The Kodály effect:

Measuring musical literacy in Dutch primary school children

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Master Thesis

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Abstract

Background: Recent years have shown a growing effort to increase the number of music lessons in Dutch primary schools. Nonetheless, an apt way to track children's individual musical development is currently lacking, and no studies have been conducted to investigate the beneficial effects on musical literacy. The Kodály approach to music strongly emphasizes musical literacy, and prior research shows evidence of a positive impact on specific music skills.

Methods: This thesis presents a study investigating the effect of Kodály inspired music education on the musical literacy scores of one hundred and thirty-four Dutch primary school children, M_{age} = 8.72 years. Children were randomized into two groups: a Kodály music intervention group and a control group. Gordon's IOWA Tests of Music Literacy provided data on musical literacy outcomes. A Musical Aptitude test assessed the learning potential for music.

Results: Musical literacy increased significantly in the music intervention group compared to the control group. Children with a high musical aptitude showed more significant improvement in musical literacy scores than children with a low musical aptitude. The present results indicate a beneficial effect of Kodály-inspired music education on musical literacy.

In the second part of the study, the focus lies on developing a Dutch instrument and materials to measure and track the individual musical literacy development of Dutch primary school children. A pilot version and materials that music teachers can use in their classrooms are presented.

Keywords: Kodály, Musical Literacy, Musical Aptitude

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Introduction

Recent years have shown a growing interest, willingness, and effort to increase the number of music lessons in Dutch primary schools (van den Broek et al., 2019). Though admirable, few initiatives focus on achieving proficient music literacy (LKCA, 2019). This is unfortunate since "musical literacy should not be the property of a chosen few, but a general knowledge of all" (Choksy et al., 2001, p. 82).

Schools often turn to ready-to-use (digital play-and-sing-along) methods that require little preparation and musicianship skills from the teacher (Penning de Vries & van Tuinen, 2019; LKCA, 2019). Currently, no studies exist on the effect of the used methods on musical literacy, and methods do not include ways to track student progression (LKCA, 2019). Recent reports stated that most schools could not indicate whether students become more musically skilled, and specific music learning goals other than 'having fun in music' are lacking in schools (Beekhoven et al., 2018; van den Broek et al., 2019, p. 31). Accordingly, schools have received the advice to formulate clear music goals and paths to reach them (Beekhoven et al., 2018). Furthermore, differentiation in music education is lacking, and schools have been advised to focus on correcting this (Beekhoven et al., 2018).

Most digital methods follow the 'SLO' educational curriculum from the Dutch national education center for curriculum development. One of the final learning goals in the curriculum for fifth and sixth-grade students is: "playing easy rhythms with quarter notes, half notes, and whole notes and their corresponding rests" (SLO, 2019). Goals for 'listening' mention different style periods, contexts, and musical forms. However, the curriculum lists no goals for developing specific aural skills to become musically literate (SLO, n.d., Kerndoel 54).

Kodály music education strongly emphasizes musical literacy and thus has the potential to allow Dutch children – regardless of their socio-economic background – to read, write, and understand music. This central principle of Kodály music education helps students reach higher musical understanding and enjoyment levels. As Kodály noted: "… without the acquisition of reading and writing, music remains inconceivable and enigmatic. 'Music reality' can only be achieved by reliable music literacy" (Kocsar, 2002, p.15).

Nonetheless, the incorporation of this methodology in Dutch primary schools is still sparse, which could be explained by several obstacles. First, Kodály music education requires a skilled and well-trained music teacher (Kodály, 1966 in Kodály, 2019; Salbert, 2015), which may be too costly for many primary schools. Secondly, the Kodály methodology mainly focuses on group-based learning and is highly sequential (Houlahan & Tacka, 2008, p. 145-153). Extra consideration is necessary, as Dutch schools are evermore encouraged to differentiate in the (music) classroom (Beekhoven et al., 2018; Ministerie van Onderwijs, Cultuur en Wetenschap, 2018, 2020). However, to properly differentiate, schools need ways to identify students' musical potential and track their development in musical skills (Gordon, 2001; Bluestine, 2009).

Prior research on the effect of Kodály music education shows a positive impact on specific music skills (Palmer, 1976; Hudgens, 1987; Holmes, 2009), but no studies have been conducted in the Netherlands. Identifying measurable results in Dutch settings is needed to provide a better foundation and incentivize schools to incorporate this methodology.

This study explores the effects of Kodály inspired music education in Dutch primary school children to close this gap. It is hypothesized that receiving Kodály inspired music education will significantly affect musical literacy. Furthermore, it will analyze differences in musical aptitude levels and the effects of these differences on the development of musical literacy. It is hypothesized that children with a high musical aptitude will show significantly

greater development in musical literacy than children with a low musical aptitude. Lastly, it explores ways to measure musical literacy in Dutch primary schools and track individual development that can be helpful for Dutch music teachers.

Research question

What are the effects of Kodaly music education on musical literacy development in Dutch primary school children, and how can musical literacy be measured?

The following subquestions have been set for this thesis:

1) What are the measurable effects of Kodály inspired music education on musical literacy in Dutch primary school children?
2) What is the effect of musical aptitude on musical literacy?
3) What resources are suitable to measure musical literacy in Dutch primary schools?

Part 1 of this thesis will focus on musical literacy and musical aptitude and how to measure this in primary school children. A theoretical framework gives a foundation for the conducted quantitative study that explores the measurable effects of Kodály education in Dutch primary school children. Finally, results from the pilot and main study are presented relating to research questions one and two.

Part 2 describes the developed resources to measure musical literacy in Dutch primary schools and gives overall conclusions and recommendations.

Part 1

The effect of Kodály music education

1. Theoretical Framework

1.1 Musical Literacy

The coexistence of various definitions of "*musical literacy*" has led to misunderstandings, and therefore some music educators avoid using the term altogether (Mills & McPherson, 2015).

Musical literacy is often expressed as the ability to read music notation and accurately turn music notation into sound (Mills & McPherson, 2015). However, as highlighted by Feierabend (1997), "The ability to identify "letter names" (i.e., F, A, C, E, D#, Bb, etc.) when looking at notes on a staff and to press the corresponding keys on an instrument should not be confused with true music literacy."

Mills & McPherson (2015) take a broad perspective on musical literacy and argue that – besides reading, writing, and comprehending staff notation – it includes the capacity to make music, reflect on the music in which you engage, and express views on the music you hear, play, and create.

In contrast, Campell & Scott-Kassner (1995), Gordon (2001, 2012), and Hurley et al. (2018) give roughly comparable definitions but do not include reflecting and expressing views, mainly focusing on inner hearing.

Campell & Scott-Kassner (1995, p. 96) define musical literacy as "1) the ability to see symbols and to think or reproduce the sound; and (2) to hear the sound and to think or write the symbol".

Gordon (2001, 2012) draws a parallel with language: listening, speaking, reading, and writing are all required in language literacy. Likewise, musical literacy includes listening to and performing music while also being able to read and write music notation.

Hurley et al. (2018) describe musical literacy as the ability to "(a) perform music notation without the assistance of an instrument, (b) hear or think of a musical phrase and write out the musical notation, and (c) be able to read, perform, decode, and compose rhythms and pitches."

To conclude, it is essential to emphasize that musical literacy is much more than understanding the theory of notation, being able to decode staff notation, and accurately producing the corresponding sound. Becoming musically literate will allow students to express their musicianship through an instrument rather than using an instrument to hear the music (Feierabend, 1997).

In this study, the previously given definition by Campbell & Scott-Kassner (1995) will be leading: although this definition is somewhat limited in the sense that it does not include musical performance, it allows measuring musical literacy in a purely objective and quantitative manner.

1.2 Measuring Musical Literacy

Due to its intricate nature, measuring musical literacy can be challenging. One may even consider why doing so is necessary at all. After all, music achievement also encompasses numerous other skills, such as vocal and instrumental performance, aesthetic listening, understanding of music structures and styles, and creativity. However, achieving those advanced music skills is, in many ways, dependent on the development of basic music literacy skills (Gordon, 1991).

Keeping track of a pupil's development in music literacy allows for specific goals that are beneficial to both teacher and student. First and foremost, it gives insight into a pupil's continuous individual improvement. It reveals strengths and weaknesses and allows for comparing their development in musical literacy with their musical potential. Equally

important, it provides information that allows for the improvement of instruction by the teacher. By measuring a pupil's development, a teacher can indicate whether they are meeting the needs of the child and curriculum goals or if they need to adjust their instruction and lessons (Gordon, 1991, 2012; Bluestine, 2000).

With this in mind, we should look back at the current standing of music education in Dutch primary schools and the fact that schools cannot indicate their pupils' musical improvement (van den Broek et al., 2019, p. 31). Currently, we cannot objectively identify if and how children are improving. Therefore, we do not know if their received music education is beneficial for improving their basic musical literacy skills, which is an enormous contrast to other school subjects. The law mandates Dutch primary schools to keep track of a pupil's development in basic skills, like math and language, in an 'LVS' (pupil tracking system) (art. 10.4 Wet Primair Onderwijs BES, 2021). However, music is not part of these assessments. Studies examining music education in Dutch schools focus on music education's beneficial far transfer effect on cognitive abilities and academic achievement, but not on musical literacy (Jaschke, Honig & Scherder, 2018).

Assessing the development of musical literacy would not only provide insight into the musical development of Dutch primary school children, but it would also allow us to make objective conclusions about the impact of their music education.

IOWA Tests of Music Literacy

The Iowa Tests of Music Literacy (ITML) is an instrument developed by Gordon to objectively measure musical literacy in children from grade 4 to grade 12. It is designed to sequentially assess basic music achievement in six dimensions of tonal and rhythm audiation and notational audiation (Gordon, 1991). The test has six different levels, with each level becoming increasingly complex. Each level contains six subtests divided into two categories:

Tonal Concepts and Rhythm Concepts. The three subtests in the Tonal Concepts are Audiation/Listening, Audiation/Reading, and Audiation/Writing. The Three subtests in the Rhythm Concepts are also called Audiation/Listening, Audiation/Reading, and Audiation/Writing. Table 1 gives an overview of the different levels and subtests with recommended grade ranges for administration (Gordon, 1991).

Table 1

Iowa Tests of Music Literacy Levels

Level	Grade Range	Subtest	Tonal Concepts	Rhythm Concepts
1 & 2	4 – 12	Listening	Major and harmonic minor tonalities	Usual duple and usual triple meters
		Reading & Writing	Major and harmonic minor tonalities in treble clef with 0# and 0♭ in the key signature	Usual duple and usual triple meters $\frac{2}{4}$ and $\frac{6}{8}$
3	4 – 12	Listening	Major, harmonic minor, dorian, phrygian, lydian, mixolydian, aeolian, and locrian tonalities and pentatonic	Usual duple, usual triple, and unusual combined meters
		Reading	Major, harmonic minor, dorian, phrygian, lydian, mixolydian, aeolian, and locrian tonalities and pentatonic in treble clef with up to 3# and 3♭ in the key signature	Usual duple, usual triple, and unusual combined meters $\frac{2}{4}$ $\frac{3}{4}$ $\frac{4}{4}$ $\frac{6}{4}$ $\frac{3}{8}$ $\frac{6}{8}$ $\frac{2}{2}$ $\mathbf{C}$
		Writing	Major and harmonic minor tonalities in treble clef with up to 3# and 3♭ in the key signature	Usual combined meter with $\frac{2}{4}$ and $\frac{6}{8}$
4	7 – 12	Listening	Major and harmonic minor tonalities and multitonal	Usual duple, usual triple, and unusual meters
		Reading	Major and harmonic minor tonalities and multitonal in treble clef with up to 3# and 3♭ in the key signature	Usual duple, usual triple, and unusual meters $\frac{2}{4}$ $\frac{3}{4}$ $\frac{4}{4}$ $\frac{3}{8}$ $\frac{5}{8}$ $\frac{6}{8}$ $\frac{7}{8}$ $\frac{9}{8}$ $\frac{11}{8}$ $\mathbf{¢}$
		Writing	Major and harmonic minor tonalities and multitonal in bass clef with up to 3# and 3♭ in the key signature	Usual duple, usual triple, and usual combined meters $\frac{2}{4}$ $\frac{3}{4}$ $\frac{4}{4}$ $\frac{6}{4}$ $\frac{3}{8}$ $\frac{6}{8}$ $\frac{2}{2}$ $\mathbf{¢}$

5	7 – 12	Listening	Major and harmonic minor with chordal accompaniments	Usual combined and unusual meters
		Reading	Major and harmonic minor tonalities in two parts in treble and bass clefs with up to 3# and 3♭ in the key signature	Usual combined and unusual meters $\frac{2}{4}$ $\frac{3}{4}$ $\frac{4}{4}$ $\frac{3}{8}$ $\frac{5}{8}$ $\frac{6}{8}$ $\frac{7}{8}$ $\frac{9}{8}$ $\frac{11}{8}$ $\frac{2}{2}$ $\cut$
		Writing	Multitonal in treble and bass clefs with up to 1# and 1♭ in the key signature	Unusual meters with $\frac{3}{4}$ $\frac{5}{8}$ $\frac{7}{8}$ $\frac{8}{8}$ $\frac{9}{8}$ $\frac{11}{8}$
6	7 – 12	Listening	Major and harmonic tonalities with chordal accompaniments	Usual combined and unusual meters
		Reading	Major and harmonic minor tonalities with chord symbols in the treble clef with 0# or 0♭ in the key signature	Usual combined and unusual meters with $\frac{2}{4}$ $\frac{3}{4}$ $\frac{6}{4}$ $\frac{3}{8}$ $\frac{5}{8}$ $\frac{6}{8}$ $\frac{7}{8}$ $\frac{9}{8}$ $\frac{2}{2}$ $\frac{11}{8}$ $\cut$
		Writing	Major and harmonic minor tonalities and multitonal in two parts in treble clef with no sharps or flats in the key signature	Unusual meters with $\frac{3}{4}$ $\frac{5}{8}$ $\frac{7}{8}$ $\frac{8}{8}$ $\frac{9}{8}$ $\frac{11}{8}$

1.3 Measuring Musical Aptitude

It is essential to distinguish between musical literacy and a child's *potential* to learn music. Musical literacy refers to music achievement, i.e. when measuring musical literacy, we measure what has already been learned in music thus far. Musical aptitude, however, is a measurement of the potential to learn music in the future. In other words: musical literacy is taught, while the potential to learn music is a combination of innate potential and environmental influences (Gordon 2001, 2012).

All informal and formal music guidance that children receive in or outside of the home directly influences their levels of musical aptitude. It fluctuates until the age of nine, after which it is stabilized. Environmental influences will then no longer have much effect on musical aptitude (Gordon 2001, 2012). According to Gordon (2012), a person's potential to achieve music remains approximately what it was at the age of nine.

No child is without some level of musical potential, and every child deserves to reach whatever they are capable of in music. However, that level of potential is not the same for all children (Bluestine, 2000; Kemp & Mills, 2002; Gordon, 2012). Differences between children in musical aptitude will cause their achieved level of musical literacy to differ, even when receiving the same music instruction.

Nevertheless, a high musical aptitude will not always result in higher musical literacy. Without proper guidance and music instruction, a child may never achieve their potential. Likewise, a child with a low musical aptitude and a high level of motivation and music instruction may reach higher levels of musical literacy (Bluestine, 2000; Gordon, 2001, 2012).

The innate potential to learn music cannot be seen or heard by letting a child perform music. Doing so, we would only be looking at music achievement. Gordon (2012) described that we need an objective measuring tool that can "hear what a teacher cannot see" and has

developed five tests to assess the music aptitudes of different age groups, ranging from preschool to adulthood. These measuring tools are suitable for children as young as three years old. Table 2 shows an overview of all five tests.

Table 2

Musical Aptitude Tests

Test		Grade range	Administration	Administration time
Audie		Pre-school (3 – 4 years old)	Individually	
PMMA	*Primary Measures of Music Audiation*	Kindergarten – 3th grade	In groups or individually*	2x 20 minutes
IMMA	*Intermediate Measures of Music Audiation*	1st – 6th grade	In groups or individually	2x 20 minutes
MAP	*Musical Aptitude Profile*	4th – 12th grade	In groups or individually*	3.5 hours
AMMA	*Advanced Measures of Music Audiation*	7th - adulthood	In groups or individually	20 minutes

Note. * The PMMA and AMMA can also be administered online

There has been an ongoing debate on the value and use of such tests (Kemp & Mills, 2002), especially regarding the danger of using tests outside of the context they were intended for and using them to exclude children instead. However, the goal of measuring musical aptitude is not to deny children music education but to meet their educational needs. It is important to acknowledge differences in music potential. We may want all children to have a high musical aptitude, but this is not the case. Only by acknowledging this difference can a child's music educational needs truly be met. It would be unfair to ask the same thing of every child and expect them to reach the same level of musical literacy.

By objectively measuring a child's musical aptitude and thus gaining knowledge about a child's potential to learn music, a teacher will be able to use this information to guide a child properly. Depending on a student's musical aptitude, a teacher can and should adjust instruction, guidance, and difficulty (Bluestine, 2000; Gordon, 2001).

"Only when students receive instruction that is adapted to their individual musical needs in a group that has levels of music aptitude going from high to low will they achieve music as much as their music aptitude allows" (Gordon, 2001).

Additionally, it allows teachers and schools to objectively look at the music education they are providing. As musical aptitude is in a developmental stage until the age of nine and is influenced by a nurturing musical environment (Bluestine, 2000; Gordon, 2012), we should be determined to ensure appropriate and high-quality music education is given in the critical years before. Keeping track of a student's musical aptitude score from year to year allows teachers to track potential progress or decline. The provided music education may not always be what the pupils need to fulfill their potential. When a decrease in musical aptitude is measured, teachers should be encouraged to explore the cause and aim to stop this decrease by adjusting the music instruction. Measuring the musical aptitude of pupils over time is an opportunity to objectively gain insight into the contribution of the provided music education in schools. As Bluestine (2000) writes: "An aptitude test score can wake us up as teachers."

1.4 The Kodály concept

The Kodály concept is an umbrella term for music education inspired by the pedagogical ideas of the Hungarian composer Zoltán Kodály (1882 – 1967).

As previously argued, Kodály-inspired music education highly emphasizes musical literacy and has been chosen as the basis for the music intervention in this study. However, Kodály never developed a teaching method but instead shared his pedagogical ideas and views that shaped Hungarian music education. Although these principles have since traveled the world, there is no unified pedagogical method for Kodály music education. It was only after 1964 that the term 'Kodály method' started to spread, and many argue that we should speak of a concept or set of fundamental principles rather than a method (Dobszay, 2009; Papp & Spiegel, 2016; Szönyi, 2017).

The principles and chosen tools of the Kodály concept that serve as the basis for the music intervention in this study are outlined in a concise summary.

1. *Singing should be the center of music education*

A fundamental aspect of the Kodály methodology is that music education should be primarily vocal. Kodály: "If one were to attempt to express the essence of this education in one word, it could only be 'singing" (in Papp & Spiegel, 2016, p. 21). Melodies should be introduced by unaccompanied singing. Not only because the human voice is the instrument that is available to us all, but because it is the way to train inner hearing (Choksy, 1999; Papp & Spiegel, 2016; Szönyi, 2017). According to Kodály, "the roots of music are in singing" (in Dobszay, 2009, p. 108).

