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The Effect of Music Teaching Method on Music Reading Skills and Music Participation: An Online Study

Ronniet Orlando,[1] Craig Speelman[2]

School of Psychology and Social Science, Edith Cowan University, Australia

[1]rorlando@our.ecu.edu.au, [2]c.speelman@ecu.edu.au

ABSTRACT

Music reading skills are acknowledged as essential for musicians when learning new pieces, accompanying, or playing with others in ensembles. Approaches to teaching beginners may be divided into *rote*, with new pieces learnt by ear and /or finger positions, and *note*, where students learn to read from conventional music notation from the earliest lessons. This study set out to examine relationships between first methods of learning musical instruments and outcome measures of subsequent music reading skills, participation in music ensembles, and ability to play music by ear.

A self-administered online questionnaire collected data regarding the musical background of volunteer adult participants, and included a two-part music reading task. This was comprised of 24 audio-visual matching tasks using sets of four 2-bar melodies requiring either matching the scored melody to one of four recorded melodies, or matching a recorded melody to one of four scored melodies. Over a period of 52 days, 155 responses to the questionnaire were recorded, of which 118 (76%) were analyzed using a series of one-way analyses of variance. Results supported the hypothesis that the first method of instruction affected subsequent music reading ability, with note methods resulting in higher reading abilities than rote. Furthermore, a significant relationship emerged between music reading ability and ensemble participation, and a significant effect was found for playing by ear on music reading ability.

I. INTRODUCTION

It is widely acknowledged that competence in music reading is necessary for full participation in the music community (Sloboda, 1978), yet approaches to teaching reading are still largely idiosyncratic (Madell & Hébert, 2008). Music reading skills are evenly distributed in the music population, with some otherwise capable musicians having difficulties with reading (Sloboda, 1984). The traditionally held view, that outcomes are primarily the result of students' musical aptitudes, fails to address underlying issues such as reading problems, which could contribute to the relatively high dropout rates seen among instrumental students (Rostvall & West, 2003).

Research concerning the acquisition of music reading skills encompasses areas of music perception and cognition, developmental psychology, and varied approaches to teaching of musical instruments and notation. A review of the literature highlighted the complexity of issues surrounding this topic, as illustrated by the following examples.

Rhythm skills emerge before pitch reading skills (Hargreaves, 1986), and are often the basis of music reading problems at all stages of musical development (McPherson, 1994; Shehan, 1987). Pitch skills are also vital for functional music reading, with speed and naming of notes being positively correlated with sight-reading ability (Waters, Townsend, & Underwood, 1998).

General consensus exists amongst researchers that perception and cognition are active processes of constructing gestalts from groups of individual symbols, forming them into meaningful perceptual units (Serafine, 1983, 1984). Sight-reading (SR) thus becomes an exercise in pattern recognition (McPherson & Gabrielsson, 2002; Waters, Townsend & Underwood, 1998), as the performer recognizes chunks of notational information from an acquired repertoire of commonly occurring patterns (Waters, Underwood, & Findlay, 1997). This skill, playing from previously unseen music, is essentially a transcription task, with notational information converting to a series of kinesthetic responses on the musical instrument (Fine, Berry, & Rosner, 2006; Waters, Townsend, & Underwood, 1998). The direct visuo-motor link is moderated by musical understanding (Sloboda, 1978) and, in skilled readers, by the ability to internally hear the music before it is played (Brodsky, Kessler, Rubinstein, Ginsborg, & Henik, 2008).

Approaches to teaching musical instruments are many and varied but can loosely be divided into rote versus note methods, with the former emphasizing learning by ear and finger numbers on the strings, keys or keyboard, and the latter focusing on teaching beginners their pieces from musical notation using note names. There is little empirical evidence to guide music teachers' decisions on how and when to introduce notation to their students (Gudmundsdottir, 2010; Koopman, 1995; Triantafyllaki, 2005), and opinions are divided as to which approach is better. McPherson and Gabrielsson (2002) suggest that a child's earliest experience of learning notation should occur separately from the act of playing, avoiding the complications of learning to manipulate an instrument simultaneously with reading music. Whilst this separation occurs with the Suzuki and other rote methods, their prescriptive and imitative, rather than creative emphasis on performance skills is counter to a child-centered educational approach (Hargreaves, 1986). Fragmented musical knowledge results if reading is not taught hand-in-hand with playing the instrument (Davidson & Scripp, 1989; Hargreaves, 1986). It is worth noting that, whilst the Suzuki method is based on the aural acquisition of the mother tongue, subsequent languages are usually taught formally together with their written symbols.

