Bringing Sight Reading Up to Speed: The Pedagogy of Sight Reading in the 21st Century

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Abstract

Recent years have seen an explosion of study into how the brain learns. This paper will examine relevant studies in music reading and brain research, as pertinent to the pedagogy of piano sight reading. Discussion will explain how piano teachers may help their students to become better sight readers through application of these findings. Teachers will also learn about digital apps and computer resources that are currently available, and selected products will be demonstrated. This session's format was that of a lecture/powerpoint presentation with audience participation.

Presentation

Most pianists aspire to sight reading music rapidly and effectively. Sight reading involves the playing of music that the player has never seen before. Music reading, on the other hand, means the decoding of musical notation (Gudsmundsdottir 2010, p. 2). One could argue that the ability to sight read actually indicates how well one decodes written music, and that sight reading is, therefore, a measure of how well one reads music.

Research has found that music reading skills are surprisingly lacking among music students, even following many years of music lessons. In fact, poor sight reading may be connected to the high dropout rate in piano study. Two 21st century researchers, Mills and McPherson (2006), suggested that methods for teaching music reading skills are flawed and often fail. Gudmundsdottir (2012, p. 1) argued that methods in music reading instruction are mostly based on historical practices, and teachers have only their intuition to follow when students do not develop good reading skills.

According to Pike, piano sight reading may be broken down into four elements: 1) perception, 2) kinesthetics, 3) memory, and 4) problem-solving skills (Pike 2012, p. 24). *Perception* deals with the unravelling of patterns and structures in musical notation or the ability to perceive familiar patterns, for example: a scale, a broken chord embedded in a melody, a repeated musical motive, or a recognisable chord progression. *Kinesthetics* relate to physical movements that are automatic and have already been learned in connection with familiar rhythmic, melodic, and harmonic patterns, as well as those learned in response to markings of articulation and expression. *Memory* refers to working memory, or the ability to remember what was seen, assign appropriate physical movement, and then perform it while looking ahead at altogether new material. *Problem* *solving skill* is the ability to predict what lies ahead based upon knowledge of musical structure and to respond appropriately to unexpected musical twists and turns. Highly accomplished sight readers react quickly to change and variation, displaying an uncanny ability to 'live on the musical edge' (Pike 2012).

Efficient eye movement is crucial to solid sight reading. Piano students are often told to 'look ahead'. The term *perceptual span* measures how far ahead a reader looks to comprehend patterns. *Eye-hand span* is an indicator of how long the pianist continues to play after the score has been removed. The length of the eye-hand span correlates to complexity of the score. If the musical structure is dense or complex, the reader does not continue to play for as long as when it is less complicated. For example, a chromatic scale extending over two measures with one hand, and only a few notes in the other hand, is easier to grasp and remember than two measures of a four-part fugue (Pike 2012).

The parts of the eye involved in music reading are the *fovea* and the *parafovea*. The *fovea* is the high-resolution center of the eye, with a diameter of only about two degrees. The *parafovea* is a tiny area that encompasses the *fovea*, extending to only about five degrees. In the *parafovea*, the ability to discriminate fine detail is significantly limited. Everything beyond the *parafovea* is known as the *periphery*. In this area, perception is negligible (Pike 2012).

When sight reading two types of eye movement occur: *saccades* and *fixations*. *Saccades* are extremely fast eye movements during which no information is extracted. These are the movements observed when a piano student's eyes dart and jump around during the reading process, with both eyes moving together. *Fixations* are events when there are no visible eye movements, although tiny movements remain detectable by sensitive measuring instruments (Rayner 1998).

A new text reading app called *Spritz* capitalises upon the fact that visual data is extracted only during fixations. To this end, the text moves, but the reader's eyes do not, thus maximising the amount of time spent focusing. The app also highlights one letter of each word in red, considered by *Spritz* to be the optimal recognition point, or ORP. By drawing attention to this important letter, it is easy for the reader to extrapolate the remaining letters in each word. Readers are able to radically increase their reading speed through *Spritz*. Text reading with *Spritz*, however, differs from music reading in that the eyes move only horizontally from left to right, whereas in music reading, the eyes also move vertically and angularly (Spritz Technology, Inc. 2014).

