, and checklists, the authors proposed three main categories of musical talent: (1) Musical ability and aptitude, (2) creative interpretation, and (3) commitment and self-discipline. In a quantitative survey, 244 music educators and other experts from the U.S. indicated which behavioural characteristics and performance descriptors of musical talent are observable, even in untrained musicians. Interestingly, scores for general behaviours such as sustained interest and self-discipline were higher than for musical skills in the strict sense. Among the latter, pitch and rhythmic accuracy had the highest mean score, followed by rhythmic performance, dynamics and technical fluency. Intriguingly, originality was rated as least important. In complementary expert interviews, the importance of perceptual awareness and discrimination, meta-perception, creative interpretation, performance, and motivation was stressed. As to the role of creativity, the results of the interview study contradicted those of the questionnaire. The experts in the interview study indicated creativity as an important component of musical talent, while the participants in the survey considered creativity to be of little use for identifying talent (Haroutounian, 2000).

Taking a different approach, O'Neill (2002) investigated conceptions of musical ability by evaluating *personal beliefs* about the construct. In an interview study, 172 children between 6 and 11 years of age from the U.K. were asked about their musical self-conceptions. These turned out to be based to a large extent on personal experiences with music: children who did not play an instrument showed a more rigid view of musical ability, assuming little opportunity for change. In contrast, musically experienced children had a more flexible view. Overall, ideas about musical ability were less flexible than ideas about athletic ability across all children (O'Neill, 2002).

In sum, several studies have provided empirical evidence that conceptions of (adult) musicality in the general population include a wide range of abilities. However, whether and how this range of abilities also applies to musical ability in childhood is still unclear.

In essence, there is a lack of systematic large-scale surveys on conceptions of musical abilities in childhood. Hence, our study aims at filling this gap by surveying people with extensive contact to children (musicians/music educators, non-music educators, parents and carers) about their views on musical ability in 3- to 6-year-old children. We based our online survey on the qualitative analysis of Hallam and Prince (2003), and compared our results with theirs on adult musicality (Hallam, 2010).

The results of our study may serve as a basis for the development of novel assessment batteries to measure musical ability in childhood that build on the conceptions of musicality as held by experts and the general population. This expanded perspective of musicality in young children can then serve as the scientific basis for future empirical research and a better understanding of musical development in childhood.

Method

Participants

Survey participants were adults who regularly spent time with children between 3 and 6 years. Participants (714 female) were between 18 and 75 years of age ($M = 41.98$, $SD = 9.36$). 46.2% had a university degree (among those, $n = 159$ had a degree related to music), 25.1% had the equivalent of A-levels, 24.5% had the equivalent of General Certificates of Secondary Education, and 4.2% had lower secondary school certificates or no degree. The sample comprised 167 music educators (18.1%), 180 early childhood educators (19.5%) and 551 participants (59.8%) with a profession not related to education. 24 participants (2.6%) did not state their profession.

Materials

Development of the musical child questionnaire

The new Musical Child Questionnaire (MCQ) was developed based on statements from Hallam's study on conceptions of (adult) musical abilities (Hallam & Prince, 2003). In that study, participants from different musical backgrounds completed the sentence 'Musical ability is … ' in written statements. We reformulated these statements to match the sentence 'A child who is musically skilled … ' (e.g. 'A child who is musically skilled has a good sense of timing and rhythm'). Statements were then translated into German and, where necessary, excluded or reworded to make them suitable for the target age group (3–6).

The translation was carried out in the following steps: One of the authors (German native speaker with near-native English skills) translated all items from English into German. The translation was subsequently validated by the three remaining authors (all German native speakers and highly fluent in English), and individual sentences were modified to make them sound more idiomatic wherever necessary (decisions were taken by majority vote between the authors). Next, items that appeared to be clearly unsuitable for the description of child musicality were excluded by consensus.

In other cases, the items could be adapted for the age group by rephrasing. Each author made suggestions for rewording of items. In a next step, the suggestions were validated by all authors together through discussion until unanimous consensus was reached.

As a final step, redundant items were eliminated. Decisions on dropping items due to redundancy were driven by the need to shorten Hallam's list of 134 items. 134 items would have resulted in an overly long online survey, especially for busy caregivers of small children. With the aim of shortening the list, the authors independently judged all items for redundancy (i.e. strong overlap in their key message), and again discussed and validated their suggestions together.

