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Advances in music-reading research

Helga Rut Gudmundsdottir*

School of Education, University of Iceland, Stakkahlid, IS-105Reykjavik, Iceland

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The purpose of this paper is to construct a comprehensive review of the research literature in the reading of western staff notation. Studies in music perception, music cognition, music education and music neurology are cited. The aim is to establish current knowledge in music-reading acquisition and what is needed for further progress in this field of research. It is argued that the reading of staff notation is an important albeit neglected field in music education research. It is pointed out that research on music-reading skill in adult experts is more advanced than research on music-reading acquisition in childhood. In contrast, music-reading acquisition most often occurs during the childhood years. The paper highlights what music-reading instruction can learn from research and where future research may provide further advancements.

Keywords: music reading; music literacy; staff notation acquisition

Introduction

Experienced music teachers know that there can be many obstacles on the road to music-reading fluency. As a matter of fact, fluent music literacy is a rarely acquired ability in our western culture (Green 2002). It has been suggested that methods for teaching music-reading skills are flawed and 'that many children are failed by the ways in which they are taught to read music' (Mills and McPherson 2006). Methods in music-reading instruction are mostly based on conventions and when students fail to develop acceptable fluency in music reading, teachers have little more than intuition to base their strategies on.

The purpose of this literature review is to highlight research results that may help improve music-reading instruction. Surprisingly little conscious effort has been made to improve music-reading instruction through comprehensive study of the tenets of music reading. However, research on music reading from various perspectives in the past decades provides some important outlines of the nature of music-reading skills that have important implications for instruction.

In this paper the term 'music reading' is used for the act of decoding the symbols of staff notation using a musical instrument. This is sometimes called 'sight-reading' in the literature (see e.g. Wolf 1976). Some researchers use the terms interchangeably (see e.g. Sloboda 1978) while others make clear distinctions between the two terms (see e.g. Elliott 1982). The term 'music reading' is appropriate here because the definition of 'sight-reading' tends to be narrower, including only readings at first

*Email: helgarut@hi.is

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sight as is common in graded examinations in music schools while 'music reading' is a more comprehensive term.

Singing music from notation is usually called sight-singing. The development of sight-singing abilities may seem similar to music-reading abilities, since both require some of the same sets of skills such as pitch and rhythm reading. However, in contrast to most instrumental music reading, sight-singing relies upon preformed internal auditory representation of pitches or pitch relations (Fine, Berry, and Rosner 2006). Successful music reading on an instrument does not necessarily require internal representations of pitch as sight-singing does and fluency in one is neither necessary nor sufficient for fluency in the other. Excellent literature reviews on sight-singing exist (Demorest 1998; Fine, Berry, and Rosner 2006; Henry 2004; Killian and Henry 2005) but further comparative literature study on this issue will not be pursued here.

What is music reading?

Music reading is a complex process involving at least two distinct skills: the reading skill and the mechanical skill (Wolf 1976). From a cognitive perspective, music reading requires several simultaneous processes including coding of visual information, motor responses and visual-motor integration (Gudmundsdottir 2007). Studies find that music-reading achievement at a high level is determined by the speed of information processing and psychomotor speed (Kopiez et al. 2006). This means that the decoding ability and the motor response are important in music reading but the integration of these abilities may be the key to a successful execution.

The reading of the staff notation or the decoding of musical symbols is a multiple task in itself. According to Sloboda, music reading is a construct of processes in music perception (Sloboda 1976, 1978, 1984). Studies on perception indicate that pitch information and timing information are processed separately (Palmer and Krumhansl 1987). Therefore, it seems logical that pitch and timing information is coded separately in western staff notation. In the context of music reading, studies have confirmed that pitch and timing are perceived separately (Schön and Besson 2002; Waters and Underwood 1999). Further evidence of the separate processing of pitch and timing is found in studies on musicians with brain injuries. In one study the researchers describe a professional musician who after suffering brain damage was able to read only pitches but not the rhythm in musical notation (Fasanaro, Spitaleri, and Grozzi 1990). Thus, in music reading the decoding itself entails the separate processes of reading pitch and timing while these two must be integrated in the motor output.

The ability to read music

Bearing in mind the complexity of the task of reading music and successfully conveying the meaning of written symbols on a staff through a musical performance one may wonder how this can in fact be done. As we know, many fail to accomplish a satisfactory fluency in music reading, even after years of musical study. Nevertheless, numerous individuals do master this technique and many of them even report acquiring the skill of music reading without much conscious effort. This was true for a pianist who confessed that he did not remember having to do anything in particular to achieve excellent music-reading skills and he suspected 'that most

good music readers acquired their skill early in life without too much struggle' (Sloboda 1978, 9). His account is typical of the few, it seems, gifted individuals who have made no conscious effort to learn how to read music. However, linking music-reading fluency with musical giftedness or, perhaps more seriously, associating a lack of music-reading fluency with a lack of musical giftedness tends to foster misconceptions of the nature of music-reading ability.