There has been a great deal of research into music sight reading as far back as the 1920s. More recent work is the focus of this essay, beginning with eye movement research. One study found that the perceptual span, or how far ahead one needs to look for adequate performance, is no more than one measure for most players. The eye-hand span (in other words, the amount of music remembered if the score is removed) ranged from under one beat for less skilled performers to two beats for very skilled performers. Both of these findings challenge what pianists think they actually do. They believe they are looking ahead more than one measure and believe that, if the score is removed, they can remember significantly more than one or two beats of what is coming. That said, skilled readers do have larger eye-hand spans, can play faster, and can fixate for shorter periods of time than non-skilled readers, presumably because they are able to understand and perceive the incoming visual data more rapidly (Truitt et al.).

Eye movement researchers have also found that the eye's fixation point stays quite close to the note that is being played. In addition, it appears that useful information is extracted during the sight reading task from a very narrow region around the point of fixation. We are seduced by the illusion that detail can be extracted by a wider region of the parafovea and periphery than is actually possible (Goolsby 1994).

To assist students with better eye movement, teachers should, above all, train their students to understand musical structure. Players with an understanding of music theory and its application at the keyboard have a significant advantage over those who do not. They are able to quickly comprehend that which they see and are better equipped to send appropriate messages to the hands for realization. Application of theoretical understanding through experiential learning in the form of keyboard skills (technique, harmonization, transposition, and improvisation) fosters eye-hand coordination and reduces the time needed for visual data to travel the eye-brain-hand circuit. Saccade and fixation times are reduced since what is seen immediately makes sense, and overall reading speed increases.

Similarities do emerge from the worlds of text and speed reading. In text reading, knowledge of the subject being read assists comprehension and speed, just as it does in music reading. For both, beginning to read at a young age is helpful, as the brain has more plasticity at this time than later. Studies suggest that the window of opportunity in text reading begins to close after the first grade (Reading Rockets/First Grade Instruction n.d.). Although music reading is supported by neural networks distinct from reading words (Peretz and Zatorre, 2005), strong music readers often begin music reading at a very young age, suggesting that early music reading instruction is highly beneficial.

Three speed reading techniques can be helpful (Lee 2010). The first is the elimination of subvocalization, or reading aloud. In music, this has to do with not needing to say a note name aloud or in the head before playing it. Fast music readers simply know a note's name and short-cut to playing it. The second is skimming, or visually searching the sentences of a page for clues to meaning. This is akin to looking over a musical score before playing it the first time. The third, meta guiding, suggests the use of a finger or other tool to focus the eye on appropriate visual stimuli, and to move the eye across the page faster. Music teachers should pay attention to the eye movements of their students. Often, helping the student to focus the eyes appropriately is the key to optimising moments of fixation.

Pianists who have difficulty with eye-tracking, either left to right, or bottom to top, may be helped by the use of a 'pacer,' usually a wooden stick with a focal point at the top (Wechsler and Bell, 2006). In this session at the *2015 Australasian Piano Pedagogy Conference*, each participant was given a 6-inch craft stick with a googly eye affixed to the top. Attendees were shown eye-tracking exercises by holding the head still, and then following the stick with the googly eye from left to right, and from low to high. Eye therapists use these sticks for systematic correction of incorrect or slow eye-tracking. A common difficulty in music reading is reading from the top to bottom, rather than from the bottom to the top. The use of a pacer for this purpose is suggested by Colin Thomson in his interactive online sight reading website called *Sight Reading Academy* (Thomson 2014).

Researchers have also studied brain networks related to music reading. The specific area of the brain implicated in music reading is the superior parietal cortex. This area of the brain processes information from the senses, particularly touch, vision, and hearing. In one experiment, non-musicians were given only three months of piano instruction. Brain scans done before and after instruction showed changes in this area (Stewart 2005).

It is believed that melody, harmony, and rhythm are processed independently, although some support for interaction between these areas exists. Nonetheless, studies of brain-damaged musicians suggest distinctly different networks. A right-handed piano teacher with brain damage in the left hemisphere was able to read pitches, but not rhythm (Fasanaro 1990). It seems that the separate areas of rhythm and pitch are processed in diverse areas of the brain, 'while these two must be integrated in the final motor output, or playing experience' (Gudsmundsdottir 2010, p. 3).