The focus of all items was on children's observable behaviours, and participants were asked to indicate how often a musical child would typically show such behaviours, responding on a 5-point Likert scale (1 = rare/never to 5 = always). The final version of the MCQ consisted of 49 items (see Table 1). All four subscales showed high reliabilities (all Cronbach´s α ≥ .85; for more details see Table 1)

Goldsmiths musical sophistication index

In order to assess the musical experience of the participants, we used the musical training subscale of the Goldsmiths Musical Sophistication Index which has been shown to have very good test-retest reliability and internal consistency and good validity (Müllensiefen et al., 2014). We used the musical training subscale from the German adaptation (Schaal, Bauer, & Müllensiefen, 2014) which consists of seven items on musical training and practice, as well as self-assessed musicianship. The scale showed high reliability (Cronbach´s α = .91).

Demographic information

With the survey, participants also provided basic demographic information. These included age, gender, educational background, and profession.

Procedure

The data collection took place in Germany for 15 months in 2019 and 2020, mainly online. Participants were recruited through online channels (mailing lists of music schools, childcare institutions, and panel members of a market research company in Germany) and personal contact. As an incentive, six Amazon gift cards were raffled among the participants. Out of 1933 people who visited the survey homepage, 1074 participants actually started the survey (56%), 152 (14%) of which were excluded due to either incomplete responses (less than 50% of items answered), an implausibly

Table 1. Items of the Musical Child Questionnaire.

MCQ Item			Component Loading			
A child between 3 and 6 years who is musically skilled …	M	SD	1	2	3	4
Component 1: Musical Communication (Cronbach´s α = .94)						
48 … can express him-/herself through sound.	3.22	1.01	.76			
28 … can express emotions that a listener understands when singing or making music.	3.25	.98	.74			
33 … brings several skills together: He/she has musical ideas and tries to implement them.	3.27	.93	.71			
26 … perceives the basic mood or feelings conveyed by the music that he/she is listening to.	3.37	.94	.67			
11 … is able to react to the mood of a melody.	3.55	.91	.66			
44 … would rather express themselves through music than through other means.	2.79	.98	.65			
49 … can listen carefully and react appropriately to music.	3.23	.91	.61			
34 … is able to produce or reproduce music.	3.35	.98	.61			
37 … listens while making music to see if it sounds as intended.	3.13	.98	.59			
17 … appreciates different kinds of music.	3.31	.96	.57			
40 … is motivated to make music, so that he/she becomes more and more skilled.	3.45	.92	.56			
27 … can communicate with others through music by producing musical sounds, listening, improvising, dancing, and understanding music.	3.46	.92	.55			
30 … can invent melodies or rhythms, either with his/her voice or a simple instrument.	3.51	.95	.52			
16 … has an open mind with which he/she approaches and experiences all music.	3.58	.89	.51	.30		
47 … can immerse him-/herself in sounds.	3.36	.97	.51			
25 … plays music with feeling.	3.67	.90	.50	.34		
10 … actively incorporates music into his/her world.	3.62	.89	.45	.38		
8 … shows that he/she can capture patterns when dancing or making music.	3.53	.88	.43			
13 … is able to react creatively, emotionally and intellectually when listening to a piece of music.	3.46	.93	.39			
5 … has a good memory for patterns	3.35	.87	.38			
12 … is able to move in synchrony with the music	3.61	.87	.38			
Component 2: Enthusiasm and Motivation (Cronbach´s α = .87)						
43 **… enjoys the occupation with music.**	**4.07**	.79		.80		
41 **… has great enthusiasm for music.**	**4.06**	.80		.75		
38 **… is interested in music.**	**4.01**	.82		.70		
14 **… enjoys music in his/her life, either by making music or by listening to it.**	**4.04**	.82		.67		
15 **… enjoys music and appreciates sounds.**	**3.93**	.82		.58		
39 … often has the desire to make music.	3.66	.88	.32	.56		
45 **… has a great affinity for music.**	**3.80**	.86		.55		.38
29 … is motivated to make music together with others, so that they become a group - be it by singing, playing instruments together, or moving to the music of others.	3.69	.94		.50		
32 **… is creative when making music.**	**3.72**	.87		.50		
31 **… likes to spontaneously produce music or musical sounds.**	**3.87**	.81	.35	.48		
46 A child is musical when music means something to him/her.	3.31	1.08		.33		
Component 3: Analytical Understanding (Cronbach´s α = .85)						
21 … applies criteria to evaluate music.	3.49	1.19			.89	
9 … can follow the structure of the music he/she listens to, and talk about it.	3.34	1.02			.77	
19 … is aware of different aspects of music, so you can talk to him/her about it.	3.19	.98			.64	
22 … is able to hear, compare and distinguish different types of music.	3.23	.98			.53	
20 … likes listening to music and can describe it with words and gestures.	3.55	.91			.49	
2 **… can reproduce melodies well.**	**3.75**	.90			.46	.41
18 … recognizes different types of music (e.g. children's songs, pop, classical music).	3.19	1.06			.38	
42 **… has a will of his/her own when making and enjoying music.**	**3.72**	.90		.31	.35	
36 … has a wide range of different skills.	3.44	.95		(.24)		
Component 4: Musical Abilities (Cronbach´s α = .85)						
6 … has a good sense of timing and rhythm.	3.50	.90				.77
7 … has a feeling for the beat.	3.50	.92				.70
1 … has a musical ear, i.e. he/she recognizes melodies and tone progressions.	3.67	.90				.69

