

Finnish Music Teachers' Perceptions of Rhythmics in Music Education

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Abstract

The purpose of this study was to analyze music teachers' perceptions of rhythmics and how they use it in music education. They were asked to discuss how they perceive the value of rhythmics and its challenges. Research participants consisted of ten Finnish music teachers who participated in continuing education about rhythmics. They were interviewed and the data were analyzed with the qualitative content analyzing method. The research results showed that teachers found rhythmics a new and challenging area of music education. They had insufficient knowledge of the pedagogical foundation and concepts of rhythmics, even though they had adopted some rhythmics methods in their teaching. According to the findings, teachers were (1) appreciative and enthusiastic, (2) doubtful, or (3) positive but uncertain about using rhythmics. The biggest challenge was the lack of continuing education that would help them learn and employ the contents and methods of rhythmics better in their teaching. Other challenges included difficulties in realizing teaching due to tight teaching premises, students' heterogeneity, scarce time allocation for music teaching, and lack of usable teaching materials. The study contributes ideas and means to develop music education with rhythmics in Finland.

Index terms— dalcroze rhythmics, orff pedagogy, rhythmics, rhythm education, music education.

1 Introduction

Music education with rhythmics includes familiar elements of training, playing, singing, rhyming, and body movements (Desain & Honing, 1999; Longuet-Higgins & Lee, 1982), but the way they are taught and trained is new and different in the Finnish music education (Anttila, 2004; Mäkinen, 2012). This notion was made by the author of this article, Laura Helistekangas, when she wrote her researcher's diary while participating music teachers' continuing education. This training period led to the decision to do this research: the purpose was to find out what rhythmics can offer to music education and learning according to experienced music teachers' perceptions.

Rhythmics renews music education by adding body movement in music learning. According to Marcus (2012), rhythmics can help create a joyful atmosphere in the music class and an enthusiastic attitude to learning.

Even those students who think they are not skilled in music obtain experiences of success. Rhythmics can prove true the saying "everyone is a musician" (Marcus, 2012).

Traditionally, the emphasis of music education has been on the distribution of musical skills and knowledge (Deutsch, 2009). The current music education is, indeed, changing from the instrument-focused teaching toward holistic student development music-wise (Anttila, 2004; Regelski, 2005). It means that music education pursues developing a student as a holistic human being with all his or her previous knowledge, skills, and experiences in his or her own life situation and social environment including all values and objectives (Cooper, 2009; Elliott, 1995).

Old music educational theories and practices need new approaches and applications that would maintain the position of music education in schools. Rhythmics as an independent school subject and a pedagogical approach is still relatively new in the field of music education. Yet, it has become more familiar after the emergence of new learning materials and continuing education. Scientific research on rhythmics is still relatively scarce (Fraisse, 1982; Jorgensen, 2003).

2 II.

3 Theoretical Background

Rhythm is the backbone of music. Music flows in time and rhythm is the element that organizes time; sounds are constructed and become live through the rhythm (Ahonen, 2004; Bowman, 2002). The ability to recognize and combine basic and special rhythms is the prerequisite of interpreting reading, and writing live rhythms (Meyer & Cooper, 1960).

Rhythmics is a multidimensional concept that describes a human being's musical action and expression through body, movements, and sounds. Rhythmics is located between movement, singing, and playing, and wherever needed, it can strengthen a part in teaching. The basic idea in rhythmics teaching is rhythm and how it is experienced with one's own body (Gouyon & Dixon, 2005; Stubley, 1998).

Rhythmics exercises prepare students musical skills and develop the so-called communal sense of rhythmics that is the foundation of all playing, moving, and perception. The sense of rhythm covers the ability to time the length and timeliness of movement and the ability to perceive the changes in the speed of movement. The sense of rhythm includes the perception of the actual rhythm and the ability to maintain the rhythm. This is especially important when playing together with others (Phillips-Silver, Aktipis, & Bryant, 2010).