Good rhythmic reading abilities bear a strong correlation to success in music reading. Further, the accurate reading of rhythm depends upon the reader's ability to mentally construct and reproduce a rhythmic pattern and to think it in a particular metre. Children as young as three to four years old can learn to identify and read a limited number of pitches (Tommis & Fazey 1999). On the other hand, they give more attention to the pitches than they do the rhythm, even focusing on the pitch information at the expense of the rhythm or timing (Gudsmundsdottir, p. 10). By contrast, adults usually focus on the timing information at the expense of the pitches (Drake & Palmer 2000). Since children are not as good at identifying a large number of pitches, it is suggested that the very young brain provides a window of opportunity for laying down strong rhythmic networks in the brain. Therefore, we should not feel badly about teaching limited pitches to very young children, as they are not ready for more until later. Rather, laying a strong rhythmic foundation should be the highest priority.

There is a large amount of research indicating that the recognition of rhythmic and melodic patterns is associated with competence in sight reading. The ability to identify pitches is considered to be an important part of good sight reading; however, being able to recognise a group of pitches as part of a particular chord or a scale may be even more important. A group of non-musicians was trained to identify musical pitches with ease; however, when asked to identify specific pitches as part of a chord or scale, they fared poorly in comparison to trained musicians There was not much difference between the non-musicians and the experts in terms of isolated pitch identification; however, the experts far outperformed the novices in their ability to identify a group of pitches as a particular chord or a scale, and to translate that information into a physical response through singing or on an instrument (Gudmundsdottir 2010, p. 6).

Researchers note that the ability 'to chunk' visual information into meaningful units increases the reading ability of the performer. These studies confirm the importance of musical structure on music reading success and have prompted researchers to incorporate awareness of structure into music reading instruction (Waters, Townsend, & Underwood 1998). The term 'chunking' stems from developmental psychology and the chunking hypothesis of G. A. Miller (Miller 1956). Miller postulated that discrete pieces of information are eventually assimilated into meaningful groups, or chunks. The first reference to chunking in musical notation may have appeared in Max Camp's book *Teaching Piano*. Camp writes, 'Teaching a student to perceive symbols in metered-pulse patterns is similar to teaching an individual to read words from the grouping approach, referred to by many learning psychologists as *chunking*' (Camp 1992, p. 15). Prior to this time, the term blocking usually applied to the grouping of notes into meaningful units. Chunking is a more inclusive term, and is not limited to the grouping of chords, scalar units, or intervals, but also covers groups of notes that relate in other ways, either melodically or even rhythmically, as indicated by Camp.

Below are found several examples of chunking exercises that demonstrate how awareness of musical structure may be developed. In all cases, the student is not shown the original version of the piece until the preparatory exercises have been learned. Figures 1a through 1d illustrate a chunking exercise sequence designed to develop a structural understanding, and informed reading, of a prelude composed by the author. This sequence is closely patterned after a chunking exercise designed by Pike (Pike 2012, p. 25-26). The simple prelude is seen in Figure 1. It is not shown to the student until after the student masters the preparatory exercises in Figures 1a through 1d.

Figure 1 ***PRELUDE*** Janet Piechocinski

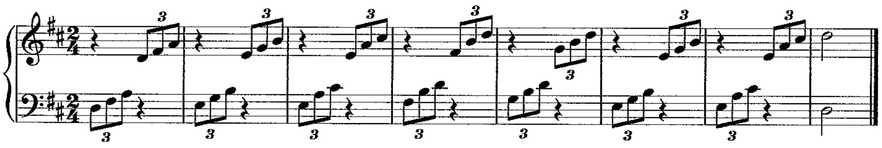


Figure 1a shows the initial preparatory reading exercise that groups the notes of each chord into chunks.

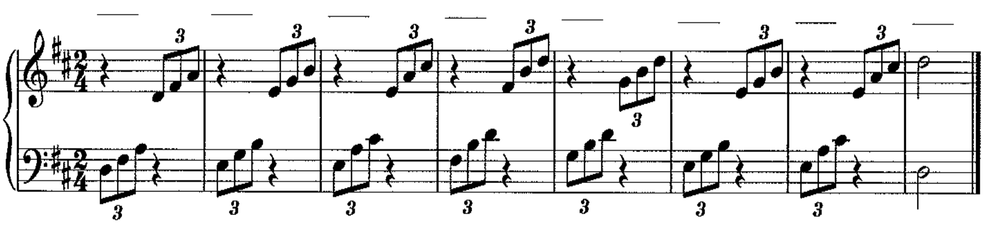
Figure1a: Chunking drill for *Prelude*

In Figure 1b, the chords alternate between the hands, training the eye to move back and forth between the clefs.