Table 1. Continued.

MCQ Item A child between 3 and 6 years who is musically skilled …	M	SD	Component Loading 1	2	3	4
35 … is able to combine hearing and sound production.	3.70	.85				.44
4 … has good hearing ability, e.g. for melodies and rhythms.	3.65	.86				.42
23 … can sing a simple melody or rhythm or play it with an instrument.	3.62	.90				.40
24 … has good overall physical coordination.	3.26	.89				.34
3 … is able to internalize sound, pitch and rhythm.	3.59	.89				.34

Note. M = Mean. SD = Standard Deviation. The ten items with highest mean values are displayed in bold. Only component loadings above .3 are shown, one item did not have any loadings above .3, therefore the highest loading which occurred is shown in brackets.

short completion time (<4 min for 68 Questions) or because of constant ratings. The resulting sample comprised 922 valid questionnaires.

This study received ethical approval from the Ethics Council of the Max Planck Society. Informed consent was obtained from all participants and the collection of e-mail addresses to participate in the raffle and/or to receive the study results was done in a separate survey which ensured that personal data could not be linked to the survey answers or demographic information.

Analytic strategy

Data were analysed using the R software environment (R Core Team, 2019), including the R packages psych (Revelle, 2020) and lavaan (Rosseel, 2012).

Our main goal was to find distinguishable facets of musical ability in children, and to explore how important these facets are relative to each other. Here, the aspects of adult musicality that Hallam (2010) based on qualitative content analysis (Hallam & Prince, 2003) were compared to the empirical grouping of items on the new MCQ. Different empirical groupings of the MCQ were obtained through principal component analysis (PCA) and their fit to the data was compared by confirmatory factor analysis. Averages of item groups were then compared.

In a next step, we explored if participants with a professional background in education or music education differ in their evaluation of musicality compared to parents and carers. To address this question, we transformed the existing MCQ into a short version through principal component analysis, which also makes it more suitable for future practical applications. Using the new scale, average component scores of music educators, general early years educators, and parents and carers were then compared with a multivariate analysis of variance.

Results

Descriptive analysis

In Table 1, mean ratings and standard deviations for all items are shown. The ten items with the highest mean ratings are displayed in bold. These ten items were thus rated by the participants as frequent indicators of high musicality in children between 3 and 6 years. Seven out of these ten highest rated items clearly relate to enthusiasm, interest and motivation which therefore seem to be important features of musicality in children.

Qualitative comparison to adult data

As a next step, we compared our results to those of Hallam (2010), who explored the conceptions of musical ability in adults in 660 individuals (aged 14–90). Their participants were predominantly female (67%) and had different levels of musical background (102 musicians, 95 educators, 132 adult amateur musicians, 60 adults who were not musically active, 193 children actively engaged

in making music and 71 children with no engagement with music outside school). In order to compare our results with the conception of musicality in adults, we grouped the items on the MCQ according to the categories used in the study by Hallam (2010), which did not report results at the item level. The classification employed by Hallam was based on an iterative procedure from an earlier qualitative content analysis (Hallam & Prince, 2003). Only 18 out of the 21 original categories describing adult musicality were used. Items on 'reading music' and 'expressing thoughts and feelings through sound' did not have any correspondences in the MCQ because there were deemed as redundant or not applicable for the target age group of the MCQ. Questions regarding the 'Origins of Musicality' were also not part of our survey.

Mean ratings of musicality categories showed only a weak and non-significant correlation (Pearson $r = .12$, $p = .64$, Spearman $r_s = .08$, $p = .76$). This suggests that the conceptions of children's and adults' musicality differ considerably.