2. *Relative solmization is essential for the foundation of inner hearing and musical reading and writing*

The essential tool that is unmistakably related to the Kodály methodology is relative solmization (Dobszay, 2009, p. 102; Papp & Spiegel, 2016, p. 13; Szönyi, 2017). Kodály recommended the system to a great extent: "Solfa singing […] shortens the way to fluent reading. Naturally, this applies only to relative solfa where, by pronouncing the name of the note, its role in the tonality is already defined" (Kodály, 1937 in Papp & Spiegel, 2016).

3. *Folksongs, children's songs, and art music are the leading portion of early repertoire*

Authentic folksongs and children's songs are the foundation of music education due to their simple form, monophonic characteristics, and cultural value. Singing should primarily be done in the mother tongue. Through folksongs, children should be led to art music (Chosksy, 1999; Dobszay, 2009; Papp & Spiegel, 2016; Szönyi, 2017).

4. *Hand signs are used to represent pitch visually in space*

Hand signs (accredited to Curwen) aid the improvement of inner hearing and intonation and are helpful in establishing the relationship between sound and names (Chosksy, 1999; Vajda, 2008; Papp & Spiegel, 2016; Szönyi, 2017). Vajda (2008) mentions the invaluable factor of hand signs in learning the sounds without written symbols and instrumental intervention.

5. *Rhythm language is used to develop and practice rhythmic skills*

Traditionally, the Kodály approach uses an adaptation of Chevé's system with fixed rhythm names (Vajda, 2008; Choksy, 1999; Papp & Spiegel, 2016; Szönyi, 2017). However, this length-oriented system is only used in the early stages of music education (Szönyi, 2017). A different, beat-oriented relative system for rhythm names is the Takadimi-system. Syllables

are assigned based on the position of the note within the beat. This rhythm system is similar to what relative solfege is for pitch. (Hoffman, 2009). According to Hoffman: “Reading rhythm with Takadimi helps you learn to recognize patterns and see grouping of notes, not simply read note to note." Although this rhythm system is not used in Hungary, it is frequently used at the Royal Conservatoire in The Hague (Salbert, 2015).

6. *Singing games & physical movement aid in rhythmical development and musical enjoyment*

The primary purpose of singing games is to aid a child's rhythmical development through movements and actions that naturally go along with the music. These movements should be preferably rhythmic (Vajda, 2008). Additionally, the games add enjoyment to the process of music education. Play is essential for a child, and incorporating this into music education provides them with essential enjoyable musical experiences (Szönyi, 2017). Houlahan & Tacka (2008) mention how singing games are fantastic for reinforcing musical concepts and skills and developing kinesthetic skills and abilities.

2 Pilot study

The pilot study served as a basis for the main study (see chapter 3) to evaluate the feasibility of the planned study and the suitability of the proposed methods and test instruments.

2.1 Method

Design

The pilot study design was a controlled pretest-posttest randomized control group design, with measures across two conditions: 1) a Kodály music intervention group and 2) a control group. The participating school was selected based on the previously established work relationship with the school. Children were randomly assigned to each condition.

Participants

In total, initial data was collected from $N = 76$ children. The children attended a school in the Netherlands for only highly gifted children (admission criteria for this school is an IQ ≥ 130). Due to COVID-19 regulations, ten children were absent from the pre-test or post-test. Exclusion criteria were children that already received other (private) music lessons outside of this study. Throughout this study, several children began taking additional music lessons. Consequently, these children have also been excluded from the final data analyses.

The final data analysis excluded children with missing values due to absentness or incomplete test results and was performed over N = 46 (26 boys and 20 girls): (1) Kodály music intervention ($N = 23$), and (2) Control group ($N = 23$). Descriptive statistics are described in the results section. Parental informed consent was obtained for all children prior to the study.

Instruments

The Intermediate Measures of Music Audiation (IMMA) and the Iowa Tests of Music Literacy (ITML) were unavailable for the pilot study in September 2020. Therefore, a new test was devised to measure different music literacy skills. Once available, the IMMA and the ITML were administered to explore the suitability of each test for the main study. The IMMA was administered to measure musical aptitude, and level 1 of the Iowa Tests of Music Literacy (ITML) was administered to measure musical literacy. Correlations between the tests are described in the results section.

The newly devised test was used to measure tonal and rhythm concepts. It is divided into two subtests: tonal and rhythm. Each subtest consists of 16 (open and multiple-choice) questions of increasing difficulty with prerecorded tonal and rhythm patterns. In the tonal subtest, children had to listen to a tonal pattern and write down the correct tonal pattern on a staff notation (open questions) or choose the correct answer (multiple choice). Administration of both parts took place on two different days, a week apart.

Additionally, a rhythm dictation was administered at both testing moments. The rhythm dictation consisted of 10 previously recorded rhythm patterns of 2 measures with $\frac{4}{4}$ and $\frac{3}{4}$ signatures. Children had to write down the correct rhythm pattern. Reliability analysis of the scale and factor analysis can be found in the results section.

Conditions

Music Intervention

Children in the intervention group received weekly 45-minute music lessons based on the Kodály concept. The music lessons were followed in a structured manner during school hours every Monday. All lesson plans were developed based on the principles and concepts outlined in 1.4 and relevant literature (*The Kodály Method, The Kodály Way to Music,*

Kodály Today, and *Solfege in the Classroom*). Every lesson included beat, rhythm, and melody and was designed around group singing and singing games. Relative solmization, solfège hand signs, stick notation, and 'Takadimi' rhythm language were introduced and practiced. Traditional music notation and absolute note names were not yet introduced.

Control Group

Children in the control group did not receive any music lessons. They only participated in the pre-and post-test and did not receive a replacement activity. Music education in the regular school curriculum consisted of occasionally using digital music methods by the classroom teacher. However, this was not part of a structured curriculum.

Procedure

The test protocol was administered to both the intervention and control groups in two stages: the pre-test (before intervention) and the post-test (after the intervention). The children were tested in a quiet group setting during school hours. The test protocol started with administering the newly devised test to measure music literacy skills at baseline (pre-test) in September 2020. The tonal and rhythm parts were administered in one session, taking 45 minutes. This was repeated after 7 months, in June 2021.

Additionally, the IMMA and the ITML were administered in April 2021. The IMMA was administered in two sessions (20 minutes each). The ITML was also administered in two sessions (45 minutes each). The music lessons were given inside the school in a separate classroom designed for extracurricular activities. The room was spacious enough for singing games and included a whiteboard and Digi-board, as suggested by Salbert (2015).

Participants were followed from September 2020 until June 2021. However, from December 2020 until April 2021, there was an unintended break in the music intervention due to

COVID-19 lockdowns. No music lessons were allowed to take place in the school during that period.

Statistical Analysis

A Repeated Measures Analysis was conducted to explore the effect of the Kodály music intervention on music literacy per group condition over time. The ANOVA was set up as Group x Time, whereby Group represents the music intervention group and the control group, and Time represents the pre-test and post-test measurements.

Descriptive statistics were computed for the overall scores of the tests. Levene's test was used to check for normality and homogeneity. Additionally, measures of skewness and kurtosis and the Kolmogorov-Smirnov test were examined. IBM SPSS Statistics 27 was used to perform the analysis. The level of significance was set at $p < 0.05$.

2.2 Results

Before analyzing, the data was explored for abnormalities, outliers, and normality of distribution. In addition, the reliability of the test items (Total PreTest, Tonal and Rhythm subscales, and Rhythm Dictation) was investigated.

Analysis of "Rhythm Dictee" showed good reliability of α .776, and inter-item correlations showed no negative values. One item was found to affect reliability positively when removed, but the difference is minimal. For further research, one may want to remove this item. Item 10 has a variance of zero and must be removed altogether.

The tonal subscale of the pre-test had a reliability of α .771. However, many items showed an item-total correlation lower than 0.3, indicating that this scale needs adjustment. Factor analysis showed a division into two subscales (open and multiple-choice).

The rhythm subscale of the pre-test had acceptable reliability of α .769. Removing item 16 would improve the reliability to α .779.

No initial differences between the groups were found on the Pretest, with regard to music literacy, $F(1,44) = 2.948$, $p = .093$, $\omega = 0.04$. With this equal a priori distribution, the first hypothesis regarding the effect of Kodály-inspired music lessons can be explored.

Performance differences over time

This study hypothesizes that receiving Kodály inspired music lessons positively affects musical literacy. Therefore, children in the music intervention group were expected to have higher scores on the post-test than children in the control group.

A mixed between-within subjects analysis of variance was conducted to compare correct answers on the pre-test (prior to receiving the music lessons) and the post-test between the intervention and control groups.

There was a substantial main effect for Time, Wilks' $\lambda = .493$, $F(1,44) = 45.240$, $p < .001$, $\eta^2p = .51$, indicating that both groups improved significantly on the post-test compared to the pre-test.

There was no significant interaction effect between Time and Group, Wilks' $\lambda = .920$, $F(1,44) = 3.844$, $p = .056$, $\eta^2p = .08$. This result indicates that the number of correct answers was not significantly affected by group condition. However, a clear trend is visible (see Figure 1 and Table 3). The children in the Kodály group showed a bigger growth than the children in the control group. It is an indication that this trend would likely become significant after a longer period of music lessons.

Figure 1

Performance over time between groups

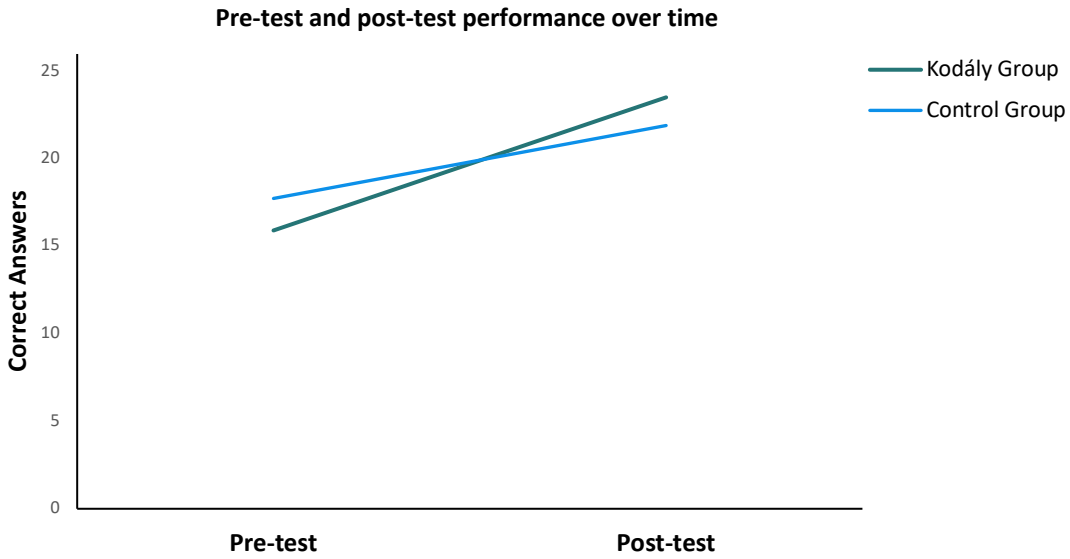


Table 3

Descriptive statistics for performance over time, by condition

Session score	Condition	Mean	St. Deviation	N
Total correct at pre-test	Kodály	15.91	4.114	23
	Control	17.74	3.014	23
	Total	16.83	3.684	46
Total correct at post-test	Kodály	23.52	4.785	23
	Control	21.91	7.248	23
	Total	22.72	6.127	46

Differential development in children with different music aptitudes

The hypothesis in this study was for children with a high musical aptitude to significantly improve their musical literacy skills over children with a low musical aptitude.

A Repeated Measures ANOVA with Time as a within-subject variable and Musical Aptitude as the between-subject variable was performed. Musical aptitude was divided into two groups: high musical aptitude score (80-100%) and those who did not have a high musical aptitude score (1-79%).

There was a highly significant main effect of Time, Wilks' $\lambda = .29$, $F(1, 22) = 54.34$, $p < .001$, $\eta^2 p = .71$, indicating that scores on the post-test were significantly higher compared to the pre-test.

There was no significant main effect of musical aptitude, $F(1, 22) = 2.33$, $p = .141$, $\eta^2 p = .10$, indicating that the scores from pre-test to post-test of children with high musical aptitude were similar to those with lower musical aptitudes.

There was no significant interaction effect between the level of musical aptitude and Time, Wilks' $\lambda = .95$, $F(1, 22) = 1.129$, $p = .268$, $\eta^2 p = .055$.

This result tells us that although children with a higher musical aptitude improved more (mean score increase = 8.43) compared to the control group (mean score increase = 6.18), musical aptitude did not have a significant effect on the improvement of these scores (see Table 4 and Figure 2).

Figure 2

Performance over time, by musical aptitude

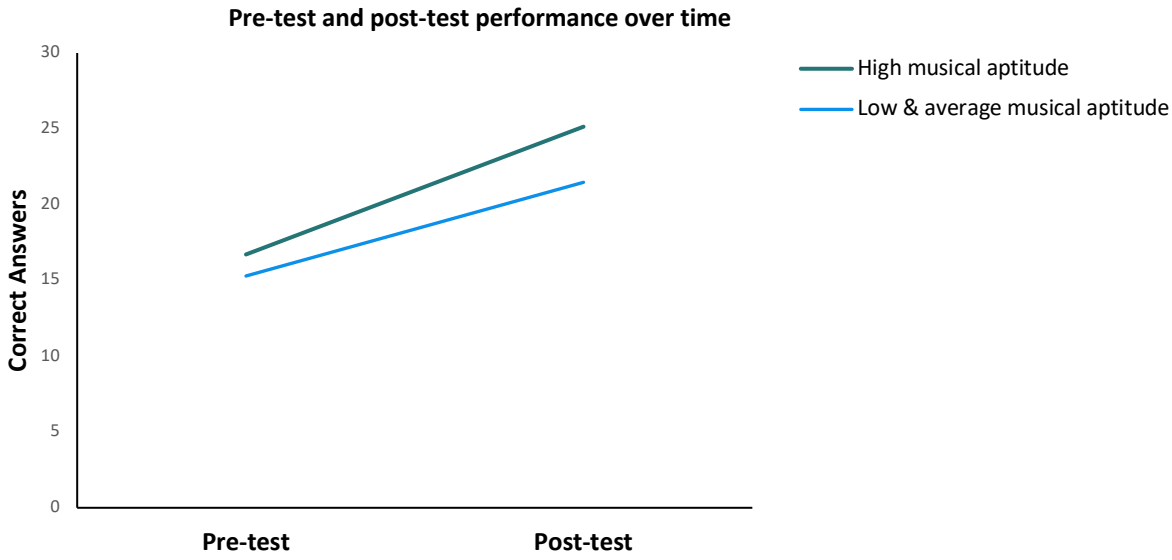


Table 4

Descriptive statistics for performance over time, by music aptitude

Session score	Music Aptitude	Mean	St. Deviation
Total correct at pre-test	Low & Average	15.29	2.519
	High	16.71	4.608
	Total	15.71	3.223
Total correct at post-test	Low & Average	21.47	5.210
	High	25.14	5.146
	Total	22.54	5.357

2.3 Reliability of the scales

Tonal

Factor analysis

A principal axis factor analysis (FA) with varimax rotation was conducted on all items. The Kaiser- Meyer-Olkin measure verified the sampling adequacy for the analysis, KMO = .77 ('marvelous' according to Kaiser & Rice, 1974), and all KMO values for individual items were greater than .5.

An initial analysis was run to obtain eigenvalues for each factor in the data. Four factors had eigenvalues of 1 and explained 63.68% of the variance. The scree plot showed multiple inflections that would justify retaining two and four factors. However, it was decided to use two factors because of the small sample size and the nature of the questions (multiple choice vs. open questions). Table 5 shows the factor loadings after rotation for the Tonal subtest. The items that cluster on the same factor suggest that factor 1 represents open questions and factor 2 represents multiple-choice questions. A similar analysis was performed for the rhythm subtest. For brevity reasons, it has been left out.

The 'tonal multiple choice' subscale had moderate reliability of α .69.
The 'tonal open questions' subscale had acceptable reliability of α .70, with all items showing an item-total correlation above .3.

The complete tonal subscale had acceptable reliability of α .771. However, many items showed an item-total correlation lower than 0.3, which indicates that they should be dropped from the scale.

Table 5

Summary of exploratory factor analysis results for the created Tonal subscale Rotated Factor Loadings

			Rotated Factor Loadings	
Items			Open Questions	Multiple Choice
12B	Tonal	OQ	.84	
15B	Tonal	OQ	.83	
8B	Tonal	OQ	.73	
13B	Tonal	OQ	.70	
14B	Tonal	OQ	.65	
7B	Tonal	OQ	.64	
14	Tonal	OQ	.64	
9B	Tonal	OQ	.57	
15	Tonal	OQ	.52	
16	Tonal	OQ	.46	
9	Tonal	MC		.85
8	Tonal	MC		.82
12	Tonal	MC		.53
11	Tonal	MC		.47
10	Tonal	MC		.45
7	Tonal	MC		.42
13	Tonal	OQ		
α			.70	.69

Note. MC = multiple choice OQ = open questions

Rhythm

The 'rhythm multiple-choice' subscale of the test had acceptable reliability of α .77 with no negative inter-item correlations. However, item 3 showed a corrected item-total correlation below .3 and is considered for removal. The 'rhythm open questions' subscale of the pre-test had acceptable reliability of α .76. Again, all corrected item-total correlations are above .3.

Rhythm Dictation

Analysis of 'Rhythm Dictation' showed good reliability of α .776, and inter-item correlations showed no negative values. One item was found to positively affect reliability when removed, but the difference is minimal. One may want to remove this item for further research, and item 10 should be removed altogether as it has a variance of zero.

2.4 Correlations between instruments

The IMMA was only administered to the 2nd, 3rd, and 4th-grade children in this pilot study. It would be more appropriate to use the MAP (musical aptitude profile) for children in grades 5 and 6 (Bluestine, 2000; Gordon, 2012). However, it takes approximately 3,5 hours to administer the MAP. Due to time restrictions, this was not feasible in this study.

The IMMA was administered closer to the post-test. Musical aptitude is not considered to be stabilized before the age of 9 and is influenced by music lessons. Therefore, the IMMA was correlated to the post-test.

IMMA and Posttest

A regression analysis explored the relationship between the scores on the IMMA and the created test for this pilot study.

Bias corrected and accelerated bootstrap 95% Cis are reported in square brackets. Musical aptitude was significantly correlated with post-test scores, r_s = .40 [. 03, .69], p = .020. A high musical aptitude was associated with higher scores on the post-test.

When also looking at the Tonal and Rhythm subscales, there was a moderate but not significant relationship between the IMMA Rhythm scores and the post-test Rhythm scores,

r_s = .29 [−.04, .58], p = .101. IMMA Tonal scores significantly correlated to scores on the post-test Tonal subscale, r_s = .37 [. 03, .67], p = .036 (see Table 6 and Table 7).