Students who have difficulties learning to read notation in their early lessons are more likely to discontinue learning an instrument (Tan, Wakefield, & Jeffries, 2009), whilst those who develop a healthy self-concept in music through mastery of skills are more motivated to continue playing (Asmus, 1986). Still, there remains a paucity of knowledge about the effects on music students' outcomes of different types of instruction, and how these may affect student retention and drop-out rates (Humphreys, May, & Nelson, 1992).

A. Methodologies Applied in Previous Research

1) Matching Tasks. A multi-faceted study (Waters, Townsend, & Underwood, 1998) required pianists to sight-read from musical scores, complete a note-naming task, recall briefly presented chords, and tackle several other computer-presented tasks. It also included a visual-auditory matching task with single bars of piano music presented on cards to be matched to subsequently heard recordings. The researchers concluded that SR ability relies on the use of auditory representations of the score and musical context, over and above basic pattern recognition skills. Other studies have also used matching tasks to examine perceptual processing of notation. Waters, Underwood and Findlay (1997) used 30 two-bar strings of ten notes, measuring reaction time and recording eye movements on a matching task. They found expert musicians were more sensitive than novices to temporal structure.

A same / different paradigm was used in a SR study of 40 pianists asked to judge intervals visually presented on a computer screen. The intervals were visually similar, visually dissimilar, spatially similar, or spatially dissimilar. Results demonstrated that, where poor sight-readers relied on visuo-spatial features, good sight-readers used non-visual forms of interval coding, which required sound conceptual understanding of musical notation (Gillman, Underwood, & Morehen, 2002).

Hébert and her colleagues developed a new music-reading battery which included a same / different symbol identification task, with 150 musical symbols relating to pitch, silence and note duration, meter, and dynamics in three blocks of increasing difficulty (Hébert et al., 2008). These symbols were presented as discrete items, whereas Schön and Besson (2003) used a musical context for their matching task, requiring the musician to judge whether the last note of a five-note auditory sequence was the same as the visual notation simultaneously presented on a computer screen. Brodsky and his colleagues also chose to present their stimuli within a musical context by using an embedded melody task to demonstrate the skill of notational audiation. This is the ability to internally hear music being read silently without it being sung or played on an instrument. A well known theme was embedded in a newly composed visually presented phrase, from which the participants had to decide if it contained the familiar melody or a different (lure) tune. Only one third of the highly trained musicians were able to perform this task reliably, but all could differentiate between the embedded familiar and lure melodies if they were presented aurally (Brodsky, Kessler, Rubenstein, Ginsborg, & Henik, 2008).

2) Questionnaires. Some studies used questionnaires to retrospectively enquire about early musical training and self-assessment of current abilities such as SR. Relationships between this data and musical performance factors were then analysed (Brodsky, Kessler, Rubinstein, Ginsborg, & Henik, 2008; McPherson, 1995). McPherson (1995) chose a researcher-administered questionnaire to assess 16 variables associated with high school instrumentalists' musical backgrounds (N =101). In a subsequent study, path analysis was used to ascertain relationships between four factors derived from the earlier 16 variables, and five types of musical performance, with results indicating that early musical exposure had only a small influence on SR skills, where ability to play by ear had a moderate effect on SR ability, and SR had a direct effect on improvisation skills (McPherson, Bailey, & Sinclair, 1997).

A recent development in musical psychology research is the use of self-administered online questionnaires, as in a large-scale Belgian study on semantic description of music that yielded 774 respondents over a nine-month period (Lesaffre et al., 2008). With online surveys there may be a problem of self-selection of participants, typically a tendency towards those with greater awareness and knowledge of the studies' topics (Krishnamurthy, 2004), as well as potential ethical issues in unauthorized participation by minors (Peden & Flashinski, 2004). Test environments cannot be standardized as each participant is taking part in a different location and on a different interface (Best & Kruger, 2004). However, specific populations may be targeted (Best & Kruger, 2004) at virtually no cost (Krishnamurthy, 2004). A combination of quantitative and qualitative data may be collected (Sudweeks & Simoff, 1999), which is instantly recorded electronically ready for statistical analysis.