Figure 1 shows the 18 categories with average ratings for children (MCQ) and adults (Hallam, 2010) side-by-side. Again, *motivation, creativity* and *appreciation of music* appeared as most important in children, followed by *composing and improvising*, and *group performance*. Rated as least important for children were *knowledge about music, technical skills*, and *meta-cognition*. Bonferroni-corrected *t*-tests at the category level show that the mean responses in almost all categories differ significantly between adults' and children's musicality (Figure 1) with the exception of *integration of skills* and *personal characteristics*.
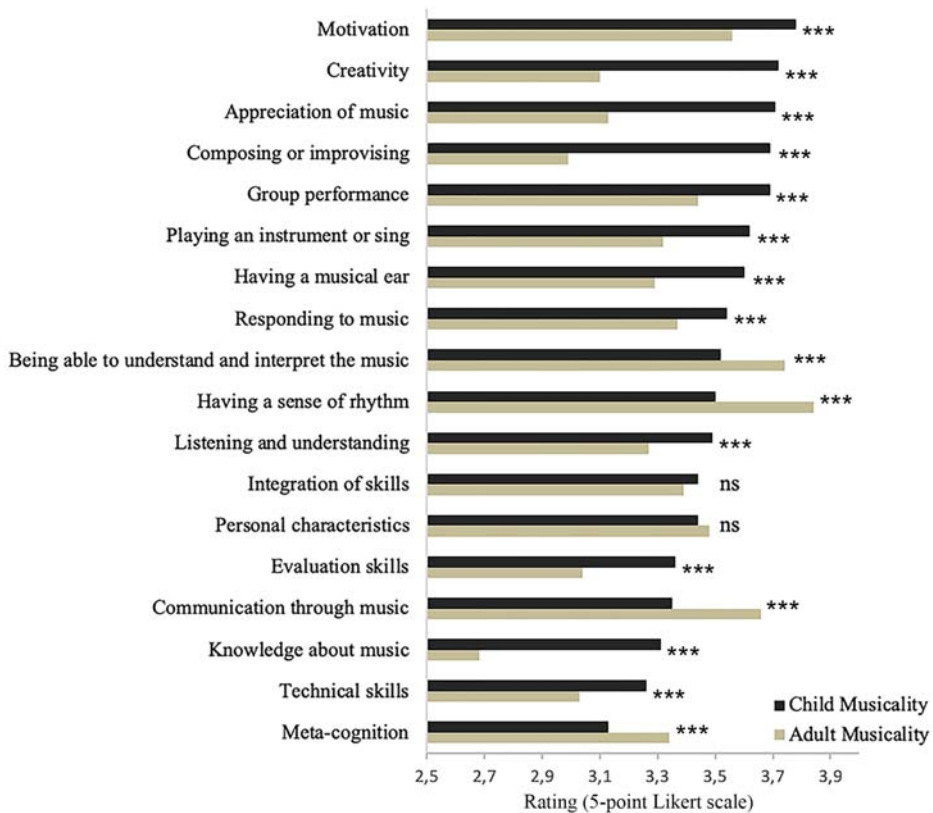
Figure 1. Comparison of Category Means for child and adult musicality. Ratings for children in black, ratings for adults (from Hallam, 2010) in tan. All *p*-values are results of two-tailed t-tests. *** *p* < .001. ns = not significant.

Only four categories were perceived as being more important for musicality in adults than in children: *having a sense of rhythm*, *communication through music*, *being able to understand and interpret the music*, and *metacognition*. All other categories were rated as significantly more important for child musicality. Here, the categories with the greatest difference in mean values were *composing and improvising*, *knowledge about music*, *creativity* and *appreciation*.

Grouping items of the MCQ

Three PCA models were computed to group the items of the MCQ into distinct components. We designed the first PCA model to replicate the model of Hallam (2010), using the same number of components ($k = 6$) and rotation (varimax rotation). This model explained 55% of variance among the 49 items (see Table 2 for root mean square of the residuals). The second PCA model used the same criterion for deciding the number of components that Hallam (2010) had used (i.e. select all components with eigenvalues > 2) while also using varimax rotation (as Hallam, 2010). The resulting 3-component-solution explained 46% of the item variance. The third PCA model was carried out independently of Hallam's prior calculations to achieve an optimal model-data-fit. We used parallel analysis (Horn, 1965) to determine the number of PCA components by comparing the empirical eigenvalues to the eigenvalues determined by simulation and resampling from the same dataset. A 4-component solution was suggested as optimal. This time, oblique rotation was applied to the resulting model, because we assumed from theoretical considerations that the components would be related, following McDonald's (1999) argument that facets or dimensions of the same construct are likely to be related rather than completely independent of each other (McDonald, 1999). The resulting 4-component solution explained 50% of the item variance.