Table 6

Correlation between Musical Aptitude and scores on the Posttest

	IMMA Composite	IMMA Tonal	IMMA Rhythm
Posttest total	40* [.03, .69] *p* = .020		
Posttest Tonal		.37* [.03, .67] *p* = .036	
Posttest Tonal Open Questions		.32 ns [-.01, .65] *p* = .067	
Posttest Tonal Multiple Choice		.29 ns [-.10, .66] *p* = .098	
Posttest Rhythm			.29 ns [−.04, .58] *p* = .101
Posttest Rhythm Open Questions			.23 ns [−.075, .511] *p* = .189
Posttest Rhythm Multiple Choice			.29 ns [−.06, .58] *p* = .102

*ns = not significant, *p< .05, **p<.01, BCa bootstrap 95% Cis reported in brackets.*

Table 7

Correlation between Musical Aptitude and scores on the Posttest after Factor analysis

	IMMA Composite	IMMA Tonal	IMMA Rhythm
Posttest total	.37* [.02, .65] *p* = .035		
Posttest Tonal		.30* [-.07, .63] *p* = .087	
Posttest Tonal Open Questions		.39* [.13, .62] *p* = .026	
Posttest Tonal Multiple Choice		.08 ns [-.32, .48] *p* = .636	
Posttest Rhythm			.20 ns [−.16, .48] *p* = .265
Posttest Rhythm Open Questions			.19 ns [−.15, .47] *p* = .295
Posttest Rhythm Multiple Choice			.29 ns [−.05, .56] *p* = .106

*ns = not significant, *p< .05, **p<.01, BCa bootstrap 95% Cis reported in brackets.*

IOWA Music Literacy and Posttest

Several bivariate correlation procedures were carried out to examine the relationship between the scores on the ITML and the post-test. The IOWA ML has norm scores from 4th grade and up and has only been administered to children in fourth, fifth, and sixth grade in the pilot study.

Bias corrected and accelerated bootstrap 95% Cis are reported in square brackets. Scores on the post-test were not significantly correlated with scores on the ITML Total score,

r_s = .32 [-.26, .73], p = .292. Scores on the ITML Total were positively related to higher post-test scores, but not significantly.

Significant correlations were found between the ITML Tonal subscales and scores on the post-test, but not for the ITML Rhythm subscales. Table 8 shows all correlations between the ITML and the corresponding post-test subscales scores.

Table 8

Correlations between IOWA Tests of Music Literacy and scores on the Posttest

	ITML Total	ITML Tonal	ITML Tonal Listening	ITML Tonal Reading	ITML Tonal Writing	ITML Rhythm	ITML Rhythm Listening	ITML Rhythm Reading	ITML Rhythm Writing
Posttest total	.32 ns [-.26, .73] *p* = .292								
Posttest Tonal total		.48** [15, .71] *p*=.003	.22 *ns* [-.18, .53] *p*=.198	.49** [. 19, .72] *p*=.002	.53** [. 22, .76] *p*=.001				
Posttest Tonal *OQ*		.34* [-.65,.65] *p*=.043	.039 ns [-.38, .42] *p*=.820	.51** [. 16, .76] *p*=.001	.47** [. 08, .75] *p*=.004				
Posttest Tonal *MC*		.37* [. 05, .64] *p*=.028	.38* [. 01, .66] *p*=.024	.091 ns [-.15, .35] *p*=.599	.23 ns [-.11, .53] *p*=.184				
Posttest Rhythm						.18 ns [-.35, .63] *p*=.488	-.11 ns [-.67, .56] *p*=.675	.30 ns [-.33, .72] *p*=.488	.15 ns [-.36, .58] *p*=.556
Posttest Rhythm *OQ*						.05 ns [-.49, .62] *p*=.835	-.20 ns [-.70, .48] *p*=.437	.16 ns [-.49, .66] *p*=.551	.16 ns [-.31, .57] *p*=.533
Posttest Rhythm *MC*						.16 ns [-.35, .57] *p*=.551	-.14 ns [-.52, .51] *p*=.957	.07 ns [-.39, .58] *p*=.770	-.013 ns [-.52, .44] *p*=.959

*ns = not significant, *p< .05, **p<.01, BCa bootstrap 95% Cis reported in brackets.*

2.5 Discussion

This pilot study examined how to measure musical literacy in Dutch primary school children and if the methodology for the main study would be suitable. In addition, preliminary statistical analyses explored the possible effects of Kodály inspired music education on musical literacy.

The results show that children who received weekly structured Kodály music lessons increased more from pre-test to post-test than children in the control group. Although the differences were not statistically significant, a clear trend was visible.

The five-month unintended break due to Covid-19 lockdowns likely influenced the results and the main study shows results after a longer intervention period.

Furthermore, the devised test instrument needs a thorough review, as it may not adequately measure musical literacy. Therefore, the validated Iowa Tests of Music Literacy was administered in the main study, while a Dutch musical literacy test useful for Dutch classrooms was further developed.

Musical aptitude scores did not have a significant effect on post-test scores. Compared to the pre-test, students with a high musical aptitude score did not score significantly higher on the post-test than students with low or average scores. However, again we see a visible trend.

Combining the premature results from the pilot study, the claim that Kodály music education has a significant effect on musical literacy is not yet supported, although promising-looking trends are visible. The main study (Main study) has a longer intervention period and larger sample size to overcome these limitations. Nevertheless, the pilot study results support the argument that musical literacy can be measured in Dutch primary school children when one wants to objectively examine the effect of music education on musical literacy and the children's individual musical development.

2.6 Limitations and suggestions

A considerable limitation of this study is that it was not a blind study. The same person gave the music lessons and performed the data analysis (i.e., the author), possibly leading to unintended bias. Therefore, it is advisable to have other music teachers involved in further studies.

The control group in this study did not receive any music lessons or replacement activities. Therefore, in future studies, a third group receiving another form of music education or replacement activity is necessary to investigate the music intervention's effect thoroughly.

The test instrument to measure musical literacy was in development and not validated. The rhythm part of the instrument correlated poorly with the validated Iowa Tests of Music Literacy. Further adjustments and research are needed for it to be valid and suitable. The suggestion for the main study is to use the ITML to measure musical literacy.

The selection of the sample size may need more careful consideration. The final sample size in this study is small due to Covid-19 regulations that led to a high drop-out rate. Additionally, the participants in this study are only highly gifted children from one school. A study with other Dutch primary school children might show different results.
Children were not blocked based on their musical aptitude. For the main study, the suggestion was to use IMMA musical aptitude scores for blocking to ensure an even distribution of musical aptitude in all groups.

2.7 Conclusion

This pilot study shows that it is possible to measure musical literacy in Dutch primary school children and that doing so gives enormous possibilities to track musical development objectively. By measuring musical literacy and aptitude, we can establish whether the provided music education is effective and identify when and where adjustment of music instruction is necessary.

Although the presented results in this pilot study are premature, they show a possible effect of Kodály inspired music education on musical literacy. Even though the differences were not significantly different, a promising-looking trend was visible. The main study (Main study) further explored the possible effects on musical literacy after a longer intervention with an improved methodology and study design.

3 Main study

The main study was conducted from September 2021 to April 2022 to explore further the possible effect of Kodály music education on musical literacy in Dutch primary school children. Careful consideration was given to the results from the pilot study, and the study design and methodology were improved. For instance, a larger sample group size and intervention period overcome identified limitations.

3.1 Method

Design

A pre-test – post-test control group block design was applied in the present study, with measures across two conditions: 1) a music intervention group and 2) a control group. Three schools participated in this study: a primary school for gifted children that had already participated in the exploratory study and was selected based on the previously established work relationship with the school and two other regular Dutch primary schools. Children were block assigned to each condition based on their Musical Aptitude score.

Participants

Data was collected from $N = 177$ participants across three primary schools (43.5% girls). The final data analysis excluded missing values due to absentness or incomplete test results. Exclusion criteria were children that received other (private) music lessons outside of this study. The final analysis comparative analysis was performed over $N = 134$ (76 boys and 58 girls, mean age = 8,72): (1) Music intervention ($N = 63$; mean age = 8,3), and (2) Control group ($N = 71$; mean age = 9,19). Descriptive statistics are described in the results section.

Two of the three primary schools were regular Dutch primary schools. The third school was for highly gifted children only (admission criteria for this school is an IQ ≥ 130). Parental informed consent was obtained for all children prior to the study.

Instruments

All tests were conducted and scored according to the scoring and validation criteria stated in each testing manual or handbook.

Intermediate Measures of Music Audiation

The *Intermediate Measures of Music Audiation* (IMMA) assessed Musical Aptitude. The test is divided into two parts: tonal aptitude and rhythm aptitude. Each subtest includes 40 test items with prerecorded tonal or rhythm patterns. The tonal patterns are without rhythm, and the rhythm patterns are without a variable pitch. Each item requires participants to listen to a set of patterns and decide if the two patterns are the same or different. Answers are given on a paper answer sheet. If both heard patterns sound the same, a circle is drawn around the pair of faces that look the same. If the child thinks that the patterns sound different, a circle is drawn around the faces that look different.

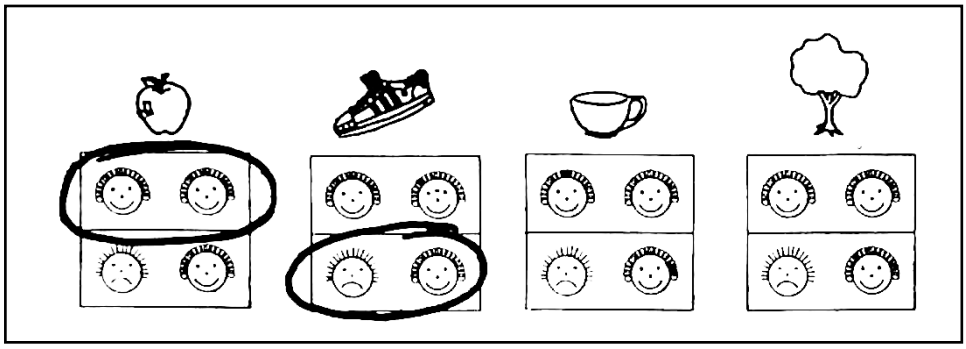
Figure ***3*** shows the practice examples of the tonal part.

The original test instrument is in English. For the present study, Dutch translations of the instruction were recorded and edited into the original audio. The original test item recordings were not edited.

The administration took place in a group setting on two different days in the same week. The pre-test IMMA composite scores equally divided the children over the conditions to create balanced intervention and control groups based on music potential.

Figure 3

Example items from the IMMA Tonal answer sheet



IOWA Tests of Music Literacy

The *Iowa Tests of Music Literacy* (ITML) measured musical literacy. The ITML was chosen based on its validity and reliability (Gordon, 1991). It includes six subtests (listening, reading, and writing) divided into a tonal and a rhythm part. Administration of both parts took place on two different days, a week apart.

In this study, level 1 of the ITML was applied. Level 1 contains only major and harmonic minor tonalities in treble clef with no sharps or flats in the key signature.

In the tonal *Audiation/Listening* subtest, children listened to a tonal pattern and indicated the tonality they heard (major or minor) by filling in the ovals on a paper answer sheet. In the tonal *Audiation/Reading* subtest, children listened to a tonal pattern and indicated whether the notated patterns on their answer sheet were the same as the ones they heard on the recording (yes or no). Finally, in the tonal *Audiation/Writing* subtest, children listened to a recorded tonal pattern and completed the notated pattern on their answer sheet by coloring in the right notes (Gordon, 1991).

In the rhythm *Audiation/Listening* subtest, children listened to a rhythm pattern and indicated the meter they heard (duple or triple) by filling in the ovals on their answer sheet. In

the rhythm *Audiation/Reading* subtest, children listened to a rhythm pattern and indicated whether the pattern they heard was the same as the one on their answer sheet (yes/no). Finally, in the rhythm *Audiation/Writing* subtest, an uncompleted notated rhythm pattern needed to be completed on their answer sheet by listening to the rhythm pattern and filling in the correct missing notes and rests.

Conditions

Music Intervention

Children in the music intervention group received weekly 45-minute lessons based on the Kodály principles. The music lessons were followed in a structured manner during school hours, on the same day each week. All developed lesson plans were based on the principles and tools as outlined in chapter 1.4 and relevant literature (*The Kodály Method, The Kodály Way to Music, Kodály Today*, and *Solfege in the Classroom*). Every lesson included beat, rhythm, and melody and was designed around singing and singing games. Relative solmization, solfège hand signs, stick notation, and 'Takadimi' rhythm language were introduced. Traditional music notation and absolute note names were only introduced limitedly, in connection to known songs and after an internal connection was made. All concepts were introduced based on a sound to name and symbol connection.

Control Group

Children in the control group did not receive any music lessons in addition to their regular school curriculum. The children only participated in the pre-and post-test and no replacement activity was given. Music education in the regular school curriculum consisted of daily singing songs in the classroom and occasionally using digital music methods. However, this was not part of a structured curriculum.

Procedure

The children were tested as a group in a quiet setting during school hours. The test protocol started with the administration of the IMMA. The tonal and rhythm parts were administered on separate days, taking 20 minutes each. The ITML was then administered in two different sessions: the tonal part and the rhythm part. Each took 45 minutes. The test protocol was administered to the intervention and control groups in two stages: the pre-test (before intervention) and the post-test (after the intervention).

The music lessons were given inside the school in a separate classroom designed for extracurricular activities. The rooms in all schools were spacious enough for singing games and include a whiteboard and Digi-board, as suggested by Salbert (2015).

Participants were followed from September 2021 until April 2022. Due to COVID-19 regulations, there was a short unintended break of 4 weeks at the end of November 2021. No music lessons were allowed to be given in the school during this period.

Statistical Analysis

A Repeated Measures Analysis of Variance (ANOVA) was used to look at the effect of the Kodály music intervention on music literacy per group condition over time. Descriptive statistics were computed for the overall scores of the tests. Measures of skewness and kurtosis and the Kolmogorov-Smirnov test were used to check normality and homogeneity. The ANOVA was set up as Group x Time, whereby Group represents the music intervention group and the control group, and Time represents the pre-test and post-test measurement. IBM SPSS Statistics 27 and R statistical software were used to perform the analysis. The level of significance was set at $p < 0.05$.

3.2 Results

Prior to analyzing the data regarding the research questions, the data was explored for abnormalities and outliers, and normality of distribution. Skewness and kurtosis measures and the Kolmogorov-Smirnov test explored the data.

Differences in Musical Literacy over time

The main hypothesis of this study is that Kodály music lessons have a positive effect on musical literacy. Therefore, children in the music intervention group were expected to have higher ITML post-test scores than those in the control group.

A mixed between-within subjects analysis of variance (ANOVA) was conducted to compare ITML scores on the pre-test and post-test between the intervention group and the control group, with Time as a within-subject variable, Group as the between-subject variable, and Musical Literacy scores as the dependent variable.

A significant interaction effect was found between Time and Group, $F(1,122) = 31.175$, $p < .001$, $\eta^2p = .20$, sphericity assumed (See Figure 4 and Table 9). This effect indicates that the Kodály group increased significantly on their composite musical literacy post-test scores compared to the control group. Contrasts revealed that the mean scores of the Kodály group increased significantly on the posttest, Wilks' $\lambda = .766$, $F(1,122) = 37.198$, $p < .001$, $\eta^2p = .23$, while the mean scores of the control group did not change significantly, Wilks' $\lambda = .981$,$F(1,122) = 2.41$, $p = .123$, $\eta^2p = .02$. This result rejects the null hypothesis and confirms the hypothesis that Kodály music lessons have a beneficial effect on musical literacy.

Figure 4

Performance on Musical Literacy between groups

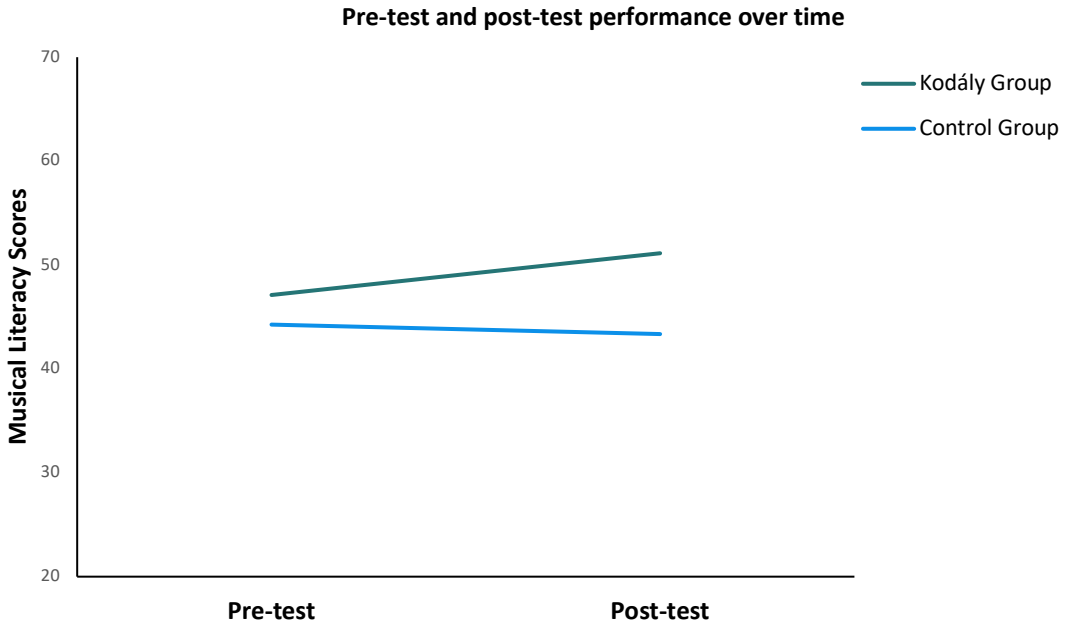


Table 9

Descriptive statistics for Composite Musical Literacy scores over time, by condition

Composite score	Condition	Mean	St. Deviation	N
Pre-test	Control	44.26	5.354	71
	Music	47.11	7.203	63
	Total	45.52	6.375	134
Post-test	Control	43.35	6.102	71
	Music	51.13	5.538	63
	Total	46.80	6.127	134

Two mixed between-within subjects analyses of variance (ANOVA) were conducted to compare ITML Tonal scores and ITML Rhythm scores on the pre-test and post-test between the intervention group and the control group, with Time as a within-subject variable and Group as the between-subject variable.

Tonal Musical Literacy

For the Total Tonal scores, a significant interaction effect was found between Time and Group, $F(1,129) = 21.268$, $p < .001$, $\eta^2p = .14$, indicating that the music intervention group increased significantly in their total Tonal post-test scores compared to the control group (Figure 5). Again, we see that the mean scores of the Kodály group increased significantly on the post-test, Wilks' $\lambda = .798$, $F(1,129) = 32.683$, $p < .001$, $\eta^2p = .20$, while the mean scores of the control group did not change significantly, Wilks' $\lambda = .997$, $F(1,129) = .452$, $p = .502$, $\eta^2p = .00$ (Table 10).