The basic elements of rhythmics exercises are musical PE and dancing, body rhythms, songs, rhymes, and playing with small rhythmic instruments. Rhythmics supports the development of basic sense of rhythm, for example, by training beat, word and melody rhythms, tempo, ostinations or similar rhythms or melody themes, and combinations of rhythms. A holistic approach is central in rhythmics; all senses are used for the versatile rhythmic perception. In rhythmics, the body experiences the connection between music and movement-rhythm. Rhythmics provides every human being with an opportunity to make music, experience music comprehensively, and experiences of success. The objective is to support a child's holistic development and his or her self-expression skills and self-esteem (Swanwick, 2002; Thackray, 1969).

Teaching proceeds from smaller entities toward larger ones mainly through imitating, experimenting, and discovery. The main emphasis in rhythmics classes is to combine movement and music. It is based on the idea that music belongs to everyone and each student participates in the musical event with his or her own abilities. This is how the student's own active role and interaction with others become fulfilled (Chen, Penhune, & Zatorre, 2008; Haines, 2003).

In rhythmics, music and exercise support each other (Styns, van Noorden, Moelants, & Leman, 2007). Their combination is natural because music and exercising have many elements in common, such as beat, rhythm, tempo, harmony, and the variation between intensity and tempo. Music when combined with movement makes people function holistically, in other words, physically, mentally, and emotionally. Movement, rhythm, and music are channels that people as moving instruments can use as instruments to bring out their creativity (Dumas, Laroche, & Lehmann, 2014; Juntunen 2004; Thomas & Moon, 1976).

Music pedagogue and composer Émile Jaques-Dalcroze (1865-1950) is considered as the pioneer of rhythmics, in the beginning of the 20th century. His footsteps were followed by German music pedagogue and composer Carl Orff (1895 - 1982). They noticed how children were interested in the holistic expression and used this notion in the methods they created (Johnson, 1993; Mead, 1986; Zachopoulou, Derri, Chatzopoulos, & Ellinoudis, 2013).

Dalcroze pedagogy is a music education approach that is based on Jaques-Dalcroze's educational ideas of combining music and body movement in music teaching. The teaching process covers three contents: rhythmics, melody, and improvising (Juntunen, 2004).

Orff pedagogy is also comprehensive, studentcentered music education (Frazee & Kreuter, 1987; Goodkin, 2001; Orff & Walter, 1963; Wheeler, Raebeck, Orff, & Kodály, 1977). It is based on an interactional teaching process that includes the elements of listening, movement, speech, singing, and playing. In the Orff teaching process, students move from experimenting to improvising and expressions, and combine music with other artistic school subjects (Bachmann & Dobbs, 1993; Goodkin, 2002; Shehan Campbell, 1991). In Finland, the phenomenon of rhythmics occurs as the theme in text-books and continuing training. This study focused on the question of how rhythmics appears and is experienced in music education at basic school. The purpose is to describe how music teachers evaluate the value of rhythmics, how they use it and what kinds of challenges they have faced in rhythmics teaching. The research questions set for this study are as follows:

? How to music teachers perceive the value of rhythmics in music education?

? How do music teachers use rhythmics in music education?

? What are the challenges of using rhythmics in music education according to music teachers' perceptions?

To answer these questions, a qualitative study approach was chosen (Silverman, 2006). The research participants were carefully chosen: music teachers who had completed a 5-day continuing education period

in rhythmic teaching at the Open University of Lapland. Ten teachers (aged 33-47 years, men and women) were recruited in the study. They all had graduated from class teacher education and five of them were also qualified subject teachers. They worked as teachers in grades 1 to 9 and had been teaching music through their whole teacher's careers (19-22 years).

The data were collected through qualitative theme interview method (Rubin & Rubin, 1995). The interview questions followed the research questions and comprised the following themes: perceptions of rhythm and rhythmic, continuing training in rhythmic, rhythmic in music education, the value of rhythmic, and hopes, needs, and developmental ideas regarding rhythmic teaching.

The data analysis method was qualitative content analysis (Mayring, 2000). The analysis started by transcribing the interviews followed by reduction. The data were divided within the themes of analysis by finding suitable data excerpts to each category. These excerpts were further analyzed in the light of the research questions.