For comparing the model-data fit of the PCA models, we conducted confirmatory factor analyses of all three models. Fit indices are given in Table 2 and show that the 4-component PCA model based on parallel analysis had the best fit to the data according to the Bayesian Information Criterion (BIC), while relative (TLI, CFI) as well as absolute fit indices (RMSEA, SRMR) for the 4-component PCA were also in an acceptable to good range (see Table 1 for items and their loadings).

Component 1 was interpreted as *musical communication*. It comprised 21 items with component loadings from .38 to .77 and included items that described a spontaneous, emotional approach to music both when listening and when expressing oneself. The second component, *enthusiasm and motivation*, comprised 11 items indicating the enthusiasm, the affinity and the enjoyment of music and the motivation to make music. Component loadings ranged from .33 to .80. Component 3, *analytical understanding*, focused on the analytical understanding of music (e.g. 'A musical child is aware of different aspects of music, so that it is possible to talk about them'), and the use of knowledge to evaluate music (e.g. 'A musical child applies criteria to evaluate music'). Component 3 included 8 items with component loadings from .35 to .90. Component 4 was termed *musical abilities*. It was composed of 8 items on basic musical abilities concerned with audiation, musical parameters such as pitch, melody, pulse, timing, and rhythm, and the integration of these abilities for making music. Component loadings ranged from .36 to .76. Table 3 shows the mean ratings and the amount of explained variance by component.

Table 2. Fit indices of computed models.

	BIC	TLI	CFI	RMSEA	SRMR
6-component PCA	99212.03	.850	.858	.056	.057
3-component PCA	99931.18	.815	.823	.062	.057
4-component PCA	97207.80	.839	.847	.059	.059

Note. BIC = Bayesian Information Criterion. TLI = robust Tucker-Lewis Index. CFI = robust comparative fit index. RMSEA = robust root mean square error of approximation. SRMR = standardized root square residual.

Table 3. Mean ratings grouped by components.

|	Means	SD	n	Explained variance
Musical Communication	3.38	.64	922	20%
Enthusiasm and Motivation	3.86	.58	922	12%
Analytical Understanding	3.43	.70	922	9%
Musical Abilities	3.55	.62	922	9%

Note. SD = Standard Deviation. n = number of participants.

Professional background and expertise associated with differences in the evaluation of children's musicality

The grouping of items on the MCQ provides an informative classification suggesting four different facets of children's musicality. However, for investigating how ratings differ between participants (e.g. due to professional background or musical expertise) the full MCQ represents neither a practical nor robust measurement instrument. Responding to 49 items is too time consuming for most research studies that may also include additional questionnaires. In addition, many items showed relatively low component loadings which can produce skewed results when unit weighting is used for scoring. Hence, a scale was constructed using the polychoric correlation matrix of the 49 items as input to parallel analysis. Four components were identified as optimal and oblimin rotation was applied to allow correlations between components. Only items with component loadings of >.6 were retained. This yielded a 4-component solution comprising 15 items (the retained items and their respective loadings are shown in Table 4) that was highly similar to the PCA model comprising all 49 items. Therefore, the same labels were used for naming the four components (1 musical communication, 2 enthusiasm and motivation, 3 analytical understanding of music, 4 musical abilities).

Component scores were computed for all participants using regression and subsequently comparted with a multivariate analysis of variance with professional background (musicians/music educators, non-music educators, parents and carers) as the independent variable and the four component scores as dependent variables. Using Pillaís trace, we found a significant effect of professional group on the components of our measurement instrument $V = 0.27$, $F(8,1732) = 33.76$, $p < .001$. Separate univariate ANOVAs on the scores of the four components revealed a significant difference only on component three (analytical understanding of music), Welch´s $F(2,302) = 123.99$, $p < .001$ in a linear relationship ($F(1,868) = 208.90$, $p < .001$; see Figure 2).

Table 4. Items of the short scale of the Musical Child Questionnaire with component loadings.