Figure 5

Tonal Musical Literacy scores over time between groups

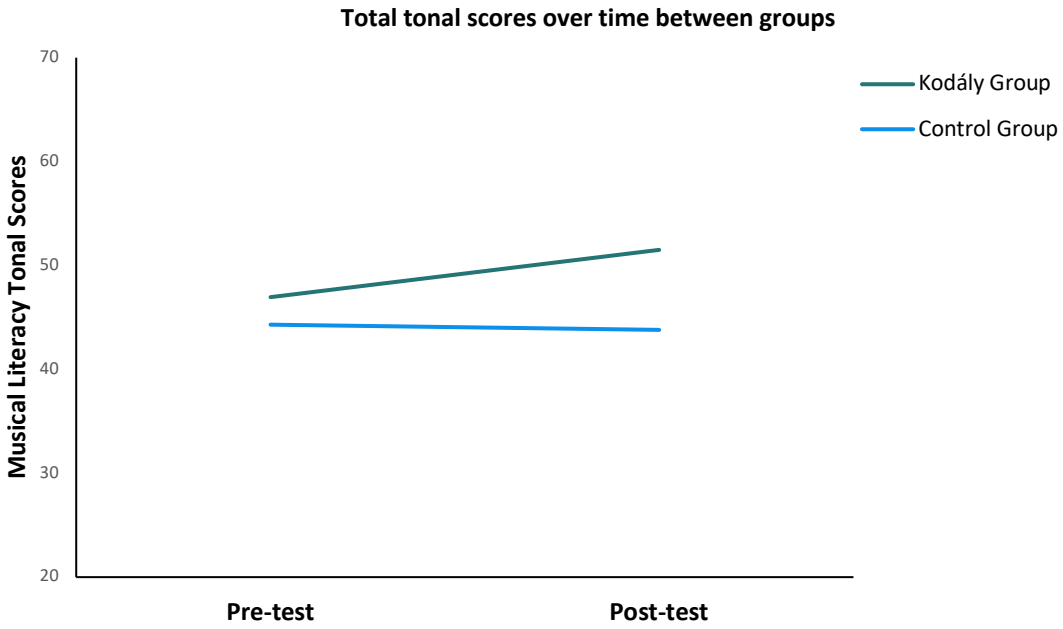


Table 10

Descriptive statistics for Tonal scores over time, by condition

IOWA Total Tonal	Condition	Mean	St. Deviation
Pre-test	Control	44.30	6.652
	Music	46.95	8.838
	Total	45.56	6.375
Post-test	Control	43.80	7.095
	Music	51.50	7.950
	Total	46.80	8.420

Tonal subtests

Looking at all tonal subtests separately, significant interaction effects were found for all subtests: T1 (listening), $F(1,129) = 12.689$, $p < .001$, $\eta^2p = .09$, T2 (reading), $F(1,129) = 4.461$, $p < .037$, $\eta^2p = .03$, and T3 (writing), $F(1,129) = 14.623$, $p < .001$, $\eta^2p = .10$ (Figure 6, Figure 7, and Figure 8). Table 11 summarizes descriptive statistics of each subtest per group.

Pairwise Comparisons showed that the mean scores of the Kodály group on T1 increased significantly on the post-test, Wilks' $\lambda = .875$, $F(1,129) = 18.397$, $p < .001$, $\eta^2p = .13$, while the mean scores of the control group did not change significantly, Wilks' $\lambda = .997$, $F(1,129) = .426$, $p = .515$, $\eta^2p = .00$.

The mean scores of the Kodály group increased significantly on the T2 from the pre-test to post-test, Wilks' $\lambda = .935$, $F(1,129) = 8.959$, $p = .003$, $\eta^2p = .06$. The mean scores of the control group did not change significantly, Wilks' $\lambda = 1.000$, $F(1,129) = .008$, $p = .931$, $\eta^2p = .00$.

The Kodály group has significantly increased mean scores on the T3 post-test compared to the pre-test, Wilks' $\lambda = .838$, $F(1,129) = 24.907$, $p < .001$, $\eta^2p = .16$, while the mean scores of the control group did not change significantly, Wilks' $\lambda = .999$, $F(1,129) = .086$, $p = .770$, $\eta^2p = .00$.

Figure 6

Tonal Listening scores over time between groups

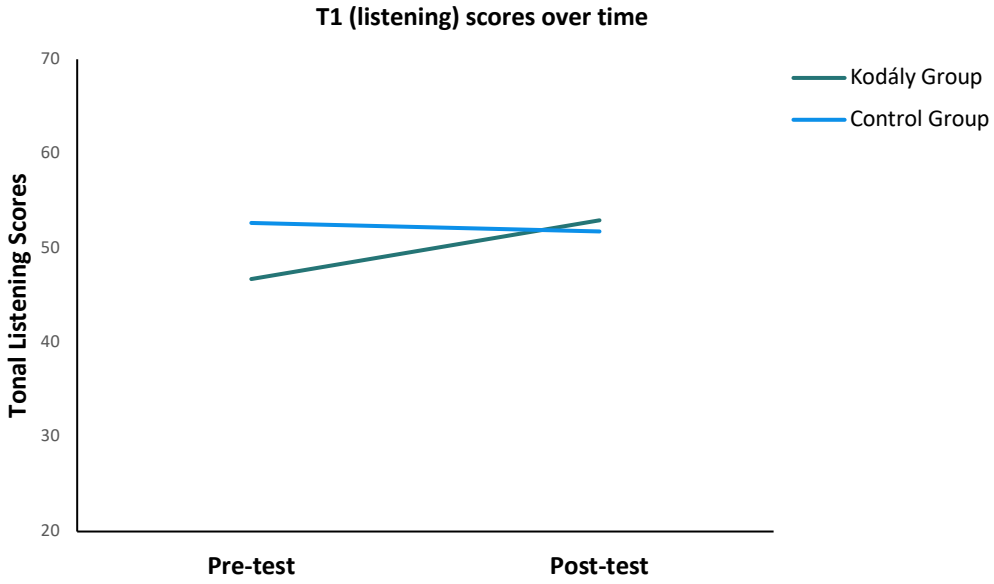


Figure 7

Tonal Reading scores over time between groups

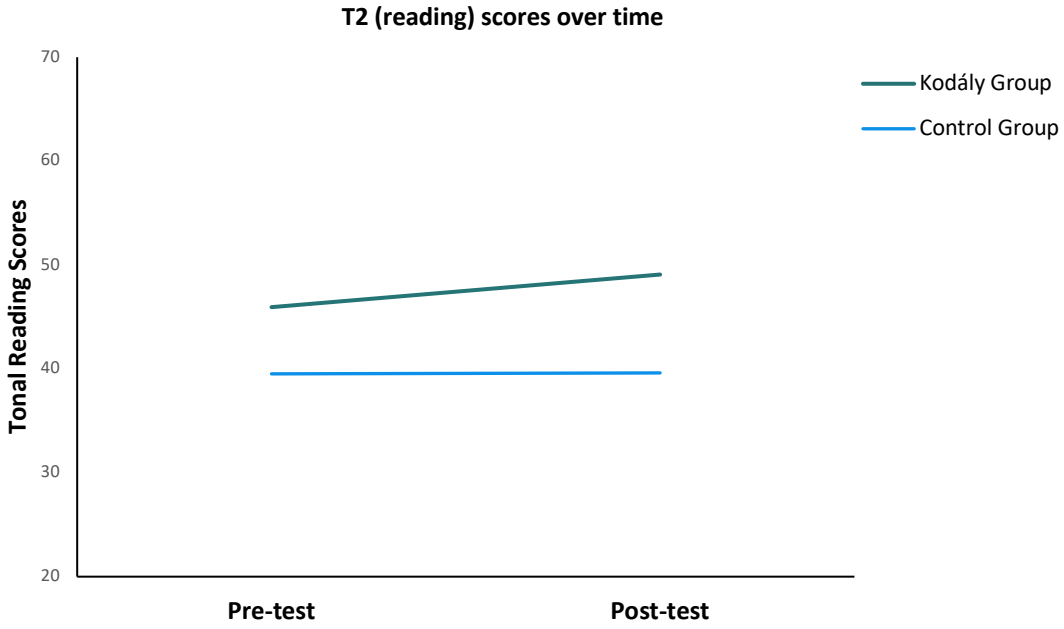


Figure 8

Tonal Reading scores over time between groups

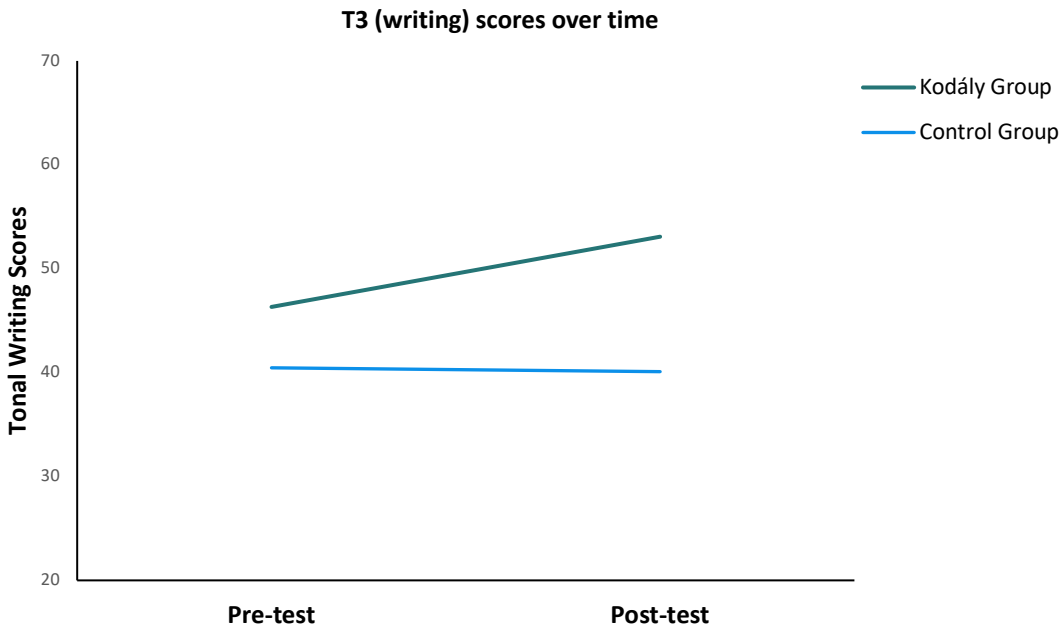


Table 11

Descriptive statistics showing mean scores and standard deviation (SD) are shown for each group in time across all Tonal subtests.

	Kodály Group			Control Group		
	T1	T2	T3	T1	T2	T3
Pre-test	46.73 (13.298)	45.94 (9.389)	46.32 (13.204)	52.57 (6.604)	39.52 (9.455)	40.46 (11.463)
Post-test	52.95 (9.458)	49.08 (39.61)	53.08 (11.406)	51.77 (7.658)	39.61 (8.620)	40.09 (11.911)

Rhythm Musical Literacy

For the Total Rhythm scores, a significant interaction effect was found between Time and Group, $F(1,123) = 249.288$, $p < .001$, $\eta^2p = .09$, indicating that rhythm scores are significantly affected by group condition. As expected, we see that the mean scores of the Kodály group increased on the post-test, Wilks' $\lambda = .875$, $F(1,123) = 17.592$, $p < .001$, $\eta^2p = .12$. The mean scores of the control group did not change significantly over time, Wilks' $\lambda = .999$, $F(1,123) = .161$, $p = .689$, $\eta^2p = .00$ (see also Figure 9 and Table 12).

Figure 9

Performance on Rhythm Musical Literacy between groups

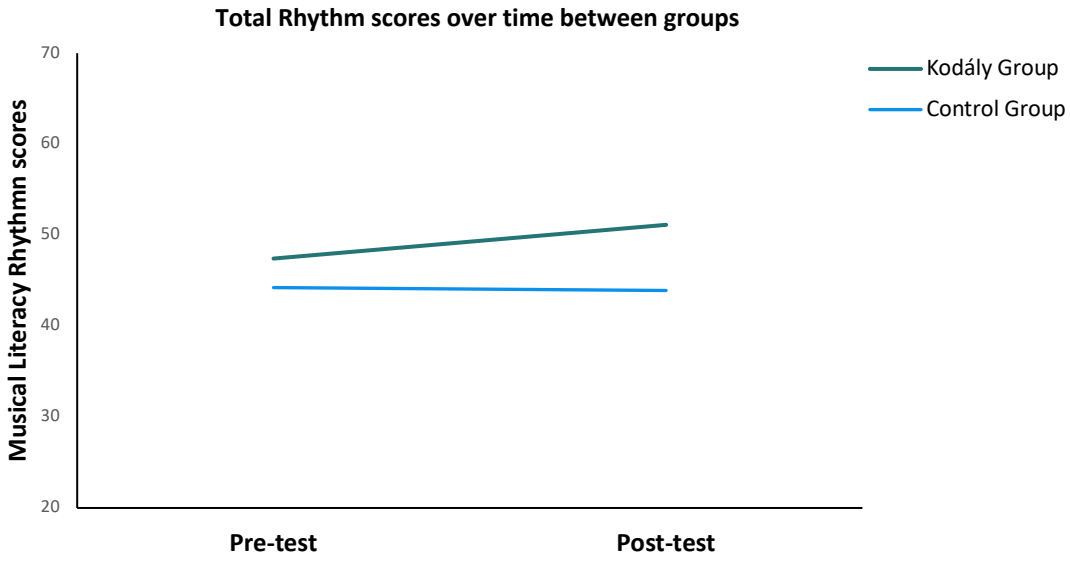


Table 12

Descriptive statistics for Rhythm scores over time, by condition

IOWA Total Rhythm	Condition	Mean	St. Deviation
Pre-test	Control	44.23	5.698
	Music	47.42	6.989
	Total	45.63	6.470
Post-test	Control	43.91	6.420
	Music	51.13	6.452
	Total	47.09	7.352

Rhythm subtests

A significant interaction effect between Time and Group was only found in R3 (writing), $F(1,123) = 9.023$, $p = .003$, $\eta^2p = .07$.

No significant interaction effects were found for R1 (listening), $F(1,123) = 3.037$, $p = .084$, $\eta^2p = .02$, and R2 (reading), $F(1,123) = 1.735$, $p = .190$, $\eta^2p = .01$ (Figure 10, Figure 11, and Figure 12). Table 13 summarizes descriptive statistics of each subtest per group.

The mean scores of the Kodály group increased significantly on the R3 subtest from pre-test to post-test, Wilks' $\lambda = .851$, $F(1,123) = 21.612$, $p < .001$, $\eta^2p = .15$. The mean scores of the control group did not change significantly, Wilks' $\lambda = .996$, $F(1,129) = .513$, $p = .475$, $\eta^2p = .00$.

Figure 10

Rhythm Listening scores over time between groups

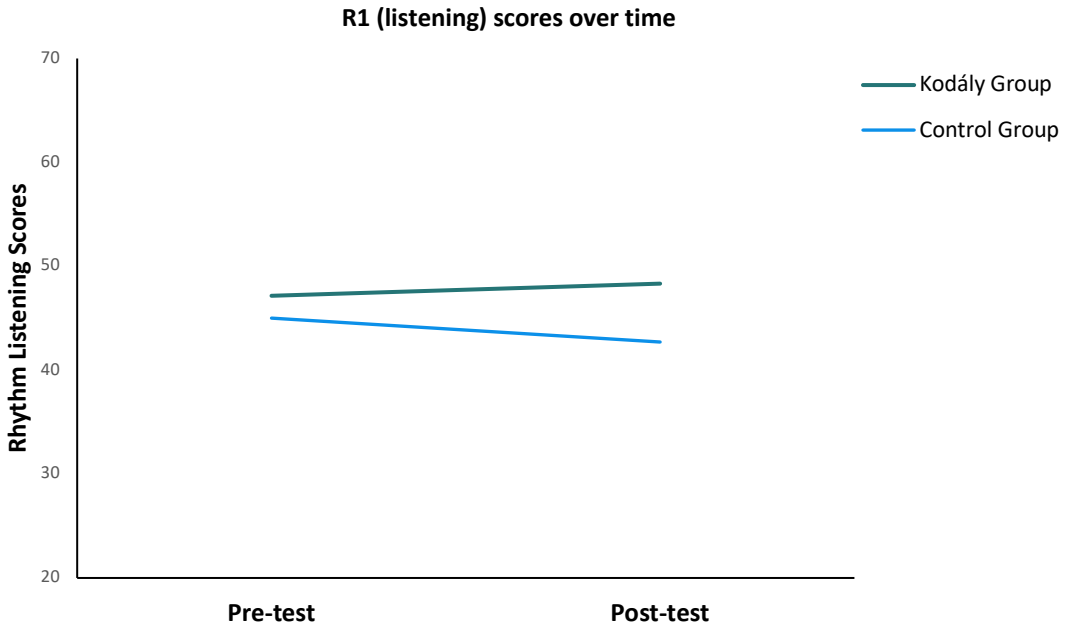


Figure 11

Rhythm Reading scores over time between groups

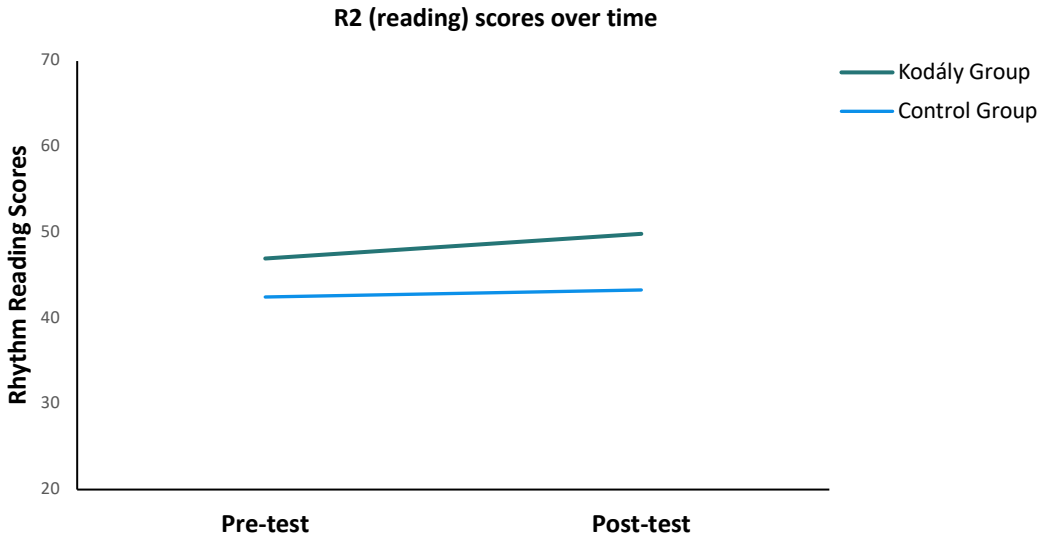


Figure 12

Rhythm Writing scores over time between groups

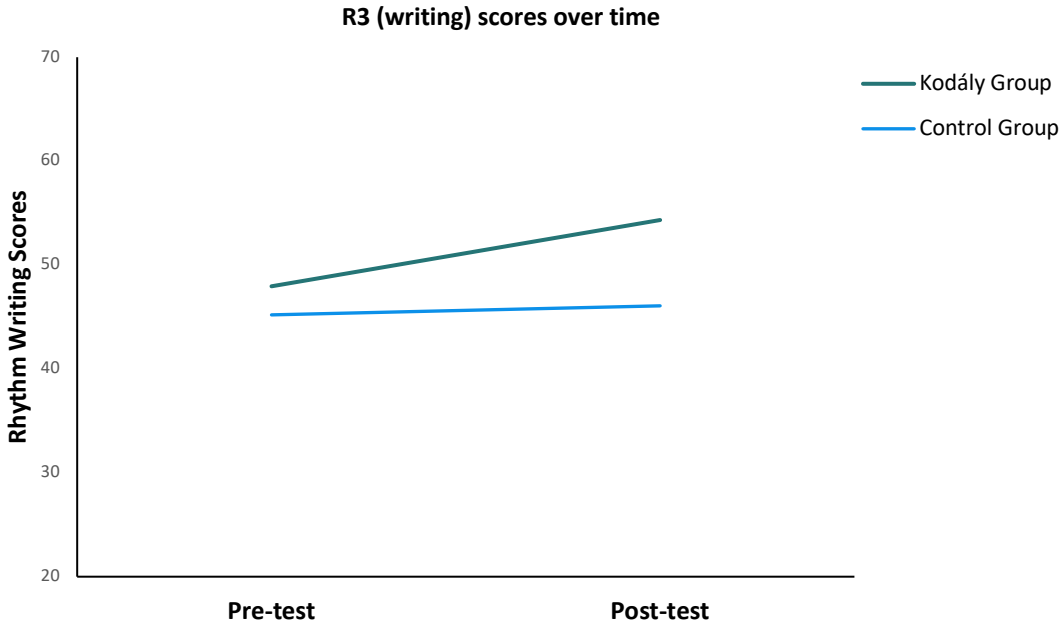


Table 13

Descriptive statistics showing mean scores and standard deviation (SD) are shown for each group in time across all Rhythm subtests.