In the second phase of the analysis, the data excerpts were grouped based on their similarities and differences. These sets of data were analyzed one by one in order to find those themes that repeatedly emerged in the data and that were common to many interviewees. Then, the data were grouped into themes that represented the essential contents for each research question.

The final phase of analysis was abstracting, aiming at creating a clear picture of the data and form reliable and comprehensive results, conclusions, and discussion. Main and sub themes were used for describing teachers' perceptions of rhythmic and rhythmic teaching in music education.

IV.

4 Results

5 a) The Value and Implementation of Rhythmic

When analyzing teachers' appreciation of rhythmic, it seemed evident that their values reflected on their ways of implementing rhythmic in their practical teaching. The teachers could be divided into three groups based on their appreciation of rhythmic: appreciative and enthusiastic attitude (N=4), doubtful attitude (N=2), and positive but uncertain attitude (N=4).

The first group (appreciative and enthusiastic) saw a clear need for rhythmic in education. These teachers surfaced how rhythmic can help perceiving and expressing a rhythm, and how movement is an essential element in rhythmic teaching: And I think it is a good thing that we have started to put emphasis on it, because at least I have understood and noticed along these years that finding the basic beat can already be pretty difficult. –I do not know whether this need has been met by making literature and training to help teachers to find the rhythm. I mean what it is and what you could do or how to develop the discovery or sense of rhythmic. That is one important point. We should remember that, in my opinion, all pretty much starts from rhythm in music. (2) Appreciative and enthusiastic teachers considered group playing important and pointed out that rhythmic allows everyone to participate in training without waiting their turn. In teaching situations, these teachers had noticed the positive influence of rhythmic as even those students who had not perceived themselves skillful in music had participated in rhythmic training instead of just standing by. Teachers emphasized that rhythmic increased students' motivation in music learning, developed their courage and social skills as well as their sense of togetherness: But when you do these exercises together, it includes this social aspect, you know, the social way of doing together. (2) Appreciative and enthusiastic teachers considered rhythmic as an important part of their teaching and wanted to employ it even more. They used rhythmic in almost all of their music lessons, and they used more varied methods and areas of rhythmic in their teaching than other teachers did. These teachers considered it rewarding as they made students to realize and learn how to use their body for producing rhythm.

Teachers who were doubtful about rhythmic did not appreciate rhythmic as a whole but used it to some extent in their teaching. Rhythmic was considered a pretentious and complicated teaching method, nor did they perceive it essential for children's Finnish Music Teachers' Perceptions of Rhythmic in Music Education musical development. These teachers described rhythmic merely as trickery and warming up, not real music making. According to the doubtful teachers, rhythmic exercises would be more suitable to PE classes than music education.

The teachers who had a positive, yet uncertain attitude to rhythmic understood that rhythmic would have benefits in music teaching but found it difficult to bring it in practice. They thought that they did not have sufficient skills for rhythmic teaching and described their teaching limited. Physical exercises were seen troublesome and, therefore, movement as the elements of rhythmic had smaller role than playing and singing in their teaching. The positive attitude was manifested by the teachers' understanding about how rhythmic helps students perceive rhythm and play instruments. In addition, they appreciated the possibility of having all student participate, listening to others, and doing together. According to the teachers, rhythmic exercises made teaching more versatile, pleased students, and prepared them to learn even surprisingly difficult contents of education.

6 b) The Challenges of Using Rhythmics in Teaching

The teachers brought out problems and challenges of rhythmics teaching. These could be divided into three main categories that were the need for continuing education, poor usability of teaching material, and difficulties in realizing teaching.

First of all, the teachers emphasized that they had an on-going need for continuing education. Only training would provide them with sufficient skills to use the new learning contents and teaching methods of rhythmics as a part of their teaching:

It is a fact, like I said, that in my opinion, we need really a lot of continuing education. These are themes that they are difficult to learn from some books or find elsewhere alongside work; instead you should learn by doing. The training should include doing not reading. (6) Continuing education should be not only long term but repeating as well. A five-day-long continuing education period that the teachers had completed earlier, had not been long enough to comprehensively internalize the idea of rhythmics according to most of the teachers. For example, the concepts of rhythmics

7 In my opinion, this conceptual jungle is horrible. (2)

Teachers had also found it challenging to employ learning and teaching materials of rhythmics in practice as well as to acquire necessary equipment and resources: Well, the first thing is always that you would have the resources, that you would have the equipment. And, of course, some old [equipment] always breaks down and you need new ones to replace it and so on. (1) Rhythmics exercises in text-books and especially using body rhythmics and movements in teaching require plenty of studying and training beforehand from teachers. Text-books usually include small, separate areas of rhythmics from which it is difficult to build teachable entities.