B. Rationale for Current Research

The purpose of this preliminary study was to explore the potential of an online questionnaire format with an embedded audio-visual music reading task to examine relationships between first methods of learning musical instruments, subsequent music reading abilities, and ongoing participation in music ensembles. It aimed to provide some evidence for the difference in the subsequent music reading skills and/or music reading confidence of musicians taught their first instrument by rote methods, compared to those taught to read music notation conventionally in tandem with learning their instrument. It was predicted that participants taught first by note methods would score higher in the music reading task and/or express higher levels of music reading confidence than those taught by rote methods.

Earlier research has found that difficulties with music reading contribute to attrition rates of music students (Tan, Wakefield, & Jeffries, 2009). This current study examined if there was a positive relationship between scores on the music reading task and/or expressed music reading confidence, and membership of, and/or ongoing participation in, ensembles. It also examined if there was a positive relationship between years of participation in ensembles and the above music reading outcomes.

Past studies have demonstrated a significant relationship between SR skills and ability to play by ear (e.g. Luce, 1965; McPherson, Bailey, & Sinclair, 1997). It was anticipated that this study would provide support for a positive relationship between the self-assessed ability to play by ear, and the music reading outcomes. It was also predicted that aural methods of instruction would result in higher levels of self-assessed ability to play by ear than note methods.

II. METHOD

This study used a self-administered online questionnaire which included a two-part audio-visual music reading task. Approval was granted by the Ethics Committee of the School

of Psychology and Social Science, Edith Cowan University, using the standards of the Human Research Ethics Committee.

A. Design

A quasi-experimental correlation design yielded both quantitative data and some supplementary qualitative data.

B. Participants

Volunteer adults were recruited by emails, targeting past and current musicians, to over 80 individuals and interest groups. Recipients of the email were requested to forward it to other potential participants anywhere worldwide. No inducements or payments were received, and all participants were anonymous, with no identifying data collected.

Over a period of 52 days, 155 individuals responded to the questionnaire, of which 118 (76%) were statistically analyzed. Of these, 74 (62.71%) were female, 40 (33.90%) were instrumental teachers, and 27 (22.88%) were professional musicians. Participants were required to be 18 years of age or over, and provided their ages in decades, ranging from 20 or under to 71 or over (see Table 1). Most participants, n = 103 (87.29%) were from Australia, followed by Europe, n = 10 (8.47%), USA and Canada, n = 4 (3.39%), and one responding from Hong Kong (0.84%). Most participants (71, or 60.16%) nominated a keyboard instrument as their first, followed by 21 (17.79%) learning a string instrument first, 15 (12.71%) woodwind or brass, 6 (5.08%) guitar, 4 (3.39%) voice, and one learning an unlisted instrument first.

Table 1. Distribution of participants' ages, in decades

Age in years	Number of participants	Percentage
20 and under	4	3.4
21 to 30	28	23.7
31 to 40	19	16.1
41 to 50	23	19.5
51 to 60	21	17.9
61 to 70	16	13.5
71 and over	7	5.9
Totals	118	100%

C. Materials and Procedure

An online questionnaire was designed using Qualtrics Labs Inc. Software, Version 18394 of the Qualtrics Research Suite (2010). Access was provided through a direct electronic link included in the soliciting emails. The questionnaire and music reading task took around 30 minutes to complete, and participants could use any computer with internet access and facility to hear the auditory components of the music reading task. The questionnaire collected demographic data as well as information regarding the participants' musical backgrounds through mostly multiple-choice questions and several questions requesting text responses.

The second part of the questionnaire was an audio-visual music reading task testing aspects of SR, without time constraints, nor physical demands, of playing a musical instrument that would apply in vivo. Part A, the *reading test*, required participants to listen to a recorded two-bar target melody and match it to the correct one of four notated two-bar melodies. In part B, the *listening test*, participants were asked to select the correct one of four recorded two-bar melodies to match the notated two-bar target melody presented on the screen. Part A and Part B each had twelve of these matching tasks.

Twenty-four sets of four two-bar melodies were composed by the first author on Sibelius Software Ltd, Version 4.0 (2005). An additional four-bar melody was similarly composed for use by participants to test the sound on their computers. Each set had variations in one or more of the following: modes, key signatures, pitch, intervals, melodic contours, time signatures, and rhythm. Melodies were then recorded electronically through the Sibelius Kontact Player, using a piano timbre, with fixed metronome rates for each set. These recordings were subsequently converted to WAV format, and finally to MP3 format, using Audacity 1.2.6 (Sourceforge, 2006), a free online program. The Sibelius notation was converted, using Adobe Illustrator CS2 (2005), to EPS format, and then to GIF files, which were inserted into the questionnaire as multiple choice options for the reading test and as targets for the listening test. Similarly, the MP3 files were inserted as multiple choice options for the listening test and as targets for the reading test. Each sound file had a miniature virtual player bar embedded to click on to play the melody.