Figure 1b: Chunking drill in harmonic rhythm for *Prelude*

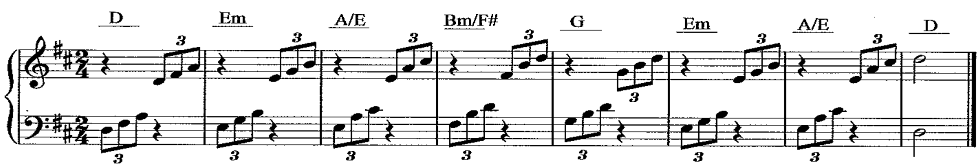
The student next sees the original composition, shown in Figure 1c, but with blanks above each measure for harmonic analysis.

Figure 1c



Finally, Figure 1d shows the harmonic analysis as completed by the student.

Figure 1d



The next two chunking exercises are originally developed by the author, and serve more than one purpose. The first trains appropriate reading of Alex Rowley's 'Little Fantasy Study,' Op. 13, No. 2, but also establishes, from the beginning, a suitable technique for playing of the slurs. In Figure 2a, two segments of the piece illustrate a reduction in which the student plays primarily the downbeats.

Figure 2a: Reduction of 'Little Fantasy Study, Op. 13, No. 2'

In Figure 2b, notes on the second beat are added to foster a drop-lift execution of the slurs.

Figure 2b

Following the playing of Figures 2a and 2b, the student is ready to perform with technical ease a version of the piece (not shown here) in which the slurs are connected by stepping semiquavers.

Figures 3a illustrates a chunking exercise that prepares the student to play Robert Schumann's 'Wild Rider,' Op. 68, No. 8. Until students can play the exercise, they are not told the name of the piece and do not hear Schumann's version. Notice that the finger numbers reflect the fingers that should be used in the original version of the piece. Playing these fingers in the chunking exercise ensures that fingering will not need to be re-learned when other notes are later added.

Figure 3a

After playing this skeleton of 'Wild Rider,' the student is ready to play the original piece. Since it will have been learned in the chunking exercise with a sense of two pulses per measure, or even one large pulse per measure, the rendition commonly heard with six even and plodding quavers per measure will have hopefully been avoided. In this case, the chunking exercise serves to assist the artistic expression of the piece in final performance.