	Kodály Group			Control Group		
	R1	R2	R3	R1	R2	R3
Pre-test	47.16 (10.976)	46.98 (8.657)	47.95 (11.314)	45.01 (8.068)	42.47 (7.604)	45.29 (9.088)
Post-test	48.33 (11.865)	49.84 (9.451)	54.33 (5.966)	42.71 (9.838)	43.29 (7.916)	46.07 (54.33)

Rhythm compared to Tonal improvement

As the Kodály methodology focuses on internalizing beat and rhythm before consciously presenting pitch and notation, children in the music intervention group were expected to show greater improvement on the Rhythm part of the ITML than the Tonal part of the ITML.

A repeated-measures ANOVA was conducted to compare the improvement in total Tonal and Rhythm scores in the Kodály intervention group. No significant effect was found between the improvement in Rhythm scores and the improvement in Tonal scores for the children in the Kodály group, $F(1,54) = .076$, $p = .783$, $\eta^2p = .00$ (Figure 13 and Table 14).

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Figure 13

Improvement in Rhythm and Tonal scores for the Kodály group

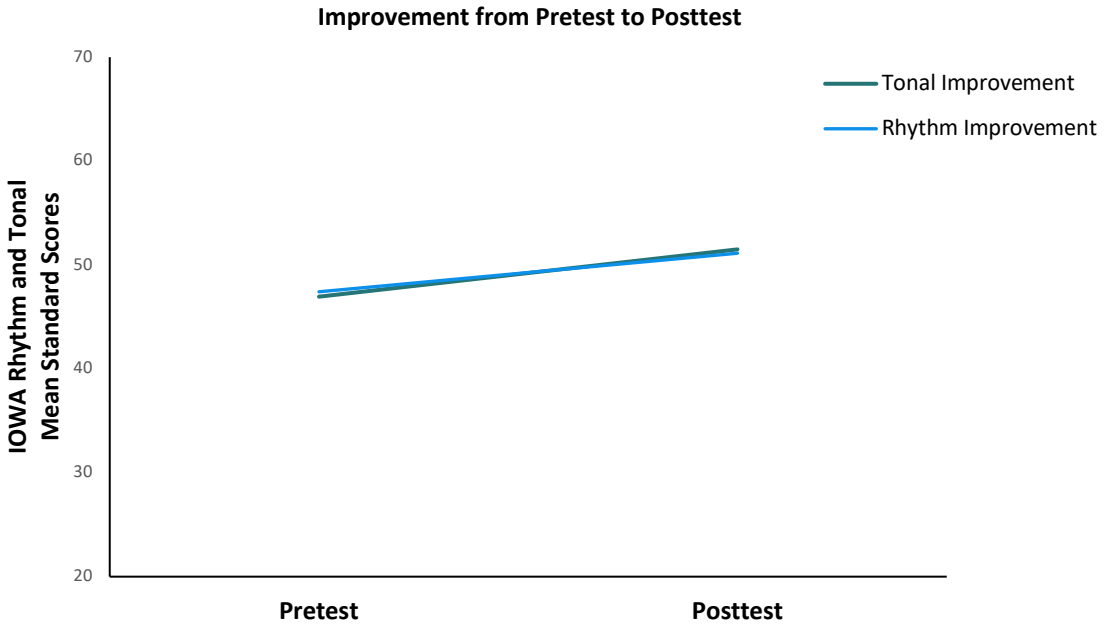


Table 14

Descriptive statistics for improvement on Rhythm and Tonal scores (Kodály group)

Improvement	Mean	St. Deviation
Rhythm improvement	3.709	7.317
Tonal improvement	4.090	7.217

Differences in Musical Aptitude over time

Three mixed between-within subjects analyses of covariance (ANCOVA) were conducted to compare raw IMMA scores on the pre-test and post-test between the intervention group and the control group, with Time as a within-subject variable, Group as the between-subject variable, and Age as a covariate. As musical aptitude is stabilized after the age of nine

(Gordon, 2001) and the mean age of the children in this study is 8.72, musical aptitude was expected to remain stable over time.

Although both groups increased in their mean scores, no significant interaction effect was found between Time and Group on IMMA Composite scores, $F(1,121) = .224$, $p = .637$, $\eta^2p = .00$, the IMMA Tonal scores, $F(1,125) = .455$, $p = .501$, $\eta^2p = .00$, and on the IMMA Rhythm scores, $F(1,121) = .101$, $p = .751$, $\eta^2p = .00$ (Figure 14, Figure 15, and Figure 16). No significant difference was found between group conditions over time in musical aptitude. Table 15 summarizes descriptive statistics for all IMMA scores per group.

Figure 14

IMMA Composite scores over time between groups

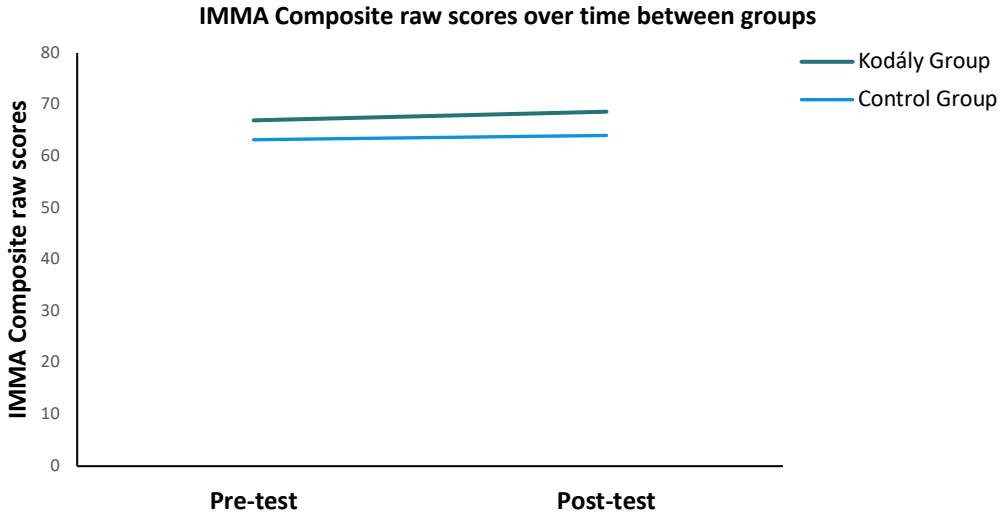


Figure 15

IMMA Tonal scores over time between groups

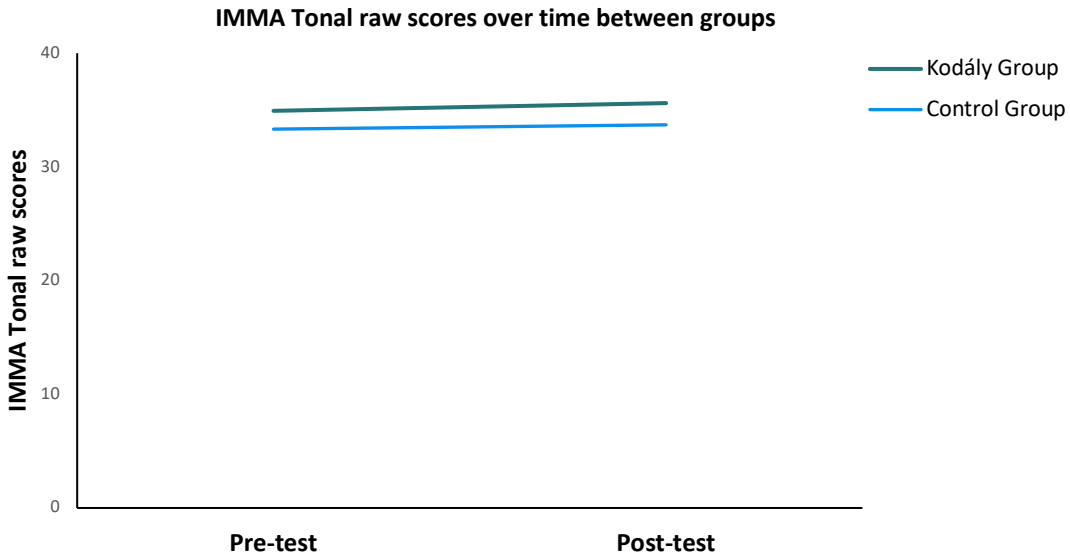


Figure 16

IMMA Rhythm scores over time between groups

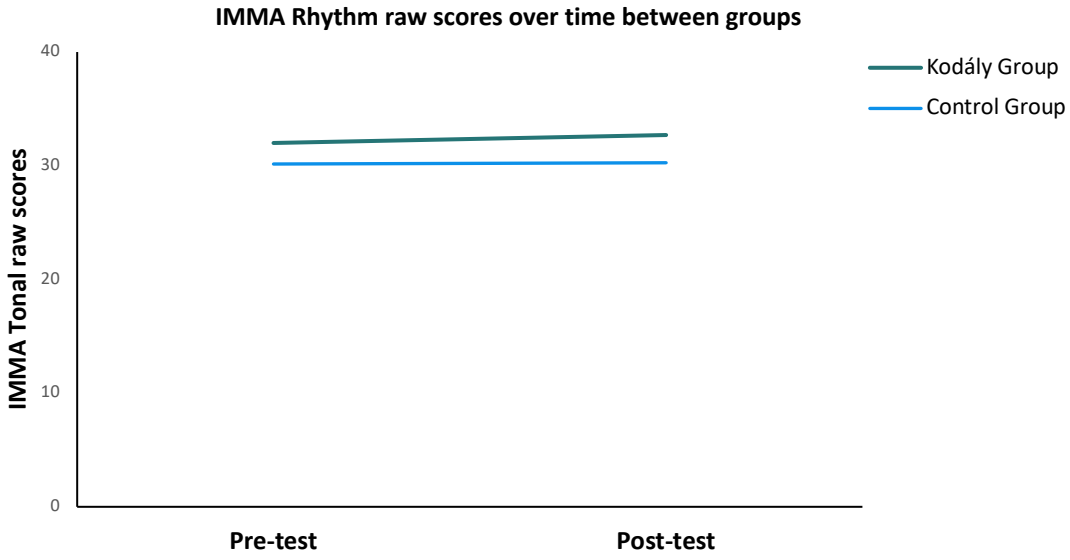


Table 15

Descriptive statistics showing mean scores and standard deviation (SD) are shown for each group in time across the Intermediate Measures of Musical Aptitude.

	Kodály Group			Control Group		
	IMMA Tonal	IMMA Rhythm	IMMA Composite	IMMA Tonal	IMMA Rhythm	IMMA Composite
Pre-test	34.93 (3.438)	32.00 (3.225)	66.96 (5.281)	33.32 (3.233)	30.15 (3.891)	63.21 (6.340)
Post-test	35.61 (3.206)	32.70 (3.692)	68.46 (5.159)	33.70 (3.623)	30.26 (4.641)	64.04 (6.847)

Differential development in children with different musical aptitudes

With proper music instruction, a high music potential leads to a more significant improvement in music achievement (Gordon 2001, 2012; Bluestine, 2000). Therefore, children with high musical aptitude scores were expected to have higher scores on the ITML from pre-test to post-test than children with a low or average musical aptitude. Musical aptitude scores were divided into three groups: a high musical aptitude percentile rank (80-100), an average musical aptitude percentile rank (21-79), and a low musical aptitude percentile rank (1-20) as suggested by Gordon (1986).

A One-Way ANOVA was conducted to compare scores on the musical literacy pre-test between musical aptitude scores. There was a significant effect of musical aptitude on musical literacy pre-test scores, $F(2,129) = 3.227$, $p = .043$, $\eta^2p = .048$ (Figure 17). Table 16 shows the means and standard deviations.

Figure 17

Pre-test Musical Literacy scores by Musical Aptitude

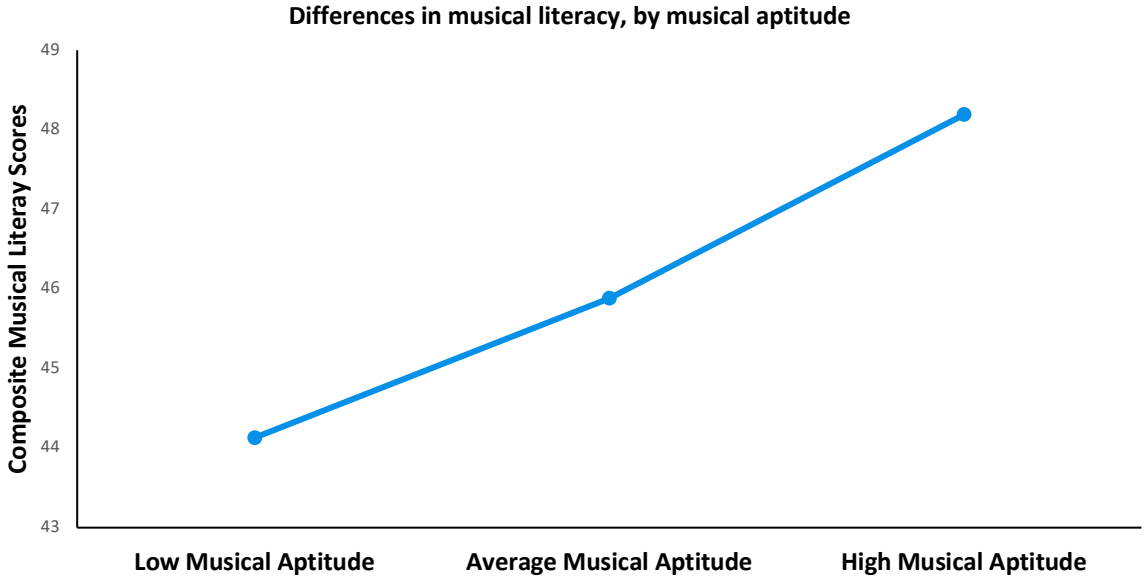


Table 16

Descriptive statistics showing mean scores and standard deviation for Composite Musical Literacy pre-test scores

Musical Aptitude	Mean	St. Deviation	N
Low	44.13	5.191	54
Average	45.88	5.707	57
High	48.19	9.933	21

A regression analysis was conducted to explore the relationship between pre-test Musical Aptitude scores and composite musical literacy scores (ITML) on the post-test.

Bias corrected and accelerated bootstrap 95% Cis are reported in square brackets. Musical aptitude was significantly correlated with post-test scores, $r_s = .61$ [.49, .71], $R^2 = .37$, $p < .001$ (Table 17). Musical aptitude is a significant predictor of Musical Literacy scores.

Table 17

Linear model of predictors of Musical Literacy scores, based on Musical Aptitude (IMMA)

	IMMA Composite
Composite ITML Post-test	.61* [.49, .71] $p < .001$

A split-plot repeated measures ANOVA with Time as a within-subject variable and Musical Aptitude as the between-subject variable was conducted.

No significant interaction effect was found between Time and Musical Aptitude, $F(2,52) = .410$, $p = .666$. Planned contrasts showed that children in the Kodály group with a high musical aptitude had significantly higher scores from pre-test to post-test than those with a low musical aptitude score, $p = .009$. No significant differences were found between children with an average musical aptitude and children with a high musical aptitude, $p = .309$, nor between children with an average musical aptitude score and children with a low musical aptitude score, $p = .108$. Figure 18 and Figure 19 show the means in musical literacy scores over time for the different musical aptitude groups. See Table 18 for the means and standard deviations.