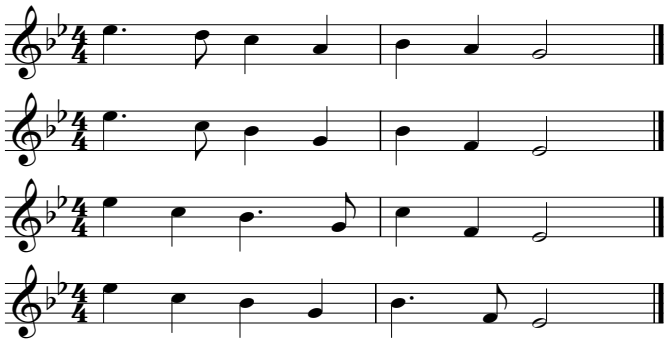

Figure 1. An example of a set of four melodies used for the music reading matching task

III. RESULTS and DISCUSSION

A. Data Screening

Raw data from the questionnaire was first screened, and the music tests were scored. Cases with no responses, or that had not progressed beyond the preliminary demographic questions, were eliminated. Some questions were re-coded to enable analysis, and codes were inserted for missing values resulting from questions that were not answered or were not relevant for some participants. Where there were fewer than two cases in a category of a variable, that category was amalgamated with a related one to allow meaningful analyses to be carried out. IBM Statistical Package for the Social Sciences (SPSS), Version 19.0 for Windows (2010), was used for all statistical analyses.

Of the 118 cases statistically analyzed, only 89 (75.42%) attempted the music reading task, the score of which was the

principle dependent variable for this study. However, it was decided to retain the remaining 29 cases (25.57%) so further analysis could be carried out on the data yielded from the first part of the questionnaire.

A series of one-way analyses of variance (ANOVA) was conducted on the data, firstly using the total score on the music reading task as the dependent variable. This test had a maximum score of 24 (M = 19.46, SD = 4.86). Initial exploration of the data revealed a negative skew of -1.68 (SE = .50), so a square root transformation was carried out on the scores, resulting in a reduction in both the skewness (-.98, SE = .25) and kurtosis (.114, SE = .50). The square root scores (M = 405.52, SD = 150.82) were then used for some of the following analyses. For all ANOVA results and for Levene's tests of homogeneity of variance, alpha was set at .05.

B. Initial Teaching Methods and Music Reading Ability

The first hypothesis was that participants taught initially by note methods would score higher in the music reading test and/or express higher levels of music reading confidence than those taught by rote methods. Three variables which measured initial methods of learning musical notation – method used to learn first pieces (*first method*), method of note identification (*note ID*), and when conventional note reading was introduced (*when notes*) – were paired in a series of one-way ANOVAs with two outcome measures of reading ability – music reading score squared, labeled *square total*, and self-assessed *reading confidence* and *problems adapting* to conventional notation – to examine the effects of the initial methods used on the music reading abilities of the participants. Results of these calculations are tabulated in Table 2.

The ANOVAs yielded a statistically significant effect of *when notes* were named on *problems adapting* to conventional notation, with a linear trend of greatest problems in those never taught note names, followed by the group taught notes more than a year after beginning to learn their instruments, and least problems experienced by those introduced to conventional note naming within weeks. *Problems adapting* also returned a significant effect on *reading confidence*, with greatest music reading confidence found in the group that had least problems adapting to conventional notation, and lowest reading confidence seen in the group who experienced most problems adapting. A significant effect for *when notes* on *reading confidence* was also found with those who had never been introduced to conventional note naming having the lowest reading confidence, whilst those introduced to notes within a year having the highest reading confidence, followed by those introduced within weeks. These results all supported the hypothesis that those taught by note methods would have higher levels of reading confidence than the participants taught by rote methods, where note reading was delayed or never used.