MCQ Item		Component Loading			
A child between 3 and 6 years who is musically skilled …		1	2	3	4
Component 1: Musical Communication (Cronbach´s α = .85)					
48	… can express him-/herself through sound.	**.86**	.03	-.04	.03
28	… can express emotions that a listener understands when singing or making music.	**.85**	.03	.04	-.05
33	… brings several skills together: He/she has musical ideas and tries to implement them.	**.77**	.11	.01	.07
49	… can listen carefully and react appropriately to music.	**.66**	-.04	.11	.21
Component 2: Enthusiasm and Motivation (Cronbach´s α = .82)					
43	… enjoys the occupation with music.	.04	**.90**	-.04	-.05
38	… is interested in music.	.12	**.85**	.03	-.11
41	… has great enthusiasm for music.	.00	**.81**	.02	.09
14	… enjoys music in his/her life, either by making music or by listening to it.	-.16	**.67**	.08	.30
Component 3: Analytical Understanding (Cronbach´s α = .81)					
21	… applies criteria to evaluate music.	-.12	.05	**.95**	-.07
9	… can follow the structure of the music he/she listens to, and talk about it.	.08	-.04	**.83**	.07
19	… is aware of different aspects of music, so you can talk to him/her about it.	.19	.02	**.63**	.15
22	… is able to hear, compare and distinguish different types of music.	.38	.00	**.54**	.01
Component 4: Musical Abilities (Cronbach´s α = .80)					
6	… has a good sense of timing and rhythm.	.03	-.02	-.03	**.90**
7	… has a feeling for the beat.	.14	.00	-.04	**.80**
1	… has a musical ear, i.e. he/she recognizes melodies and tone progressions.	-.05	.09	.13	**.77**
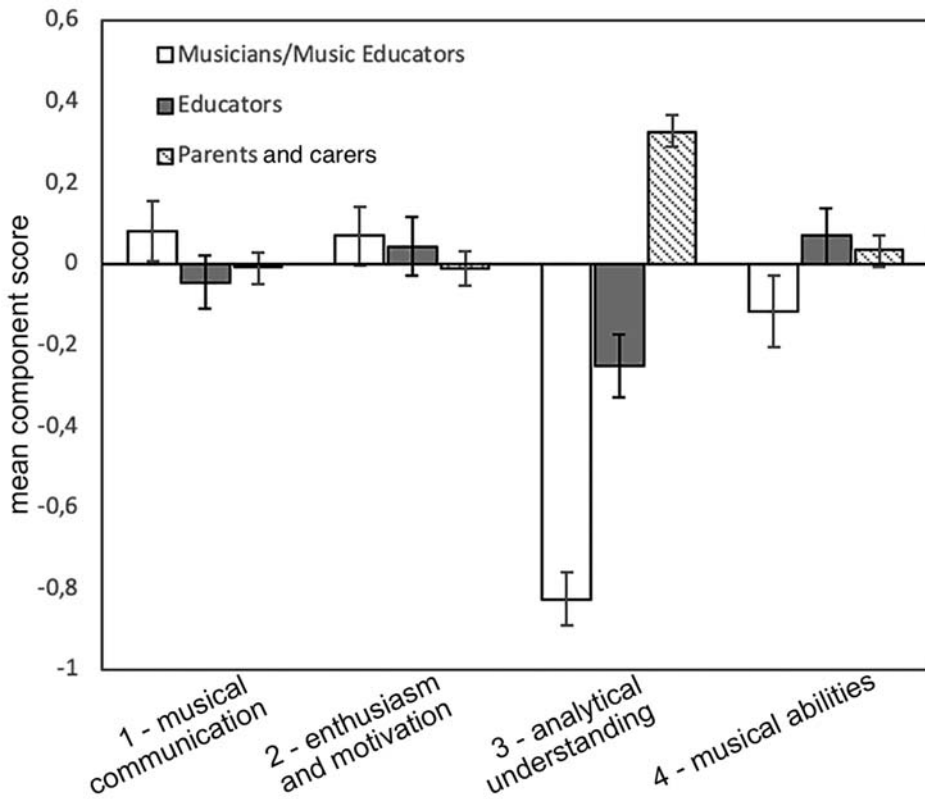
Figure 2. Mean component scores by professional groups. Error bars: standard error of the mean.

Games-Howell post hoc analysis indicated significant differences between all three groups (all *p* values < .001) with musicians/music educators perceiving analytical understanding of music as less important than educators without any special music background. In turn, educators perceived analytical understanding as less important than parents and carers.

The negative relationship between musical expertise and the evaluation of analytical music skills was also replicated by correlating the Gold-MSI musical training scores with the four component scores of the musical child scale. The correlation between the amount of musical training that an individual has received over their lifetime and the evaluation of *analytical understanding of music* in children is significant and weakly negative ($r = -.30$, $p <.001$). The correlations between musical training and *musical communication* ($r = .12$, $p <.001$) and *enthusiasm and motivation* ($r = .10$, $p <.01$) are weakly positive, and the correlation between musical training and the component *musical abilities* was non-significant ($r = .06$, $p = .07$).