Figure 18

Musical literacy scores over time by musical aptitude for the Kodály group

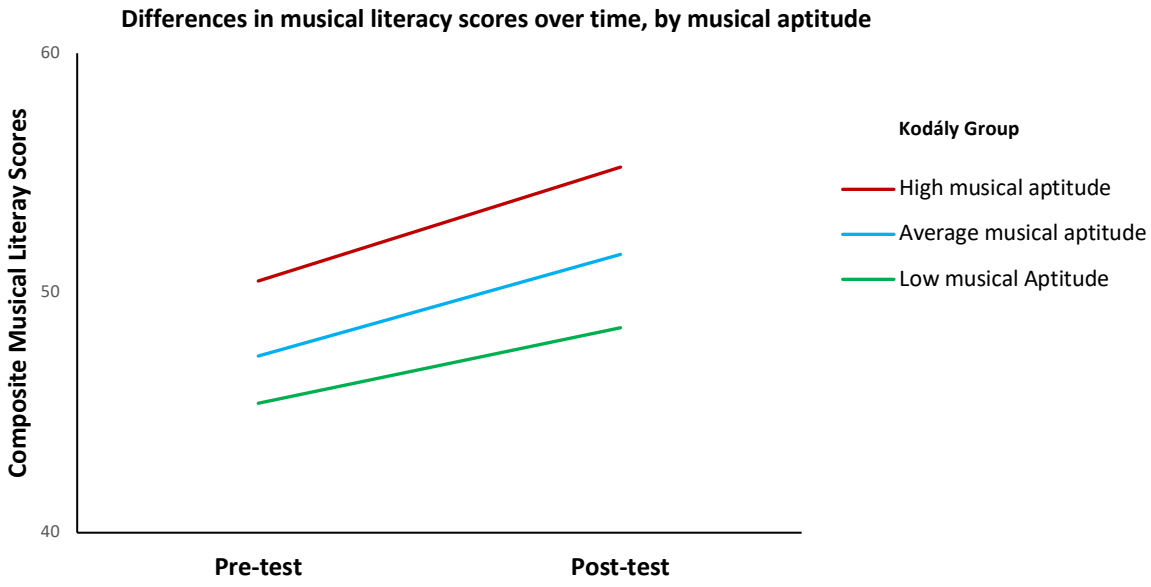


Figure 19

Musical literacy scores over time by musical aptitude for the Control group

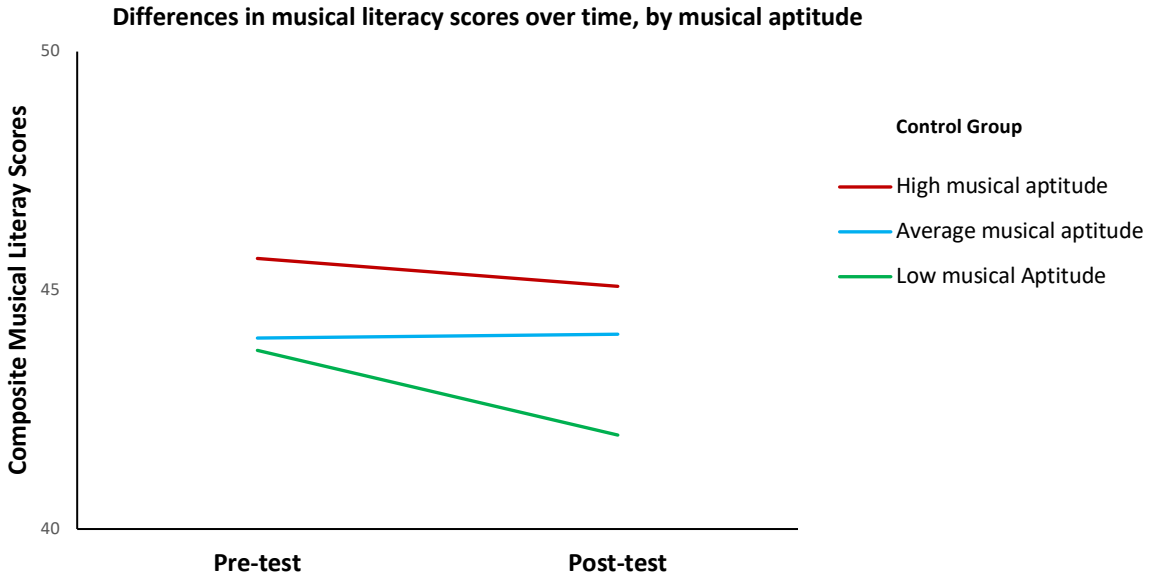


Table 18

Descriptive statistics showing mean scores and standard deviation (SD), are shown for each group in time by Musical Aptitude

	Kodály Group			Control Group		
	High MA	Average MA	Low MA	High MA	Average MA	Low MA
Pre-test	50.50 (2.523)	47.37 (1.374)	45.40 (1.596)	45.67 (1.554)	44.00 (1.076)	43.74 (.967)
Post-test	55.25 (1.818)	51.81 (.989)	48.55 (1.150)	45.08 (1.758)	44.08 (1.218)	41.968 (1.094)

3.3 Discussion

The goal of the present study was to examine the effect of Kodály-inspired music education on musical literacy in Dutch primary school children. The results show that children following Kodály-inspired music lessons show significantly greater improvement in musical literacy outcomes than children in the control group. The Kodály group increased significantly more in composite musical literacy scores and Total Tonal and Total Rhythm subtest musical literacy scores. This result suggests that Kodály-inspired music lessons have a significant positive effect on the development of musical literacy. These results build on previous research that examined the effect of Kodály music education on specific musical skills (Palmer, 1976; Holmes, 2009).

The Kodály approach has an initial focus on beat and rhythm before consciously presenting pitch and notation (Choksy, 1999; Vajda, 2008); therefore, a greater improvement in the Rhythm dimension than the Tonal dimension of the ITML was expected in the intervention group. However, no significant difference was observed in the intervention group's total improvement of Tonal and Rhythm musical literacy. These results suggest that Kodály-inspired music lessons are beneficial for equally developing tonal and rhythm literacy.

When analyzing the subtests separately, the Kodály group showed significant improvement on all tonal subtests (listening, reading & writing) and one rhythm subtest (writing). The other rhythm subtests (listening & reading) also showed a clear, but not significant, positive trend in the Kodály group. The lack of significance can be explained by the limited timespan of the intervention program in this study. The intervention group in this study followed a seven-month music program of weekly music lessons. An extended intervention program would give more insight into longitudinal effects.

The second interest in this study was the influence of musical aptitude on the development of musical literacy. Although formal music lessons directly influence musical aptitude, both groups remained stable in their musical aptitude scores over time, supporting the theory that musical aptitude is stabilized from the age of nine (Gordon, 2001).

In line with the literature (Gordon, 1991, 2001; Bluestine, 2000; Andreasen, 2018), children with high musical aptitude scores had significantly higher musical literacy scores than children with average or low musical aptitude scores on the pre-test. Additionally, musical aptitude was a good predictor of musical literacy. The results showed that although children in the intervention group with high musical aptitude demonstrated greater development in musical literacy than children with low or average musical aptitude, this difference was only significant between high musical aptitude and low musical aptitude. No significant difference was found between high and average musical aptitude, and between low and average musical aptitude. The relatively short intervention period could explain the lack of a main effect, as a clear trend is visible. Students with high musical aptitude are expected to show greater development in music achievement over the years (Gordon, 2012), and seven months seem insufficient to detect a significant difference. Longitudinal research is needed to explore this possible effect further.

3.4 Limitations

The generalization of this study is limited because it was not a blind study. The music intervention and the data analysis were conducted by the same person (i.e., the author). Therefore, unintended bias could have occurred. Further research is needed to correct this methodological constraint. Additionally, the sample size selection needs consideration as one of the three participating schools was for highly gifted children only, and they may have skewed the results. Future studies should include other regular primary schools.

It was beyond the scope of the current study to provide an alternative activity for the control group. Future studies should include a control group following another form of structured or unstructured music education.

3.5 Conclusion

Results from the quantitative analysis indicate that weekly Kodály-inspired music lessons are significantly beneficial to the development of musical literacy. Implementing Kodály music education in Dutch primary schools would be valuable in achieving musical literacy among Dutch children. Future longitudinal research will further enhance insights on the effects of Kodály music education on musical literacy. Especially interesting will be to explore the long-term effects on children that receive Kodály music lessons multiple times a week. Furthermore, a comparison with other widely used digital music education methods would be valuable.

Children with a high musical aptitude (80-100 percentile rank) show significantly greater development in musical literacy than children with a low musical aptitude (1-20 percentile rank). However, no overall effect of musical aptitude on musical literacy was found. Furthermore, the results showed that musical aptitude is a good predictor of musical literacy scores. Measuring the musical aptitude of children can help music teachers with adjusting instruction and difficulty and should be encouraged in group classroom settings.

Part 2

Resources to measure musical literacy in Dutch classrooms

4 Musical Literacy Test for Dutch Children

4.1 Development

As outlined in chapter 1, assessing a pupil's development in musical literacy gives essential information that is beneficial to both student and teacher. Unfortunately, no standardized instrument to measure musical literacy in Dutch-speaking children is currently available. Although the chosen instrument for the quantitative part of this study, the ITML, is validated, it is developed for English-speaking students. The original audio, instructions, and answer sheets are in English. For these reasons, administrating the ITML on Dutch primary school children in a typical classroom setting can be challenging if they are not proficient in English. Furthermore, the percentile rank norms were derived from American students from 1970 to 1971 (Gordon, 1991), and Dutch normative scores are lacking.

A Dutch instrument is thus needed that allows music teachers to assess musical literacy in their classrooms objectively. Realistic objectives for each school grade in Dutch primary schools needed to be established first to develop such an instrument. As a starting point, kindergarten and first-grade objectives were established. The test blueprint and test development have been restricted to first grade, as that is when writing and reading become part of the school and music curriculum.

4.2 Learning objectives

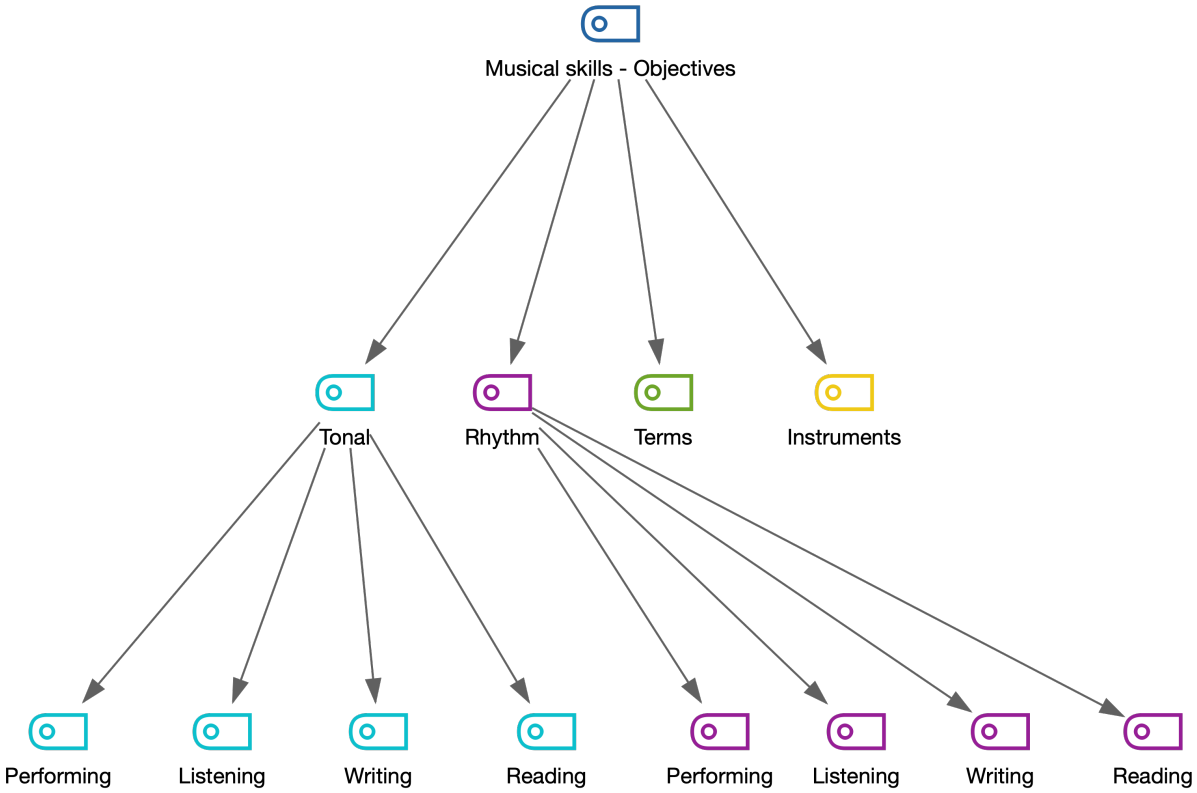
The study results showed that Kodály music education has significant positive effects on the development of music literacy in Dutch primary school children. Learning objectives can therefore be derived from leading literature on Kodály music education. In this process, the established learning objectives that were used for the development of a Dutch test instrument are based on the following works: *The Kodály Method I* (Choksy, 1999), *Music in Preschool* (Forrai, 1998), *The Kodály Way to Music* (Vajda, 2008), and *Solfege in the Classroom* (Papp & Spiegel, 2016). Recommendations, sequence structures, and standards have been collected from these works and then coded into segments with *MAXQDA2020,* a literature review software application. The segments were divided into two main categories: rhythm and tonal. Each category was then divided into four domains: listening, writing, reading, and performing. Each derived objective from the literature was categorized under one of these domains. Figure 20 provides a visual overview of the code structure. Appendix A shows an example of the coded segments.

The objectives, derived from the literature, were then used for a test blueprint that specifies domain-wise learning outcomes. The test blueprint enlists the skills that can be tested for each domain. From this, the test items could be created.

Additionally, a summary of the goals was used to create an overview and posters that Dutch schools and music teachers can use to keep track of the objectives in their music lessons.

Figure 20

Hierarchical Code-subcodes model of the categories and domains



4.2.1 Kindergarten

here is relative consensus within the Kodály literature regarding music concepts in kindergarten (Choksy, 1999; Forrai, 1998; Vajda, 2008). These concepts were used to determine the coding structure and the goals for kindergarten, of which the results are shown in Figure 21. Figure 22 shows the summary poster designed for Dutch teachers to keep track of the main learning goals for kindergarten. The objectives are intended for Dutch classroom use; therefore, they are in Dutch. Most have been formed as "I can" statements: clearly defined learning goals that help pupils understand what they are learning and see the progression of what they are expected to master (Marzano, 2017). Research has shown that setting clear (visual) goals for pupils can improve their achievement (Hattie, 2008; Marzano & Brown, 2009).

Figure 21

Musical concepts deducted from coded segments

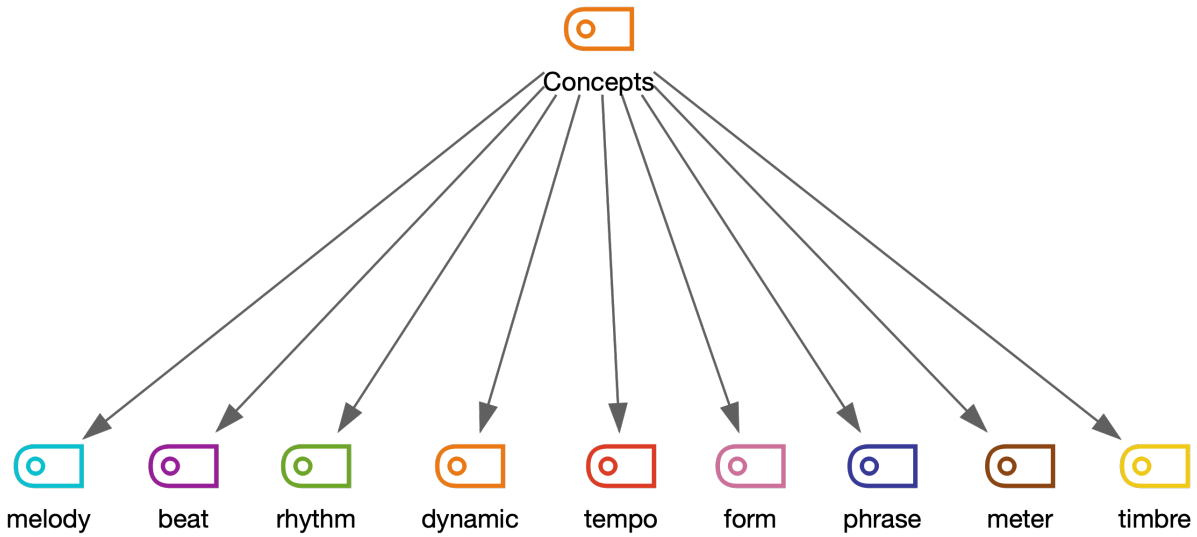


Figure 22

Objectives with "I can" statements for kindergarten: a poster concept

4.2.2 Grade 1

After defining the concepts and objectives for kindergarten, the process continued with coding the objectives for the first grade according to the same procedure. Again, they were categorized into two groups: tonal and rhythm.

Figure 23 shows an overview of the objectives for grade 1 used for the test blueprint. This overview can help teachers focus and plan their teaching and serve as an assessment checklist. Additionally, a summary poster of the goals was created for Dutch classroom use (Figure 24).

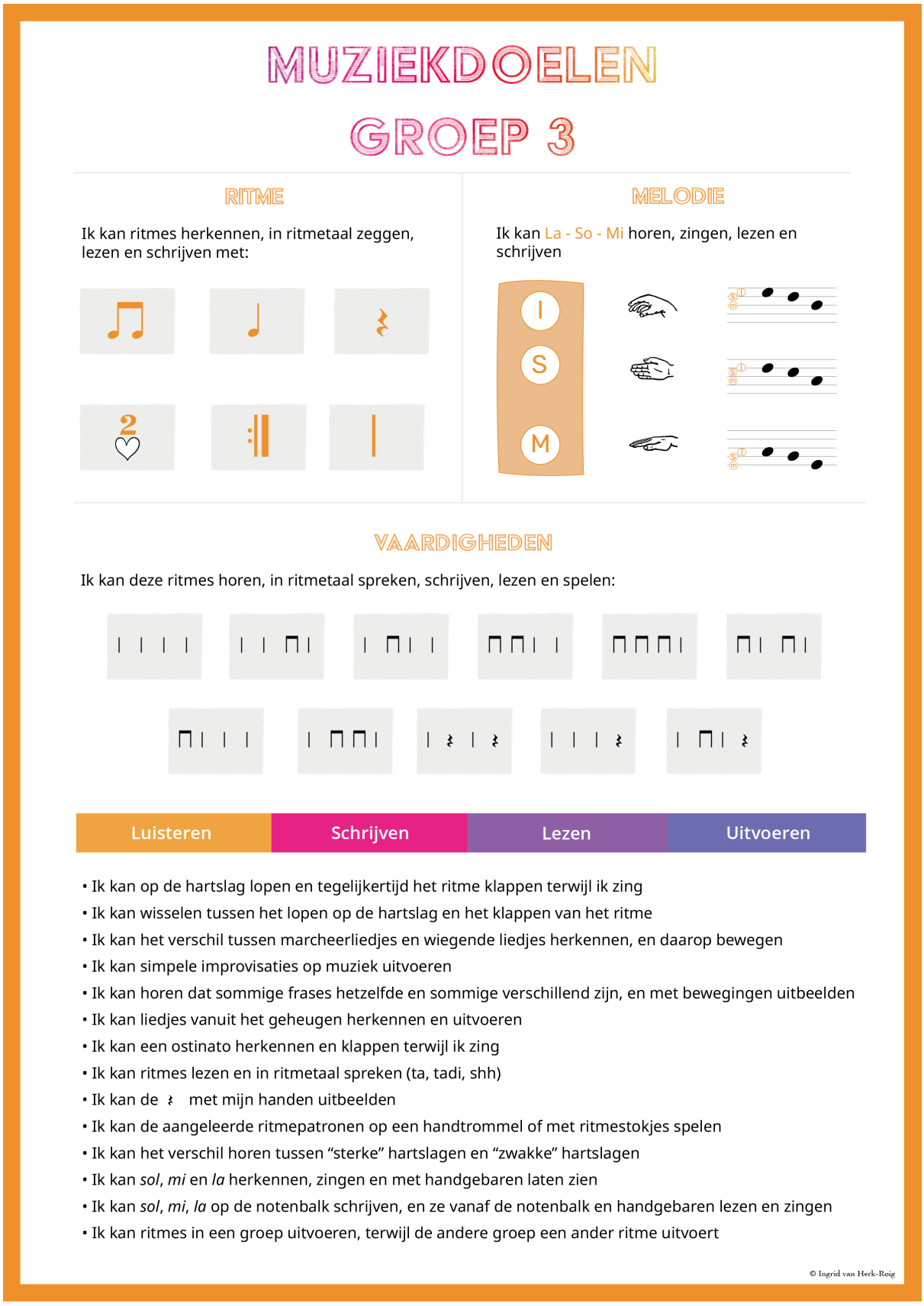
Children and teachers can see the goals in a clear visual overview, which provides them with an easy way to understand the progression they are mastering.