When you look at it, you become overwhelmed; oh dear how laborious this is, how can start constructing it. So, maybe you leave it. There is usable material but it requires a lot from yourself. (6) At least, my experience is that when I choose these [exercises] I really have to read it carefully and familiarize with it well, and try it by myself several time to get the feeling that this is how it goes. (8) The implementation of teaching was challenged by uncomfortable teaching premises, too large and heterogeneous student groups, and lack of time allocated for teaching. The teachers reminded that music is a school subject in which students vary greatly by their skills and preparedness, and in a large group, the teacher has only limited opportunity to provide individual support for students:

The biggest challenge is probably the size of the group. (7) And when you have these challenging students and really skillful students, you think of how to offer something new to these skillful ones and how to get these weaker students learn so that they would find it even a little bit easier. And on the other hand, those ones who are the ordinary students, you should have time to pay attention to them too. (5) Teachers who had a positive attitude to rhythmics wished that the Finnish music education would have one hour more teaching per week because, according to their perception, the current time allocation for music education was too limited for including wider use of rhythmics in teaching.

V.

8 Conclusions

The future of rhythmics depends of teachers' current perceptions, practical teaching, and challenges they face. The study showed how teachers experienced rhythmics as a new and challenging area of music education in many ways. However, eight of ten teachers who participated in this study had positive attitudes to it. They wanted to develop their expertise and teaching methods, and they showed interest in rhythmics.

Lack of suitable continuing education was perceived a great challenge hindering the implementation of rhythmics teaching. Teachers considered rhythmics a wide and complicated teaching content that they had find laborious to adopt. Even if the number of teaching materials is increasing, the teachers had found it difficult to take rhythmics as a part of their practical teaching as they did not have sufficient practical experience of it. This can be acquired only by participating in continuing training (Hargreaves, Purves, Welsch, & Marshall, 2007). On the other hand, one can ask whether Finnish teachers lack courage to indulge in rhythmics and bodily expression (see Seppä, 2012; cf., Weikart, Schweinhart, & Lerner, 1987)?

The study showed that the development and enrichment of music education with rhythmics necessitates the development of continuing education. Teacher education and continuing education should be combined in a way that they form a harmonious entity and a channel to develop teachers' expertise and their familiarity with new teaching methods and contents (Haack & Smith, 2000). Teachers called for more education in their region. This would cut the costs of and make it easier to participate in continuing education.

9 VI.

10 Discussion

When evaluating the reliability of the study, one can ask whether the teachers' perceptions of rhythmics were somehow biased (e.g., Creswell, 2009). They had participated in the continuing training, which meant that they had been willing to learn about the method and supposedly had a more positive attitude toward it than

teachers who have not taken such training. On the other hand, for the purposes of this study, it was important to find research participants who had hands-on experiences of using rhythemics in music education. Therefore, the recruitment of these participants who had been music teachers for years and who had completed relevant continuing education would have the necessary understanding of the theme under investigation. Their interviews would likely produce multidimensional information and perceptions of rhythemics, which appeared to be true when analyzing the rich data obtained with the interviews. The data were profound and rich and provided widely information about the positive and negative experiences as well as challenges faced by the teachers.

Rhythemics provides new ways of realizing teaching in the field of music education which would benefit the Finnish music education. It presents quite a comprehensive approach to teaching. In addition, it offers opportunities of varied music making allowing students with different abilities to participate and contribute (see also Westerlund, 2010). Actually, rhythemics teaches more than music (Frith, 2008), and it influences development and growth in a multi-sensory manner. Rhythemics develops students' body sensation, motor coordination, balance, motivation, memory, listening, and concentration, as well as creativity and improvising skills (Patel, 2006). Due to the aforementioned, rhythemics can be seen a valuable approach especially in early childhood education and elementary education when children's linguistic and motor skills, and perception skills are still developing (Smoll, 1974; Zachopoulou, Tsapakidou, & Derri, 2004).