Wolf (1976) proposed that expert musical performers need not necessarily be experts at music reading. Nothing in the literature indicates a strong relationship between performance abilities and music-reading achievement. In a comprehensive study on music students taking graded exams in Australia there were only low correlations found between performance ability and sight-reading scores, although the correlation was somewhat higher for students taking Grade VI than those taking Grade III exams (McPherson 1994). It seems that music-reading skills do not necessarily develop in parallel with performance abilities. In fact, there can be a considerable discrepancy between these two abilities. The most extreme evidence of this can be found in a report on a brain-injured musician. After his injury this professional musician displayed impairment in all skills related to music reading and writing while his other musical abilities remained intact (Cappelletti et al. 2000).

Numerous studies have failed to establish positive correlations between music-reading scores and a number of seemingly relevant traits such as amount of music instruction (Luce 1965; Mishra 1998), amount of musical practice (Anderson 1981) and amount of music-reading (sight-reading) practice (Mishra 1998). However, the ability to play by ear may have a moderate positive correlation to music-reading abilities (Luce 1965; Mishra 1998).

Difficulties in reading music

As with other complex skills, music reading does not seem difficult to those who have mastered the skill as long as the reading material is within the scope of the music readers' capacities. Studies confirm that music reading is an automatic process in trained musicians (Stewart, Walsh, and Frith 2004). Why some music students seem to reach this level effortlessly should not be of much interest to music educators. It is far more interesting to ask how all the other music students may be led towards this goal.

The apparent difficulties a large number of music students are faced with in the endeavour of mastering adequate music-reading skills has prompted many music educators to abandon music-reading instruction or at least minimise the emphasis on music literacy. The stakes are too high if failure to read music causes gifted music students to abandon music study altogether. As Mills and McPherson pointed out: '. . . exclusive concentration on reading has held back the progress of countless learners, while putting many others off completely' (Mills and McPherson 2006).

Problems in music-reading acquisition are more common than one may suspect. Several reports confirm that music-reading skills are surprisingly lacking among music students even after many years of music study (Hargreaves 1986; Mills and McPherson 2006; Scripp 1995). This is probably due to two main issues: (1) music-reading skills are complex and there are numerous factors that can cause halts on the way to music-reading fluency, and (2) music reading is a highly specialised skill that, in the case of most individuals, needs to be carefully taught and mastered.

Symptoms of success in music reading

Studies on expert music readers indicate that one of the differences between experts and less proficient readers are that the experts look further ahead in the music when they read than those who are less proficient (Goolsby 1994a, b; Sloboda 1974; Thompson 1987; Truitt et al. 1997). This is likely due to their ability to perceive the musical notation in larger chunks than less proficient readers are capable of. Chunking of information in a musical score depends on the perception of identifiable clusters or entities such as tonal patterns or rhythmic patterns. Studies have demonstrated that familiar structures, such as chords (Salis 1980; Waters, Townsend, and Underwood 1998), musical phrases (Sloboda 1977) and tonality (MacKenzie et al. 1986) are important for success in music reading and that the absence or demolition of any of these structures results in poor music-reading performances. A case study of a young brain-injured adult musician revealed that after the injuries this musician was unable to apply global strategies to pitch reading and was only able to read each pitch individually, resulting in impaired music-reading abilities (Stanzione et al. 1990).

According to the literature, experts and novices may be equally skilled at identifying a single pitch out of context. However, the experts outperform the novices in their ability to identify a group of pitches as a particular chord or a scale and are able to instantly translate that knowledge into a motor output.

Music reading and pitch structure

Results confirming the importance of musical structure on music-reading success have prompted researchers to incorporate awareness of structure into music-reading instruction. Grutzmacher (1987) tested the effect of tonal pattern training on the melodic reading of fifth and sixth graders studying wind instruments ($n = 48$). An experimental group received training in tonal patterns through harmonisation and vocalisation, while a control group was taught to recognise symbols and a range of pitches from notation. Both groups received 30-minute lessons per week for 14 weeks. Following the training the children took the Iowa Test of Musical Literacy. The results revealed that the experimental group scored significantly higher in melodic sight-reading achievement than did the control group ($p < 0.01$). That is, the method that included tonal pattern training was more effective in improving melodic reading than the method that emphasised the recognition of musical symbols. MacKnight (1975) similarly tested the effects of two methods of instruction on music-reading ability. The subjects were fourth grade students and beginners of wind instruments ($n = 90$). The training consisted of 30-minute weekly lessons for 32 weeks with a class size of six students. The experimental group was taught to read pitches as tonal patterns while the control group was taught to recognise pitches through naming, fingering and sound. The results indicated that the tonal pattern instruction was significantly superior to note identification techniques in developing sight-reading and auditory-visual discrimination skills as measured on the Watkins–Farnum Performance Scale.