Figure 23

Test blueprint - Assessment objectives for Grade 1

Figure 24

Objectives for Grade 1 with "I can" statements



4.3 Constructed test items

The collected goals and sequences were used to construct pilot test items. The test is based on the developed test blueprint for first grade and is therefore divided into two categories: a tonal part and a rhythm part. This division is also in line with Gordon's categories in his musical aptitude and musical literacy tests (Gordon, 1991, 2001, 2012).

Each part includes three subtests (listening, writing, and reading). The tonal subtests include tonal patterns of *la*, *so*, and *mi* in G = do, F = do, and C = do. The Rhythm subtests include rhythm patterns containing quarter notes, eighth notes, and quarter rests. The tonal patterns are without added rhythm, and the rhythm patterns are without pitch differences. A complete overview of the current pilot answer sheet can be found in appendix B.

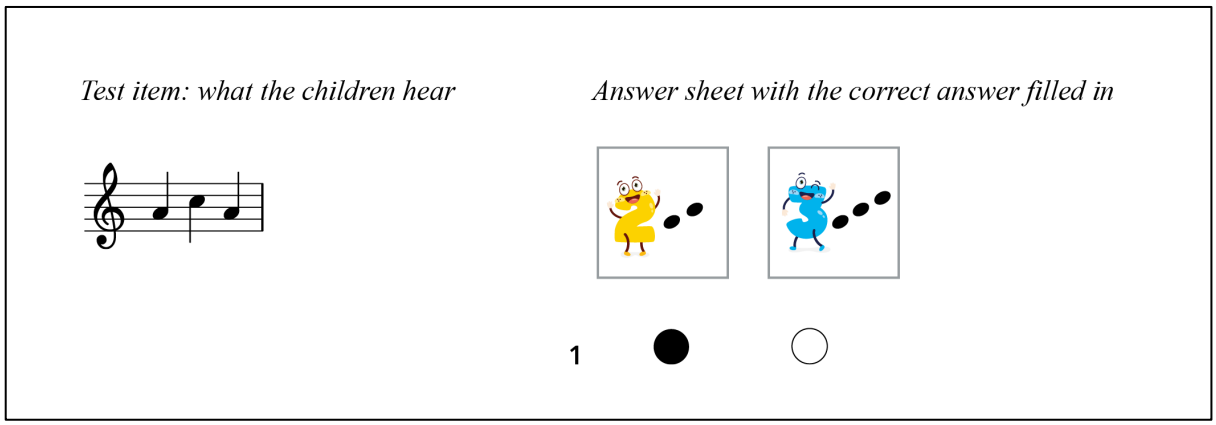
Tonal subtests

In the Tonal/Listening subtest, children listen to a recorded tonal pattern and determine whether they hear two or three different pitches by filling in the appropriate circle on a paper answer sheet. The pilot version of the Tonal/Listening subtest contains 22 test items.

Figure 25 shows a test item with the correct answer filled in. For example, children hear the tonal pattern a'– c''– a' (not shown to them) and should fill in that they hear two different pitches.

Figure 25

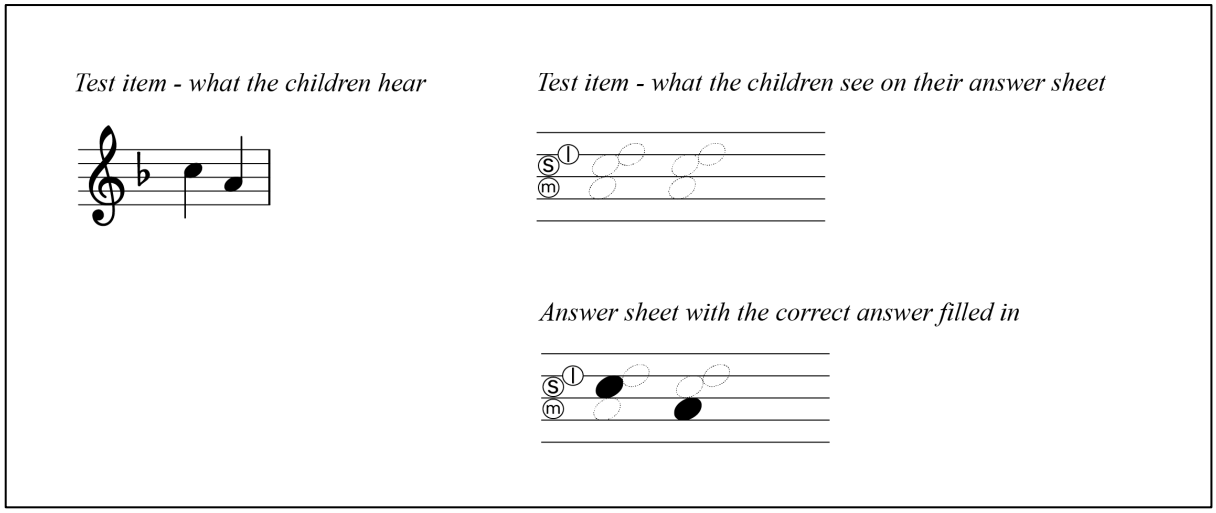
Tonal/Listening subtest – example of a test item



In the Tonal/Writing subtest, children hear a recorded tonal pattern and must write the pattern on their answer sheet by coloring in the right notes. In this subtest, the children see a staff with five lines, but no clef, time signature, and key signature are shown. Instead, the places of *mi*, *so*, and *la* are marked on the staff. Figure 26 shows an example test item with the correct answer filled in. Children hear the tonal pattern c'' – a' and must fill in the notes marked as *so* and *mi*. The pilot version of the Tonal/Writing subtest contains 12 test items.

Figure 26

Tonal/Writing subtest – example of a test item

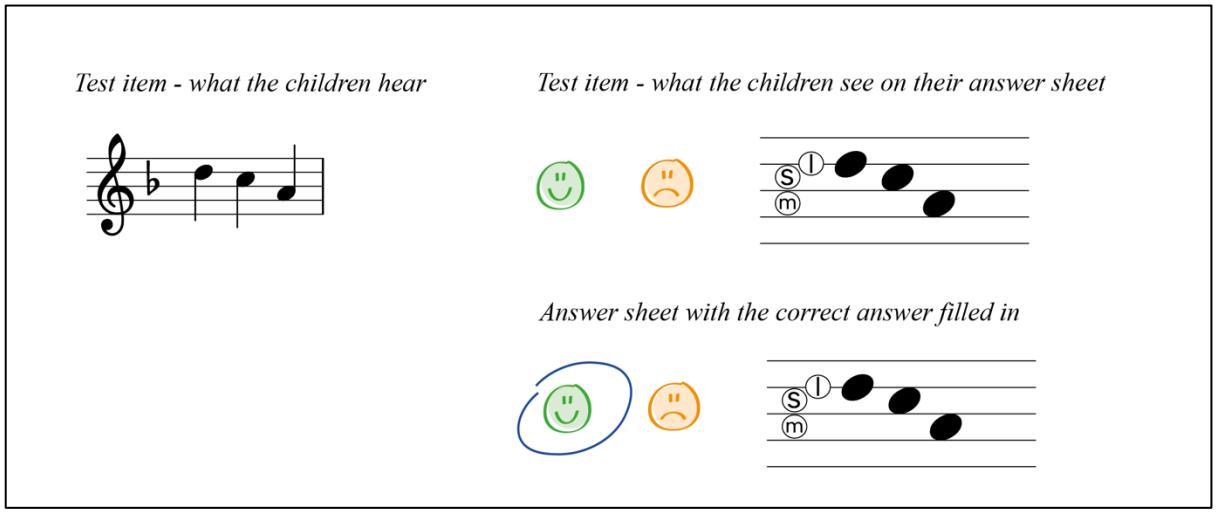


In the Tonal/Reading subtest, children listen to a recorded tonal pattern and indicate whether the notated pattern on their answer sheet is the same as the one they hear on the recording. If it is the same, they must draw a circle around the smiling face on their answer sheet. If it is different, they must draw a circle around the sad face.

Figure 27 shows a Tonal/Reading test item with the correct answer. Children hear the tonal pattern d'' – c'' – a' and see the pattern *la – so – mi* and must thus draw a circle around the happy face. The pilot version of the Tonal/Reading subtest contains 22 test items.

Figure 27

Tonal/Reading subtest – example of a test item

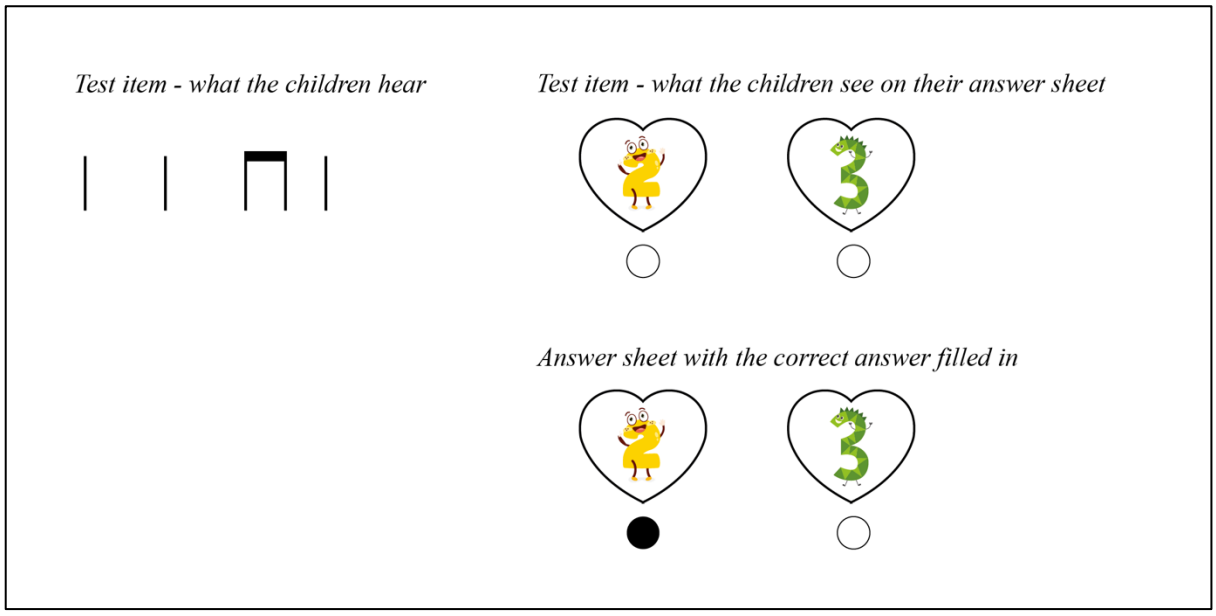


Rhythm subtests

In the Rhythm/Listening subtest, children listen to a recorded rhythm pattern and indicate whether they hear a simple duple meter or compound duple meter by filling in the appropriate circle on a paper answer sheet. Of course, we do not speak of simple duple or compound duple meters to the children, but we ask them to hear if the beats in de pattern can be divided into twos or threes. Figure 28 shows a test item with the correct answer filled in. Children hear the recorded rhythm pattern ♩ ♩ ♫ ♩ (not shown to the child) and should fill in the circle under the heart with the number two in it. The pilot version of the Rhythm/Listening subtest contains 22 test items.

Figure 28

Rhythm/Listening subtest – example of a test item

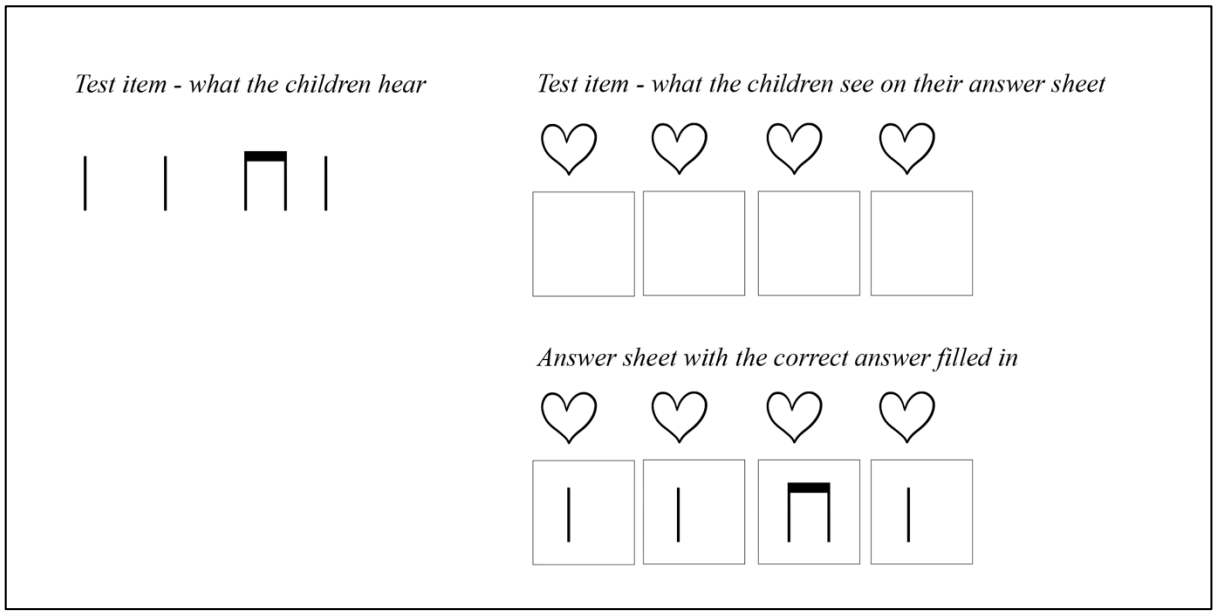


In the Rhythm/Writing subtest, children listen to a recorded four-beat rhythm pattern and must write the pattern in stick notation on their answer sheet. In this subtest, the children see four squares with hearts above them, each representing a beat. The children receive the instruction that they can hear one sound, two sounds, or no sound on each beat and can choose between  ,  , and  to write their answer. These options are also shown on their answer sheet.

Figure 29 shows a Rhythm/Writing test item with the correct answer filled in. The pilot version of the Rhythm/Writing subtest contains 12 test items.

Figure 29

Rhythm/Writing subtest – example of a test item

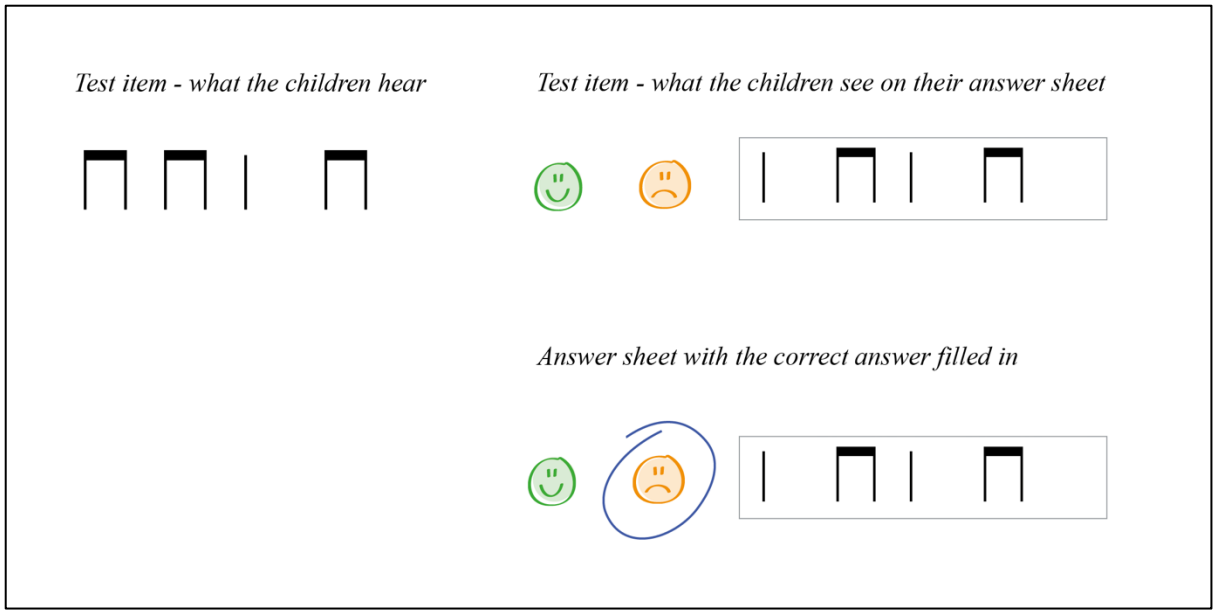


In the Rhythm/Reading subtest, children listen to a recorded rhythm pattern and indicate whether the notated pattern on their answer sheet is the same as the one they hear on the recording. If it is the same, they must draw a circle around the smiling face on their answer sheet. If it is different, they must draw a circle around the sad face.

Figure 30 shows a Rhythm/Reading test item with the correct answer. Children hear the rhythm pattern ⊓ ⊓ | ⊓ and see the pattern | ⊓ | ⊓ and must thus draw a circle around the sad face. The pilot version of the Rhythm/Reading subtest contains 22 test items.

Figure 30

Rhythm/Reading subtest – example of a test item



4.4 Discussion

Thus far, the pilot test items have been administered to 25 children to explore how children initially react to the items, test instructions, recorded sounds, and answer sheets.

Further pilot testing and analysis are necessary to explore inter-item difficulty and item discrimination. An exploratory factor analysis should be conducted to check the scales and items. Furthermore, it would be interesting to explore possible correlations between the newly devised Dutch test and IOWA Tests of Music Literacy.

The current test blueprint, and thus test items, are based on the objectives found in Kodály literature. It may be debatable if these objectives are applicable or desirable for all Dutch primary schools. For instance, there may be teachers that prefer to introduce *do* after *so – mi* instead of introducing *la,* as is suggested in this study. For these cases, an alternative test and corresponding posters are necessary that can be useful for their teaching situations. For higher grades, when *la, so, mi, re,* and *do* are known, these variations are no longer necessary.

4.5 Conclusion

In part 2 of this study, resources were explored that can be used to measure musical literacy in Dutch primary school children. The lack of a Dutch standardized test resulted in the development of a pilot test to measure initial musical literacy in Dutch children. Additionally, materials were developed to aid teachers with structuring their lessons around musical literacy development, and materials that help pupils understand the progression of the goals they are expected to reach. Future research should focus on creating objectives and measurement tools for grades 4 to 6. Furthermore, longitudinal research and development are needed to determine reliability, validity, and norm scores. Ideally, this should be done in collaboration with other Kodály music teachers and experts.