Rhythemics provides new approaches to perceived teacherhood, too. Teachers do not have to be professional musicians and play all instruments perfectly in order to be music teachers (Small, 2011). Using rhythemics in teaching suggests that teachers dare to use their personality and imagination in teaching. Namely, rhythemics requires most of all the ability to indulge in the process of musical development, to free one's creativity, and support the development of students' creativity (Shehan Campbell, 1991; Sims, 1985). Teachers can use rhythemics to challenge students to work together, participate, and interact.

The current and future challenge of rhythemics teaching and learning materials is to employ information and communication technologies in teaching. Rhythemics provides a means to nourish musical inventions, composition, and other creative production. Rhythemics education could be realized with the modern teaching technologies, such as tablets and music software (Grahn & Brett, 2007).

The purpose of music education is to strengthen students' positive relationship with music and lay foundation to life-long music hobbies (The National Core Curriculum for Basic Education, 2014). According to Dutica (2014), rhythemics approached have been acknowledged as one of the most attractive and efficient method of musical education. In addition to this, a central goal of rhythemics is to maintain every human being's creative musicality from early childhood to older age. Rhythemics in music education provides one way of supporting the comprehensive development, but-as the findings of this study imply-more practiceoriented research and development of teaching methods is still needed. ¹



Figure 1: Finnish

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- [Swanwick ()] *A basis for music education*, K Swanwick . 2002. New York, NY: Routledge.
- [Gouyon and Dixon ()] ‘A review of automatic rhythm description systems’. F Gouyon , S Dixon . 10.1162/comj.-2005.29.1.34. *Computer Music Journal* 2005. 29 (1) p. .
- [Zachopoulou et al. ()] ‘Application of Orff and Dalcroze activities in preschool children: Do they affect the level of rhythmic ability?’. E Zachopoulou , V Derri , D Chatzopoulos , T Ellinoudis . *Physical Educator* 2003. 60 (2) p. .
- [Stubley ()] ‘Being in the body; being in the sound: a tale of modulating identities’. E Stubley . doi: 10.2307/-3333388. *Journal of Aesthetic Education* 1998. 32 (4) p. .
- [Bowman ()] ‘Cognition and the body: Perspectives from music education’. W Bowman . *Knowing bodies, moving minds*, L Bresler (ed.) (Dordrecht; Netherlands) 2002. Springer. p. .
- [Desain and Honing ()] ‘Computational models of beat induction: The rule-based approach’. P Desain , H Honing . 10.1076/jnmr.28.1.29.3123. *Journal of new music research* 1999. 28 (1) p. .
- [Johnson ()] ‘Dalcroze skills for all teachers’. M D Johnson . *Music Educators Journal* 1993. 79 (8) p. .
- [Bachmann and Dobbs ()] *Dalcroze today: An education through and into music*, M L Bachmann , J P Dobbs . 1993. Oxford: Oxford University Press.