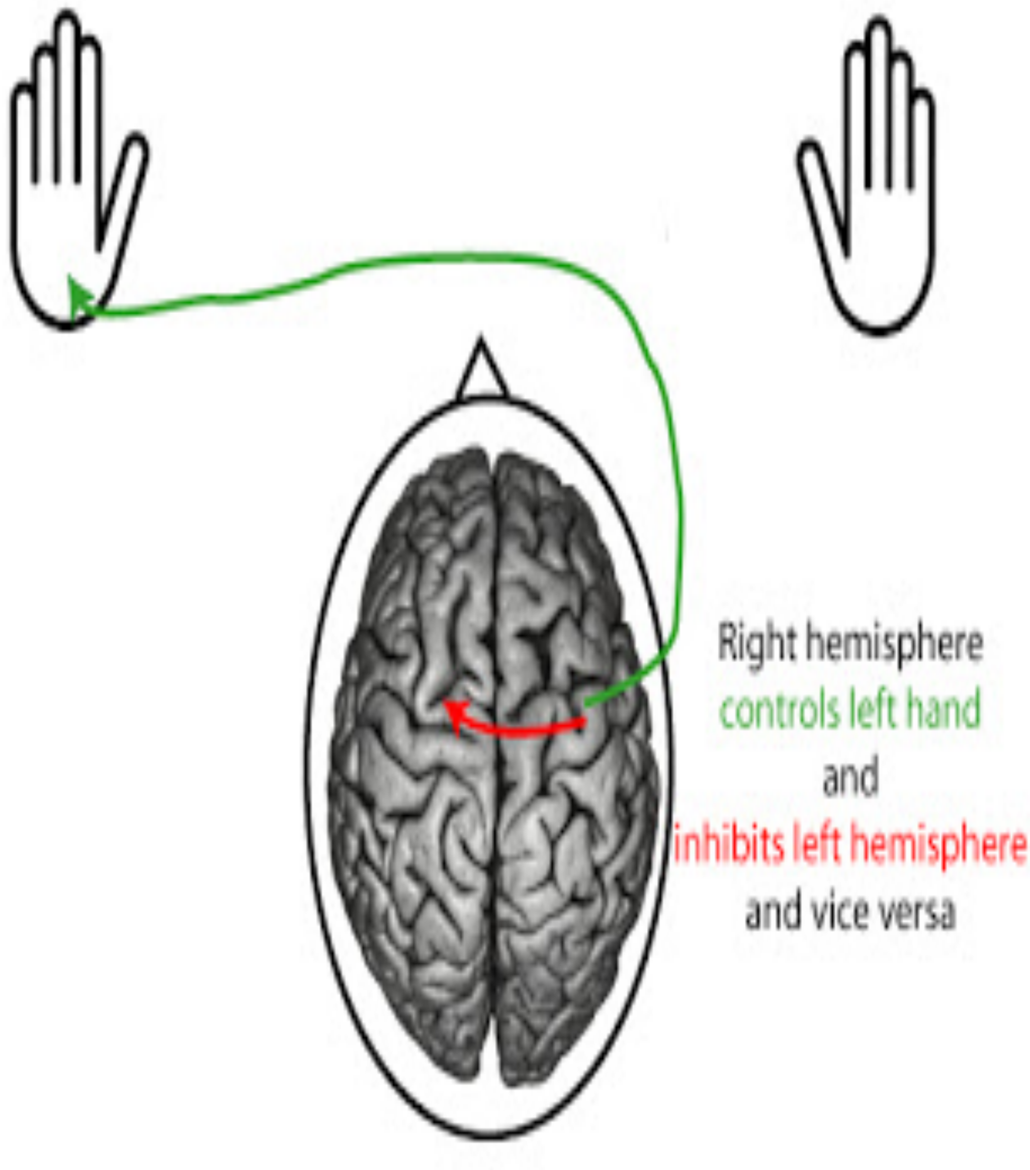
These chunking exercises serve many purposes, helping the student to view the music in ways that facilitate easy reading, but may also assist technique, musical expression, and the understanding of music structure. Once a chunking exercise is developed for a piece, it may be used over and over again, and teachers will find them well worth the time of preparation.

For some super sight readers, music reading comes more easily than for others. One study (Kopiez et al. 2006) examined the elements that set these outstanding sight readers apart from the pack. These factors included psychomotor speed (indicated by trilling speed), the speed of information processing, inner hearing, and expertise. This study found that when the sight reading is not too difficult, general pianistic expertise was enough to excel. As the difficulty increased, however, other factors became more important. Two things predicted superstar ability, including psychomotor speed (an innate aptitude) and the speed of information processing. Further, these researchers believe there is a critical window of time that closes around the age of 15, after which sight reading aptitude may not be impacted. This would again suggest that beginning music reading at a young age, and persisting through early childhood with systematic reading instruction is crucial to maximising one's potential.

There is another population that seems to have an advantage in the sight reading arena. A German study dealt with the music reading advantages of left-hand dominance (Kopiez, Galley & Lee 2005). Published in a neurobiology journal, this study found that being left-handed and male is associated with a high level of sight reading ability. Unfortunately, not everyone can be left-handed and male, but this curious anomaly is of interest, nonetheless. Left-handed people tend to be more ambidextrous than right-handed individuals, suggesting a high incidence of travel across the corpus callosum between the two halves of the brain. Perhaps it is because they are forced to use the non-dominant hand in a right-handed world, or perhaps increased coordination is innate to left-hand dominance. Either way, the gender difference is more difficult to explain.

There is some research into the question of whether to practice hands alone, or hands together. When practicing hands together, the left hand part and the right hand part compete for attention, and some details are missed. Some hands alone practice is, therefore, helpful. There is a biological reason why playing hands alone is easier. Each hand is controlled by a different hemisphere of the brain, the left hand by the right hemisphere, and vice versa. When the motor cortex of the involved hemisphere is active, it sends a message to the opposite hemisphere telling it to 'quiet down' as seen in Figure 4 (Gaertner 2012).