It is apparent from the studies above that instruction promoting understanding of musical structure is more effective than mere emphasis on pitch identification. These findings have implications for instruction as they suggest that the focus of instruction

should not be on individual pitches but rather on the structures the pitches form. These structures can be chords, melodies or phrases. Research findings suggest that pitch centred methods such as those using colour-coded pitches may not be helpful for building successful music-reading skills as they draw attention to individual pitches rather than structure. This notion has been corroborated by a study on the effectiveness of colour coding pitches for young recorder students. That study resulted in no measurable gains in music-reading acquisition with colour-coded pitches compared with a method using regular black notation (Rogers 1991).

Music reading and timing structures

Success in music reading depends to a large extent on efficient chunking of pitch information. However, the decoding of timing information or reading of rhythm is no less important in music reading than decoding of pitch. Perhaps not surprisingly, studies have demonstrated that good rhythmic reading abilities have a high positive, statistical correlation with success in music reading (Boyle 1970; Elliott 1982).

Timing is essential in music and much of the musical information is coded in the metre and the rhythm. The timing information is what moves the music forward. Therefore it seems logical that successful music reading will depend heavily on the decoding and construction of timing information or the reading of rhythmic patterns.

Accurate reading of rhythm depends on the reader's ability to mentally construct and reproduce a temporal pattern. Experiments confirm that musicians rely on internal mental representations of musical metre as they perform temporal events in music (Palmer and Krumhansl 1990; Sloboda 1983).

Cognitive development and music-reading acquisition

Although the effect of development on children's acquisition of music-reading skills has not been systematically explored, there is sufficient evidence in the literature pointing to the importance of considering children's developmental stages when planning music-reading instruction. Children as young as 3- or 4-years old can learn to read individual pitches on a limited scale of pitches (Capodilupo 1992; Pick et al. 1982; Tommis and Fazey 1999). At this young age children do not show the ability to apply global strategies to reading pitches. In fact, very young children seem more confident reading one pitch at a time than when the pitches construct a melody (Pick et al. 1982). However, no differences were found whether children were taught to identify five pitches as discrete items or in relation to middle C (Tommis and Fazey 1999).

When the same instruction in music reading is offered to children at different ages the older children respond faster to the instruction than the younger children. Capodilupo (1992) found that children's ability to retain information from pitch reading instruction increased linearly between ages 4 and 10. Similarly, Shehan (1987) found that sixth graders learned to read rhythmic patterns twice as fast as second graders with the same type and amount of instruction.

Evidence shows that the age of students should be considered when choosing a method for teaching the reading of rhythm. Methods using foot tapping to mark the beat and counting or clapping the rhythm can be highly effective with older

children and teenagers (Boyle 1970; Salzberg and Wang 1989) while the same method proves ineffective and distractive with third and fourth graders (Palmer 1976; Salzberg and Wang 1989). Methods using speech cues to identify and reproduce rhythmic patterns, as the Gordon and Kodály methods do, seem to be effective and appropriate for third and fourth graders (Bebeau 1982; Palmer 1976; Shehan 1987) as well as for sixth graders (Shehan 1987). It is important to note that the effectiveness of speech cue methods for teaching rhythm reading seems to be achieved through the combination of visual and aural strategies. In essence, written patterns are associated with aural labels in the form of speech cues and this combination tends to be a successful strategy for teaching rhythm reading (Shehan 1987).

Studies using real music-reading tasks in which pitch and timing information must be processed at the same time have found an attention bias in children towards the pitch information. Children tend to focus on pitch information at the cost of timing accuracy in a music-reading task (Drake and Palmer 2000; Gudmundsdottir 2010) while the reverse is true for adult pianists (Drake and Palmer 2000). Young piano students seem to concentrate on pitch information first and timing information second when they read piano music (Gudmundsdottir 2010).

Conclusion

Music reading is a complex skill mastered by many musicians. However, of those who commence music study, relatively few master music reading at a satisfactory level. It has been suggested that failure to acquire music-reading fluency holds back countless students of music and may be a major cause for drop out of music study (Mills and McPherson 2006). Evidence suggests that skill development in music reading is not simply a matter of refined mechanical accuracy but rather a process requiring the development of highly specialised levels of musical understanding (Scripp 1995).

Conscious efforts need to be made to identify the challenges of music reading and the underlying causes of music-reading deficiencies. In order to improve instructional strategies in music reading it is necessary to understand all the cognitive components involved in music-reading tasks. Moreover, it is important to investigate how cognitive development interacts with these components in childhood. Developmental considerations are important because music-reading skills tend to be mastered early in life and because acquisition is closely related to children's level of development.

Notes on contributor

Helga Rut Gudmundsdottir is currently an assistant professor in music education at the University of Iceland, School of Education. She graduated with a PhD in music education from McGill University.

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