No significant effects on the music reading scores of participants emerged from any of the three measures of initial teaching methods. However, a common trend was observed in the mean scores of both *note ID* and *first method*, with those taught by the finger methods having the lowest *square total* scores in the music reading task. Similarly, those taught by finger methods had the lowest level of reading confidence. One participant described still thinking of the notes in terms of fingerings and strings rather than note names, and trying to relearn notation in order to improve SR more difficult pieces and key signatures with increased confidence. Although learning pieces by note methods may be initially slower, in the long term it avoids the need for later remediation, which can be challenging and requires motivation.

Table 2. ANOVA results for teaching methods and reading ability

Initial teaching method	Dependent Variable	
	Square total	**Reading confidence**
1st method	$\bar{X}$ = 405.52 (150.82)	$\bar{X}$ = 3.00 (.80)
aural	$\bar{X}$ = 470.80 (96.26), n = 5	$\bar{X}$ = 2.29 (1.11), n = 7
notes	$\bar{X}$ = 409.84 (140.57), n = 64	$\bar{X}$ = 3.07 (.75), n = 85
finger	$\bar{X}$ = 289.00 (209.27), n = 9	$\bar{X}$ = 2.91 (.94), n = 11
combination	$\bar{X}$ = 450.10 (142.33), n = 10	$\bar{X}$ = 3.00 (.68), n = 14
	F(3,84) = 2.54, p = .06 #	F(3,113) = 2.20, p =.09 #
Note ID	$\bar{X}$ = 405.52 (150.82)	$\bar{X}$ = 3.02 (.78)
notes	$\bar{X}$ = 406.89 (145.71), n = 81	$\bar{X}$ = 3.01 (.79), n = 108
finger	$\bar{X}$ = 295.50 (249.12), n = 4	$\bar{X}$ = 2.80 (.45), n = 5
combination	$\bar{X}$ = 515.33 (68.53), n = 3	$\bar{X}$ = 3.67 (.58), n = 3
	F(2,85) = 1.90, p = .15	F(2,113) = 1.24, p =.29 #
	Problems adapting	**Reading confidence**
When notes	$\bar{X}$ = 1.26 (.54)	$\bar{X}$ = 3.00 (.80)
never		$\bar{X}$ = 1.00 (.00), n = 2
weeks	$\bar{X}$ = 1.21 (.49), n = 102	$\bar{X}$ = 3.06 (.77), n = 102
months	$\bar{X}$ = 1.60 (.55), n = 5	$\bar{X}$ = 2.40 (.55), n = 5
year	$\bar{X}$ = 1.40 (.89), n = 5	$\bar{X}$ = 3.40 (.55), n = 5
year plus	$\bar{X}$ = 2.33 (.58), n = 3	$\bar{X}$ = 2.67 (.57), n = 3
	F(4,112) = 4.30, p = .003 #*	F(4,112) = 5.04, p = .001 #*
		Reading confidence
Problems adapting		$\bar{X}$ = 3.00 (.80)
no problems		$\bar{X}$ = 3.14 (.76), n = 93
some probs		$\bar{X}$ = 2.50 (.79), n = 18
difficulty		$\bar{X}$ = 2.33 (.52), n = 6
		F(2,114) = 7.88, p = .001 #*

Assumption of homogeneity of variance met * Significant effect

C. Initial Teaching Methods and Playing by Ear

As a measure of initial methods, *when notes* was used as the factor in an ANOVA to examine its effect on the ability to *play by ear* (N = 118, M = 2.52, SD = .89). It was predicted that aural (rote) methods of instruction would result in higher levels of self-assessed ability to play by ear compared to note methods. This hypothesis appeared to be supported by a significant effect of when notes were named on ability to play by ear, F(4, 113) = 4.35, p = .003, with assumptions of homogeneity of variance met. Ability to play by ear was lowest in the group which had never learnt conventional notation (n = 3, M = 1.67, SD = .57), followed by the within weeks group (n = 102, M = 2.45, SD = .87), the within months group (n = 5, M = 2.60, SD = .55), and the within year group (n = 5, M = 3.60, SD = .55), with the highest ability to play by ear expressed by the year plus group (n = 3, M = 3.67, SD = .57). It would appear from these results that some degree of conventional note reading ability is beneficial for developing the skill of playing by ear, as was highlighted by previous research that found a

significant positive relationship between SR and ear-playing abilities (Luce, 1965).