Figure 4: Brain Hemispheric Control of the Hands (Gaertner 2012)



When we are infants, the two sides work in parallel motion. For example, a baby's arms raise simultaneously, and the baby's brain must learn to move one arm without the other. As we mature, the growing brain learns to differentiate its two hemispheres, a necessity for coordinated movement of any kind, including the playing of hands together at the piano.

When should one practice hands alone, and when should one practice hands together? The answer is to probably put them together when each hand can successfully play its own part with at least good technique and correct notes. Robert Duke and fellow researchers at the University of Texas studied how students practice and the results of that practice. One of the things they found was that if students played hands together as soon as possible, they learned the music more quickly than those who delayed combining the hands (Duke et al. 2005).

It is clear from the research that the following facets all work together to create good music sight readers: 1) understanding of musical structure, 2) a solid rhythmic foundation, 3) an ability to see and perform patterns, 4) expertise in grouping or chunking notes, and 5) plenty of hands together playing. Another important element has to do with the amount of time devoted to sight reading skill. An on-site survey of teachers in attendance at the conference presentation of this paper revealed that only a small number assigned sight reading on a regular basis, and an even smaller number devoted lesson time each week to sight reading. This was the case in spite of the fact that the Associate Board of the Royal Schools of Music (ABRSM) examinations assess piano sight reading as a separate skill.

There are several excellent subscription sight reading websites available that provide multiple levels of sight reading material. These include, but are not limited to: 1) *PianoMarvel.com* (providing instant feedback on 36 levels of sight reading material), 2) *SightReadingAcademy.com* (original material designed to encourage reading ahead through blacking out material just read, developing peripheral reading, and aiding the visual capture of note groups), 3) SightReadingFactory*.com* (allowing comparison of performed examples to a computer playback), and 4) *SightReadingMastery.com* (providing music for reading from traditional composers). Other 21st century materials available to teachers include the many available apps. Please see a listing of recommended apps at the conclusion of this paper under the title 'Suggested Apps for Music Reading Development.'

American writer and philosopher Malcolm Gladwell studied what makes people exceptionally good at what they do. He looked at people from many walks of life, including musicians and athletes. In his book *Outliers*, Gladwell reports that he believes it takes 10,000 hours of expertly guided practice to reach the highest levels of accomplishment in a field. (Gladwell, 2008) Not all reviewers of his writing subscribe to his claim; however, the message is clear that the more time one puts into a discipline, the more likely it is that success will be achieved (Vergan 2014). As piano teachers, we cannot ignore sight reading and hope for the best. We must place concerted and steady effort into developing this skill for optimal results.

In conclusion, the author offers the following reminders:

'Top Ten Final Thoughts'

10. Teach Your Children Well
9. The best brain app? Knowledge of Structure
8. Teach at every lesson
7. AAA – Assign, assign, assign
6. Focus
5. Rhythm and Pitch live in separate houses (of the brain)
4. Chunk it
3. Hands together
2. Automatise
1. ***10,000 hours, Baby!***

Suggested Apps for Music Reading Development

- ***Anytune***
- ***Bass Cat HD / Treble Cat HD***
- ***Blue Note***
- ***Chegg Flashcards***
- ***ChristmasPiano***
- ***Dust Buster 2***
- ***Fingertipmaestro***
- ***Flashnote Derby***
- ***forScore***
- ***goodEar***
- ***Inversion***
- ***JellybeanTunes***
- ***Learn Notes!***
- ***Musicnotes***
- ***NameTheNote***
- ***Note Speller***
- ***Note Trainer***
- ***NoteStar***
- ***NoteWorks***
- ***Notezilla***
- ***MuseScore***
- ***MusicFlashcards***
- ***Musicflashclass***
- ***Music Theory (Music Room)***
- ***Piano Cards***
- ***Piano Notes!***
- ***PianoFlash!***
- ***Piano Maestro***
- ***Piano Master***
- ***PianoNotes Pro***
- ***Piano Star!***
- ***PianoFlash!***
- ***Piano Monkey***
- ***Piano Tutor***
- ***Pitch Ear Training***
- ***Read Ahead***
- ***Rhythm Cat***
- ***Rhythm Calculator***
- ***Sight Reading + (Super Kiddo Studio)***
- ***SightRead4Piano by Wessar (ABRSM)***
- ***SRMachine (Purely Piano)***
- ***Rhythm Trainer***
- ***Rhythm Trainer 2***
- ***Tap Notes***
- ***Tenuto***
- ***YouRhythm***

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