- [Hargreaves et al. ()] ‘Developing identities and attitudes in musicians and classroom music teachers’. D J Hargreaves , R M Purves , G F Welsch , N A Marshall . 10.1348/000709906X154676. *British Journal of Educational Psychology* 2007. 77 (3) p. .
- [Smoll ()] ‘Development of spatial and temporal elements of rhythmic ability’. F L Smoll . doi: 10.80/00222895.-1974.10734979. *Journal of Motor Behavior* 1974. 6 (1) p. .
- [Frazee and Kreuter ()] *Discovering Orff: A curriculum for music teachers*, J Frazee , K Kreuter . 1987. New York, NY: Schott & Company.
- [Silverman ()] *Doing qualitative research: A practical handbook*, D Silverman . 2006. Thousand Oaks, CA: Sage.
- [Juntunen ()] *Embodiment in Dalcroze eurhythmics*, M.-L Juntunen . 2004. Oulu. University of Oulu
- [Helsinki: The Finnish National Board of Education ()] *Helsinki: The Finnish National Board of Education*, 2014. (The National Core Curriculum for Basic Education)
- [Ahonen ()] *Johdatus musiikin oppimiseen*, K Ahonen . 2004. Helsinki: Finn Lectura. (Introduction to music learning)
- [Thomas and Moon ()] *Measuring motor rhythmic ability in children. Research Quarterly. American Alliance for Health, Physical Education and Recreation*, J R Thomas , D H Moon . 10.1080/1067135.1976.10615336. 1976. 47 p. .
- [Dutica ()] *Melody, rhythm, color. A genuine vision upon Orff method*, L Dutica . 2014. p. .
- [Haack and Smith ()] ‘Mentoring new music teachers’. P Haack , M V Smith . *Music Educators Journal* 2000. 87 (3) p. .
- [Mead ()] ‘More than mere movement: Dalcroze eurhythmics’. V H Mead . *Music Educators Journal* 1986. 72 (6) p. .
- [Weikart et al. ()] ‘Movement curriculum improves children’s rhythmic competence’. P S Weikart , L J Schweinhart , M Lerner . *High Scope ReSource* 1987. 6 (1) p. .
- [Chen et al. ()] ‘Moving on time: Brain network for auditory synchronization is modulated by rhythmic complexity and musical training’. J L Chen , V B Penhune , R J Zatorre . 10.1162/jocn.2008.20018. *Journal of Cognitive Neuroscience* 2008. 20 (2) p. .
- [Regelski ()] ‘Music and music education. Theory and praxis for ‘making difference’’. T A Regelski . 10.1111/j.1469-5812.2005.00095.x. *Educational Philosophy and Theory* 2005. 37 (1) p. .
- [Small ()] *Music king: The meanings of performing and listening*, C Small . 2011. Middletown CT: Wesleyan University Press.
- [Elliott ()] *Music matters: a new philosophy of music education*, D Elliott . 1995. New York, NY: Oxford University Press.
- [Cooper ()] ‘Music, education, and the emotions’. D E Cooper . 10.1111/j.1540-6253.2009.01547.x. *Journal of Chinese Philosophy* 2009. 36 (4) p. .
- [Patel ()] ‘Musical rhythm, linguistic rhythm, and human evolution’. A D Patel . 10.1525/mp.2006.24.1.99. *Music Perception* 2006. 23 p. .
- [Marcus ()] ‘Musicality: Instinct or acquired skill?’. G F Marcus . 10.1111/j.1756-87650.2012.01220.x. *Topics in Cognitive Science* 2012. 4 (4) p. .
- [Anttila ()] *Musiikinopettajan tehtävät [The tasks of a music teacher]*, M Anttila . 2004.