Discussion

This study examined the conceptions of childhood musical ability held by German adults. Our adult participants, who had varying degrees of experience with children, music, and education, held differentiated conceptions of musical ability that also included traits, behaviours, and abilities not typically captured by common musicality tests. We identified four components of children's musical ability: *musical communication*, *enthusiasm and motivation*, *analytical understanding of music*, and *musical abilities*. Although '*musical abilities*', that are traditionally assessed by psychometric tests *are*

represented by one component, the component *enthusiasm and motivation* was considered as even more important by the survey participants. The role of *analytical understanding* was less clear. Musicians and music teachers described this component as *less* important than educators, while parents and carers attributed the greatest importance to this facet. *Musical communication* received the lowest ratings.

Our results show that motivational factors were considered to be a particularly important key component of childhood musicality. This reflects the respondents' awareness that exercise and stamina are necessary to develop musical ability. Enthusiasm for music and the motivation to engage with it are likely assumed to support this process. This is consistent with earlier findings that have shown that motivation is part of adult musical ability (Hallam, 2010; Hallam & Prince, 2003). In addition, experts suggested that motivational aspects should be taken into account in the search for musical talent in children (Haroutounian, 2000). The enjoyment of music, as well as the intrinsic motivation that develops through pleasurable experiences with music, have often been described as an important precursor to musical engagement and as a prerequisite for the inevitably strenuous practice necessary to develop musical skills (Sloboda, Davidson, & Howe, 1994).

Our data suggests that motivation should be part of comprehensive music test batteries for children. However, measuring this component poses challenges: It cannot be tested simply like a particular skill, and questionnaires would have to be filled in by parents or teachers. Another possibility to capture musical motivation are systematic observations of musical behaviour of children (Haroutounian, 2000; Swanwick, 1988). Despite the criticism that motivation can be short-lived (Karma, 2007), the assessment of motivation and enthusiasm for music could help clarify its role in musical development processes.

Another important indicator of musical ability in childhood was *musical abilities* in the narrower sense: audiation ability, a feeling for beat, timing and rhythm, and the ability to recognize and internalize pitch and melodies. The component also included basic music production skills (e.g. 'A musical child can repeat a simple melody or rhythm by singing or playing an instrument'), which emphasizes the importance of including music production in the assessment of musical ability. Traditional test batteries (e.g. batteries by Gordon, Seashore, Bentley) cover many of these skills, but tests that require children to produce music actively need to complement traditional batteries (e.g. music screening for children; Jungbluth & Hafen, 2005).

Analytical understanding of music emerged as another component of children's musical ability in our survey. This component describes cognitive aspects of musical ability: an understanding of musical elements that enables the child to recognize and analyse, describe, compare, and evaluate music. In a previous, qualitative study on everyday conceptions of musical understanding in adults, the largest percentage of spontaneously generated descriptors also referred to the understanding of musical elements (Hallam & Papageorgi, 2016). Thus, the awareness and conscious processing of musical elements is perceived as a crucial element of musical ability in adults.

The component of *musical communication*, in contrast, had a focus on emotional aspects of music. It included the emotional perception of music as well as expressive and creative ability and an openness towards all music styles. Perceptive and expressive abilities seem to be tightly linked: Sloboda et al. (1994) have argued that building structure-emotional connections through emotional experience of music is a necessary precursor to spontaneous expressive performance.

This study also compared conceptions of childhood musicality between groups of people involved in music to different degrees, because previous studies have shown considerable differences between groups of participants (Hallam, 2010; Hallam & Papageorgi, 2016; Hallam & Prince, 2003; Hallam & Shaw, 2002). In our study, only ratings on one component (*analytical understanding*) differed significantly between professional groups. Interestingly, musicians and music teachers perceived musical understanding as being *less* important than educators without musical background, who, in turn, rated it still lower than parents and carers. This could either indicate that musicians generally consider these skills to be less essential for musical ability, or that they believe that this skill is fundamentally learnable and therefore not yet as relevant at the age of 3–6.

When comparing our results with the conceptions of musical ability in adults (data from Hallam, 2010), the ratings of the participants differed significantly across most categories. In conceptions of musical ability in childhood, motivation, creativity, and appreciation of music received the highest ratings, which could indicate that these are seen as important prerequisites to develop musical potential, while in adults, musical ability was strongly associated with productive and aural skills (Hallam, 2010).