Final conclusion

This study explored the effects of Kodály music education on musical literacy in Dutch primary school children and examined how musical literacy can be measured.

The results show that Kodály music education has a significant positive effect on musical literacy. Implementing Kodály music education in Dutch primary schools will significantly improve musical literacy among Dutch children and should therefore be recommended. Future research is needed to further enhance insights into the effects of Kodály music education on musical literacy.

No overall effect of musical aptitude on musical literacy was found in this study. However, children with a high musical aptitude showed significantly greater development than children with a low musical aptitude. Measuring pupils' musical aptitude twice a year will provide teachers with additional information that can aid them in adjusting instructions to a pupil's educational needs and differentiating in the music classroom. Therefore, measuring the musical aptitude of children for this purpose should be encouraged.

As part of this study, materials were developed for teachers and pupils that can be used in Dutch teaching situations to help solve the lack of Dutch resources to measure musical literacy. For teachers, materials were developed to help them structure their lessons around musical literacy development and serve as a checklist for assessment. For pupils, visual materials were developed to help them understand the progression of the goals they aim to reach and to provide a visual focal point for learning and checking progress. Further research is needed to validate the devised pilot test and develop materials for higher grades.

Musical literacy is not yet structurally measured in Dutch primary schools. However, doing so would provide crucial information about the effectiveness of music instruction and pupils' growth over time. It would allow pupils to see their growth along a continuum of musical literacy goals and provide teachers with information that helps them look at what

needs further adjustment in their music instruction. Measurements over time through a musical literacy test allow teachers to gather more accurate and more useful information that helps them improve instruction adjusted to a pupil's musical literacy development. Combined with the implementation of Kodály music education, Dutch primary school children can become musically literate.

"Musical reading and writing, the path towards understanding music is available to everyone." – Zoltán Kodály

References

Andreasen, F. (2018). Gifted Young Musicians Poised for Advanced Training: Selection Measures. *International Journal for Talent Development and Creativity*, *6*(1).

Beekhoven, S., Vander Heyden, K., A, H., Hoogeveen, K., & Kruiter, J. (2018, January). *Onderzoek Impuls Muziekonderwijs*. Sardes.

Bluestine, E. (2000). *The Ways Children Learn Music* (2nd ed.). Chicago: GIA Publications.

Cambell, P. S., & Scott-Kassner, C. (1995). *Music in Childhood: From Preschool Through the Elementary Grades*. Schirmer.

Choksy, L. (1999). *The Kodaly Method I: Comprehensive Music Education* (3rd ed.). Prentice Hall.

Choksy, L., Abramson, R., Gillespie, A., Woods, D., & York, F. (2000). *Teaching Music in the Twenty-First Century* (2nd ed.). Pearson.

Dobszay, L. (2009). *After Kodály: Reflections on Music Education* (2nd ed.). Kecskemét: Zoltan Kodály Pedagogigal Institute of Music.

Feierabend, J. (1997). *Developing Music Literacy: An Aural Approach for an Aural Art.* Retrieved January 1, 2021, from http://www.giamusic.com/music_education/feier_developingmusicliteracy.cfm

Forrai, K. (1998). *Music in Preschool.* Queensland: Sound Thinking Australia.

Gordon, E. E. (1986). *Primary Measures of Music Audiation and the Intermediate Measures of Music Audiation*. G.I.A. Publications inc.

Gordon, E. E. (1991). *Iowa Tests of Music Literacy*. GIA Publications Inc.

Gordon, E. E. (2001). *Preparatory Audiation, Audiation, and Music Learning Theory: A Handbook of a Comprehensive Music Learning Sequence*. GIA Publications, Inc.

Gordon, E. E. (2012). *Learning Sequences in Music: A Contemporary Music Learning Theory 2012 Edition/G2345* (2012th ed.). G I A Pubns.

Hattie, J. A. C. (2009). Visible Learning: A Synthesis of Over 800 Meta-Analyses Relating to Achievement. Routledge.

Hoffman, R. (2009). *The Rhythm Book* (2nd ed.). Harpeth River Publishing.

Holmes, A. V. (2009). *Effect of fixed-do and movable-do solfege instruction on the development of sight-singing skills in 7- and 8-year-old children* (Dissertation). University of Florida.

Houlahan, M., & Tacka, P. (2008). *Kodály Today: A Cognitive Approach to Elementary Music Education*. Oxford University Press.

Hudgens, C. K. K. (1987, May). A study of the Kodaly approach to music teaching and an investigation of four approaches to the teaching of selected skills in first grade music classes (Dissertation). North Texas State University https://digital.library.unt.edu/ark:/67531/metadc331823/m2/1/high_res_d/1002715504-Hudgens.pdf

Hurley, G., Musselwhite, D., & Wesolowski, B. C. (2018). Examining the Effect of Aural Preparation on Second Grade Students. *Research & Issues in Music Education*, *14*(1).

Jaschke, A. C., Honing, H., & Scherder, E. J. A. (2018). Longitudinal Analysis of Music Education on Executive Functions in Primary School Children. *Frontiers in Neuroscience*, *12*.

Kemp, A. E., & Mills, J. (2002). Musical Potential. In R. Parncutt & G. E. McPherson (Eds.), *The Science and Psychology of Music Performance: Creative Strategies for Teaching and Learning* (pp. 3–16). Oxford University Press.

Kaiser, H. F., & Rice, J. (1974). Little jiffy, mark IV. *Educational and psychological measurement*, *34*(1), 111-117.

Kocsar, I. H. (2002). *Music Should Belong To Everyone, 120 Quotes from the Writings and Speeches of Zoltán Kodály*. British Kodaly Academy.

Kodály, Z. (1966). The responsibilities and opportunities of the musician-educator. In *Writings on Music Education* (2019). (pp. 201–207). Liszt Academy.

LKCA. (2019). *Matrix Muziekmethoden Primair Onderwijs*. https://www.lkca.nl/wp-content/uploads/2020/02/Matrix_MuziekMethoden.pdf

Marzano, R. J. (2017). *The New Art and Science of Teaching (More Than Fifty New Instructional Strategies for Academic Success) (The New Art and Science of Teaching Book Series)*. Solution Tree Press.

Marzano, R. J., & Brown, J. L. (2009). *A Handbook for the Art and Science of Teaching (Professional Development)* (1st ed.). Association for Supervision & Curriculum Development.

Mills, J., & McPherson, G. E. (2015). Musical literacy: Reading traditional clef notation. In G. E. McPherson (Ed.), *he Child as Musician: A handbook of musical development* (2nd ed., pp. 192–207). Oxford University Press.

Ministerie van Onderwijs, Cultuur en Wetenschap. (2018, March 14). *Uitvoering Regeerakkoord middelen (hoog)begaafdheid.* Rijksoverheid. Retrieved from: https://www.rijksoverheid.nl/binaries/rijksoverheid/documenten/kamerstukken/2018/03/14/kamerbrief-over-uitvoering-regeerakkoord-middelen-hoogbegaafdheid/kamerbrief-over-uitvoering-regeerakkoord-middelen-hoogbegaafdheid.pdf

Ministerie van Onderwijs, Cultuur en Wetenschap. (2020, August 31). Differentiatie. Primair Onderwijs | Inspectie van Het Onderwijs. Retrieved January 1, 2021, from https://www.onderwijsinspectie.nl/onderwijssectoren/primair-onderwijs/schoolverschillen/differentiatie

Ministerie van Onderwijs, Cultuur en Wetenschap. (2020 November 4). Evaluatie en verbeteraanpak passend onderwijs. Rijksoverheid. Retrieved from: https://www.rijksoverheid.nl/documenten/kamerstukken/2020/11/04/kamerbrief-evaluatie-en-verbeteraanpak-passend-onderwijs

Palmer, M. (1976). Relative effectiveness of two approaches to rhythm reading for fourth-grade students. *Journal of Research in Music Education*, *24*(3), 110–118.

Papp, Z., Spiegel, M. (2016). *Solfege in the Classroom*. Kodály Institute of the Liszt Ferenc Academy of Music.

Penning De Vries, B., & van Tuinen, S. (2019). *Effective Resources to Support Arts Education: Report on the survey within the framework of the CIDREE study into Effective Resources to Support Arts Education*. Enschede: SLO.

Salbert, D. (2015). *Collecting Repertoire for Kodály-inspired Music Lessons in Dutch Elementary Schools* (Thesis). https://www.researchcatalogue.net/view/154479/155691

SLO. (2019, October). *Leerlijn Muziek*. https://www.slo.nl/publish/pages/5102/leerlijn-muziek.pdf

SLO. (n.d.). TULE inhouden & activiteiten. Kunstzinnige oriëntatie. Kerndoel 54. TULE SLO. Retrieved January 1, 2021, from https://tule.slo.nl/KunstzinnigeOrientatie/F-L54b.html

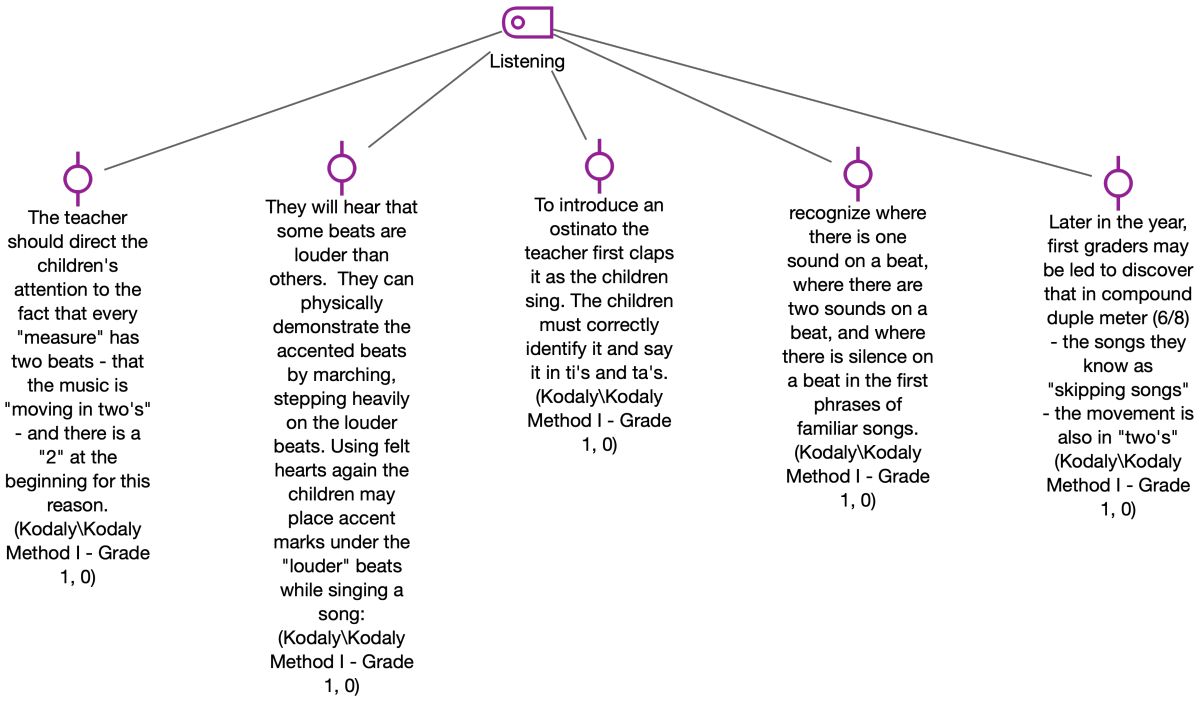
Szönyi, E. (2017). *Kodaly's Principles In Practice Approach To Music Education Through The Kodaly Method* (5th ed.). Editio Musica Budapest.

Vajda, C. (2008). *The Kodaly Way to Music - Book 1*. Boosey & Hawkes.

van den Broek, A., Temorshuizen, T., Lodewick, J., de Vries, H., & van Essen, M. (2019). *(Meer) muziekonderwijs als doel en middel Tussentijds onderzoek naar het stimuleringsprogramma muziekonderwijs Onderzoek in opdracht van het ministerie van OCW*. ResearchNed Nijmegen.

Wet PO 2021. (2021, 4 December). Retrieved from https://wetten.overheid.nl/jci1.3:c:BWBR0030280&hoofdstuk=I&titeldeel=II&afdeling=1&paragraaf=1&artikel=10&z=2021-10-01&g=2021-10-01

Appendix A – Examples of coded segments



Appendix B – Dutch Musical Literacy Test Answer Sheet

NEDERLANDSE TEST VOOR MUZIKALE GELETTERDHEID
LEVEL 1 - RITME

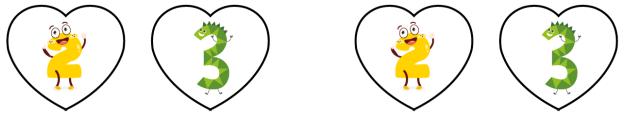
NAAM _____ **DATUM** _____

GROEP _____ **SCHOOL** _____

LEEFTIJD _____

RITME / LUISTEREN

OEFENOPGAVEN



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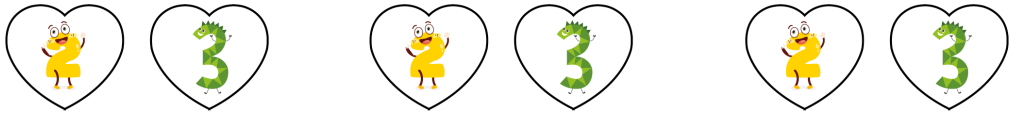

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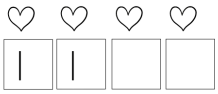
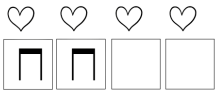
3	○	○	11	○	○	19	○	○
4	○	○	12	○	○	20	○	○
5	○	○	13	○	○	21	○	○
6	○	○	14	○	○	22	○	○
7	○	○	15	○	○			
8	○	○	16	○	○			

RITME / SCHRIJVEN

OEFENOPGAVEN

1 

2 

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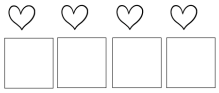
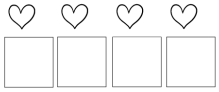
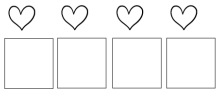
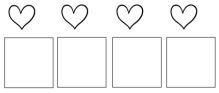
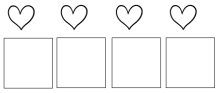
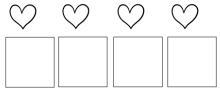
1 

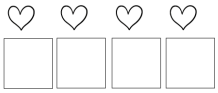
2 

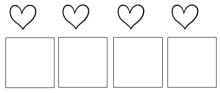
3 

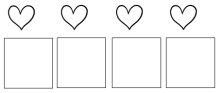
4 

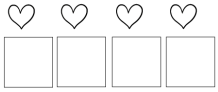
5 

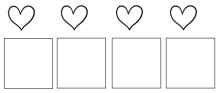
6 

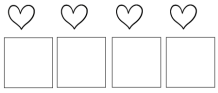
7 

8 

9 

10 

11 

12 

RITME / LEZEN

OEFENOPGAVEN

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NEDERLANDSE TEST VOOR MUZIKALE GELETTERDHEID
LEVEL 1 - MELODIE

NAAM _____ DATUM _____

GROEP _____ SCHOOL _____

LEEFTIJD _____

MELODIE / LUISTEREN

OEFENOPGAVEN




1 ○ ○ 2 ○ ○

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2	○	○	10	○	○	18	○	○
3	○	○	11	○	○	19	○	○
4	○	○	12	○	○	20	○	○
5	○	○	13	○	○	21	○	○
6	○	○	14	○	○	22	○	○
7	○	○	15	○	○			
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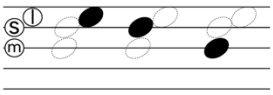
MELODIE / SCHRIJVEN

OEFENOPGAVEN



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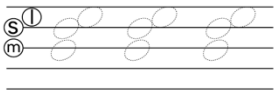

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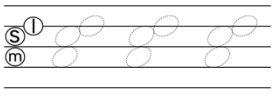

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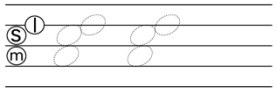

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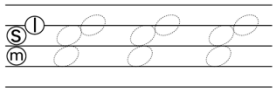

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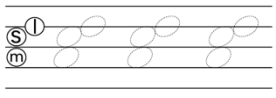

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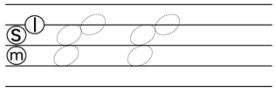

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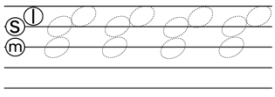

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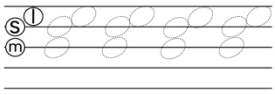

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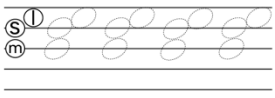

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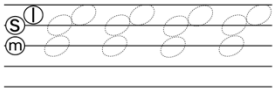

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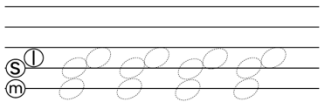

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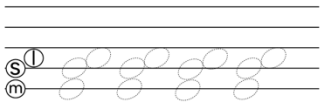

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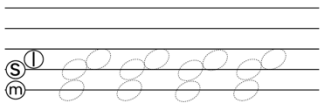

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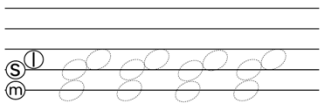

MELODIE / LEZEN

OEFENOPGAVEN

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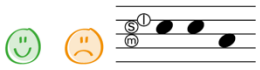

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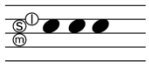

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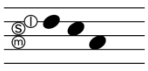

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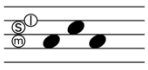

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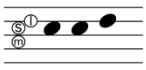

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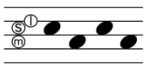

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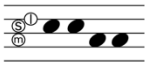

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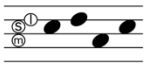

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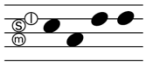

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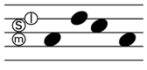

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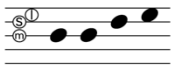

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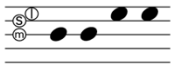

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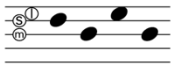

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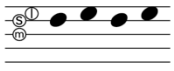

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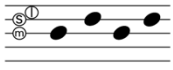

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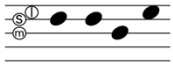

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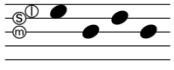

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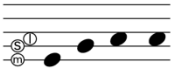

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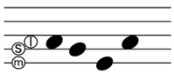

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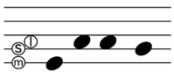

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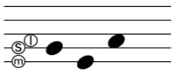

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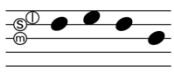

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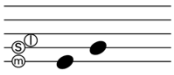

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