- [Mäkinen ()] *Musiikki päiväkodissa*, J Mäkinen . 2012. Vaasa. Vaasa University of Applied Sciences (Music in day care centers)
- [Westerlund ()] *Nuottilukihäiriökö ongelma? Oppimishäiriön kohtaaminen soittotunnilla [is dyslexia with music notation a problem? Encountering a learning disability at a music lesson]*, E Westerlund . 2010. Turku. Turku University of Applied Sciences
- [Wheeler et al. (ed.) ()] *Orff and Kodaly adapted for the elementary school*, L Wheeler , L Raebeck , C Orff , Z Kodály . Wm. C. Brown Company (ed.) 1977. Dubuque, IA.
- [Goodkin ()] ‘Orff-Schulwerk in the New Millennium’. D Goodkin . *Music Educators Journal* 2001. 88 (3) p. .
- [Atjonen Väisänen (ed.)] *Osaava opettaja: keskustelua 2000-luvun opettajankoulutuksen ydinaineksesta*, P Atjonen, & P Väisänen (ed.) (Joensuu) p. . University of Joensuu (A skillful teacher: discussion about the core contents of the 21 st century teacher training)
- [Goodkin ()] *Play, sing & dance. An introduction to Orff-Schulwerk*, D Goodkin . 2002. New York, NY: Schott.
- [Mayring ()] ‘Qualitative content analysis’. P Mayring . <http://www.qualitative-research.net/index.php/fqs/article/view/1089/2385> *Forum: Qualitative Social Research* 2000. 1 (2) .
- [Rubin and Rubin ()] *Qualitative interviewing. The art of hearing data*, H J Rubin , I S Rubin . 1995. Thousand Oaks, CA: Sage.
- [Creswell ()] *Research design. Qualitative, quantitative, and mixed methods approaches*, J W Creswell . 2009. Thousand Oaks, CA: Sage.
- [Fraisie ()] ‘Rhythm ad tempo’. P Fraisse . *The psychology of music*, D Deutsch (ed.) (London) 1982. Acedemic Press. p. .
- [Grahn and Brett ()] ‘Rhythm and beat perception in motor areas of the brain’. J Grahn , M Brett . 10.1162/jocn.2007.19.5.893. *Journal of Cognitive Neuroscience* 2007. 19 (5) p. .
- [Thackray ()] ‘Rhythmic abilities and their measurement’. R Thackray . *Journal of Research in Music Education* 1969. 17 (1) p. .
- [Campbell ()] ‘Rhythmic Movement and public school music education: Conservative and progressive views of the formative years’. Shehan Campbell , P . *Journal of Research in Music Education* 1991. 39 (1) p. .
- [Seppä ()] *Rytmiikka soitonopetuksen rikastuttajana. Kokemus, elämys, ilo [Learning with joy -including rhythmic elements in instrumental music tuition]*, H Seppä . 2012. Helsinki. Metropolia University of Applied Sciences
- [Haines ()] ‘Sequencing, co-ordination and rhythm ability in young children’. C Haines . 10.1046/j-1365-2214.2003.00358.x. *Child: Care, Health and Development* 2003. 29 (5) p. .
- [Phillips-Silver et al. ()] ‘The ecology of entrainment: foundations of coordinated rhythmic movement’. J Phillips-Silver , C A Aktipis , G A Bryant . 10.1525/mp.2010.28.1.3. *Music Perception* 2010. 28 (1) p. 3.
- [Zachopoulou et al. ()] ‘The effects of a developmentally appropriate music and movement program on motor performance’. E Zachopoulou , A Tsapakidou , V Derri . 10.1016/j.ecresq.2004.10.005. *Early Childhood Research Quarterly* 2004. 19 (4) p. .
- [Longuet-Higgins and Lee ()] ‘The perception of musical rhythms’. H C Longuet-Higgins , C S Lee . *Perception* 1982. 11 (2) p. .
- [Meyer and Cooper ()] *The rhythmic structure of music*, L Meyer , G Cooper . 1960. Chicago, IL: University of Chicago Press.
- [Orff and Walter ()] ‘The Schulwerk: Its origin and aims’. C Orff , A Walter . *Music Educators Journal* 1963. p. .
- [Jorgensen ()] *Transforming music education*, E R Jorgensen . 2003. Bloomington, IN: Indiana University Press.
- [Styns et al. ()] ‘Walking on music’. F Styns , L Van Noorden , D Moelants , M Leman . 10.1016/j.humov.-2007.07.007. *Human Movement Science* 2007. 26 p. .
- [Deutsch ()] ‘Where was technology and music education twenty years ago’. H A Deutsch . 10.1111/j.1533-1598.2009.01171.x. *Journal of Popular Music Studies* 2009. 21 (1) p. .
- [Frith ()] ‘Why music matters’. S Frith . 10.1111/j.1467-8705.2008.00811.x. *Critical Quarterly* 2008. 50 (1-2) p. .
- [Sims ()] ‘Young children’s creative movement to music: Categories of movement, rhythmic characteristics, and reactions to changes’. W L Sims . *Contributions to Music Education* 1985. 12 p. .
- [Dumas et al. ()] ‘Your body, my body, our coupling moves our bodies’. G Dumas , J Laroche , A Lehmann . 10.3389/hnhum.2014.01004. *Frontiers in Human Neuroscience* 2014. (online)