Although our results differed markedly from those of Hallam (2010), some similarities existed. In general, Hallam showed that conceptions of musical ability in adults are more complex than definitions used by musicality tests. This seems equally true with the conceptions of children's musicality. At the level of components, *musical communication* appeared in both models, whereas our component *enthusiasm and motivation* can be attributed to the two components of adult musicality *valuing, appreciating and responding to music*, and *commitment, motivation, personal discipline and organization*. The components of child musicality *analytical understanding of music* and *musical abilities* correspond to Hallam's component *rhythmic ability, pitch and understanding*. Those components which are not found in our model primarily describe abilities that are naturally less pronounced in early childhood (*playing an instrument or singing* and *composition, improvisation and related skills*).

When comparing our results with Haroutounian's study on musical ability in children (Haroutounian, 2000), there is strong overlap between the two models. A broad consensus among the experts showed that sustained interest and motivation were seen as very important components of musical ability, which is consistent with our results. However, Haroutounian's model does not include an equivalent to our component *analytical understanding*, which is a further indication that music experts attach less importance to this facet of musicality in childhood.

Practical implications

The insights gained in this study provide some practical implications for music education. Our results suggest that modern early musical education should promote a wide range of different skills that contribute to the musical development of children. The development of musical potential goes beyond practicing a musical instrument, as there is a rather wide range of possible ways to experience music. These can be provided by creating a diverse, musically enriched environment and taking individual interests into account. We suggest, based on our results, that the promotion of interest in music, inspiration and creative experimentation with music is one of the most important goals of pre-school educational processes. Especially in childhood, the development of musical abilities heavily relies on motivational factors and early experiences. A social environment in which music is appreciated and enjoyed is critical for the future development of musical abilities (Shuter-Dyson, 1999). The role of preschool music teachers should focus on enabling children to experience music as fun, inspiring and fulfilling. In addition, educators should be aware that assumptions that children make about their own musicality or lack of musicality can be crucial in determining how individuals feel about musical engagement, and whether or not they seek access to music learning (Sloboda et al., 1994).

Limitations and future directions

While our findings are in line with previous research on the topic, there are some limitations due to the design of our investigation. We based our questionnaire on qualitative statements collected in an earlier study on adult musicality which was conducted in the United Kingdom (Hallam & Prince, 2003). This approach ensured that statements were not based on our own perception of musicality but on conceptions in a greater sample of different groups of people. Although we have carefully adapted these statements to make them suitable for musicality in childhood, future studies could investigate whether qualitative surveys with open-ended questions would raise additional points. A related possible source of bias could be due to cultural differences between Germany and the

UK (where the original survey was conducted). However, comparable high mean ratings suggest that this did not greatly affect our results.

Another possible source of bias is the composition of the sample in this study. Our sample cannot be considered representative of the general population, nor the population of educators, music educators or musicians. Instead, the sample consisted of self-selected and mostly highly educated and predominantly female participants who regularly spend time with children in the relevant age group. Since the majority of participants were female, our results primarily reflect the conceptions of musicality from a female perspective. This was similar in previous studies (Hallam, 2010; Hallam & Prince, 2003). Therefore, the role of gender and educational level should be investigated in more detail in further studies. Possibly, a greater variation in sample would lead to even more diverse conceptions.

Because our study was explorative in nature, several interesting starting points for future research can be derived from it. Our results confirm the notion that musical ability in childhood comprises a range of broader abilities and explicitly takes into account motivational factors and musical communication. This broad conception is not yet reflected in current scientific measurement instruments. Therefore, our results could be used to identify gaps in current testing procedures and form the basis for extending these to better reflect current conceptions of musicality. One example of a measurement instrument which takes into account the multifaceted nature of musicality is the Goldsmiths Musical Sophistication Index (Gold-MSI, Müllensiefen et al., 2014) which can be used to assess self-reported musical skills and behaviours in adults. In the long run, a valid assessment of this broader conception *of children's musicality* could lead to a more comprehensive picture of children's musical development processes. This broader conception may also take into account that every child has a musical potential that can be developed and that there are many ways to benefit from musical engagement, even outside of a professional career as a musician.

Conclusion

In conclusion, our data suggest that besides those musical abilities commonly assessed by standardized measurement instruments, three other facets of musicality are perceived to be important in a musical child: enthusiasm and motivation, analytical understanding of music, and musical communication. Testing tools should thus aim to assess a broader range of abilities and features. Developing a test battery that includes measures of these facets is challenging but holds the promise to enrich a wide range of future empirical approaches to better understand musical development in early childhood.

Disclosure statement

Notes on contributors

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