D. Playing by Ear and Music Reading Ability

In light of earlier research, it was anticipated that this study would demonstrate a positive relationship between the self-assessed ability to play by ear, and music reading outcomes. Results, as recorded in Table 3, supported this hypothesis, with the ability to play by ear having a significant positive effect on both the square total reading scores and reading confidence of participants. Other researchers have noted that regular performance by ear, without notation, is important for students' SR skills (McPherson, Bailey & Sinclair, 1997). This could in part be due to the important role in SR of notational audiation - internally hearing the music without playing it on an instrument - which requires well developed aural abilities (Brodsky, Kessler, Rubinstein, Ginsborg, & Henik, 2008).

Table 3. ANOVA results for playing by ear and reading ability

Playing by ear skill level	Dependent Variable	
	Square total	**Reading confidence**
	$\bar{X}$ = 402.09 (153.42)	$\bar{X}$ = 3.00 (.80)
no ability	$\bar{X}$ = 302.93 (168.18), n = 15	$\bar{X}$ = 2.35 (.19), n = 17
rudimentary	$\bar{X}$ = 392.18 (152.23), n = 27	$\bar{X}$ = 2.70 (.66), n = 37
proficient	$\bar{X}$ = 430.12 (132.69), n = 34	$\bar{X}$ = 3.31 (.72), n = 48
highly prof	$\bar{X}$ = 463.77 (153.42), n = 13	$\bar{X}$ = 3.47 (.64), n = 15
	$F(3,85) = 3.47$, $p = .02$ #*	$F(3,113) = 6.11$, $p = .00$ #*

Assumption of homogeneity of variance met * Significant effect

E. Ensemble Playing and Music Reading Ability

The final hypothesis anticipated a positive relationship between years of participation in ensembles and music reading scores and/or expressed music reading confidence. Both measures of ensemble participation, *ensemble years* and *ensemble now*, demonstrated significant effects on both music reading measures (see Table 4), indicating that both the length of time spent playing in musical ensembles, as well as current participation, contributed to music reading ability. In addition, higher reading confidence was a predictor of current ensemble participation, as indicated by the significant relationship between these two variables. As has been noted earlier, students who have trouble learning to master notation early in their training are more likely to discontinue lessons (Tan, Wakefield, & Jeffries, 2009) and, as a consequence, ensemble playing. Both chamber music and school ensemble playing have earlier been shown to improve SR skills (Humphreys, May, & Nelson, 1992; Luce, 1965) by exposing the player to novel and varied repertoire (Burman & Booth, 2009). However, participation in such ensembles requires members to already have some music reading skills. It appears there are other factors which contribute to the desired outcomes of sound music reading skills and ensemble participation.

Table 4. ANOVA results for ensemble playing and reading ability

Factor	Dependent Variable	
Ensemble playing years	**Square total**	**Reading confidence**
	$\bar{X}$ = 430.93 (128.87)	$\bar{X}$ = 3.10 (.76)
less than 1	$\bar{X}$ = 373.16 (153.85), n = 6	$\bar{X}$ = 2.57 (.97), n = 7
1 to 5	$\bar{X}$ = 332.66 (111.05), n = 12	$\bar{X}$ = 2.53 (.62), n = 17
6 to 10	$\bar{X}$ = 443.41 (137.54), n = 12	$\bar{X}$ = 3.11 (.76), n = 18
over 10	$\bar{X}$ = 459.02 (116.99), n = 49	$\bar{X}$ = 3.30 (.68), n = 63
	$F(3,85) = 3.47$, $p = .02$ #*	$F(3,113) = 6.11$, $p = .00$ #*
Now	$\bar{X}$ = 409.08 (151.30)	$\bar{X}$ = 3.03 (.80)
no	$\bar{X}$ = 352.94 (169.46), n = 37	$\bar{X}$ = 2.76 (.83), n = 45
yes	$\bar{X}$ = 452.35 (120.46), n = 48	$\bar{X}$ = 3.21 (.73), n = 66
	$F(1,83) = 9.98$, $p = .002$ *	$F(1,109) = 9.30$, $p = .003$ #*
Reading conf.	**Ensemble now** coded 1 = yes, 2 = no	
	$\bar{X}$ = 1.41 (.49)	
can't read	$\bar{X}$ = 1.67 (.57), n = 3	
not conf	$\bar{X}$ = 1.64 (.49), n = 25	
confident	$\bar{X}$ = 1.37 (.48), n = 49	
very proficient	$\bar{X}$ = 1.26 (.45), n = 34	
	$F(3,107) = 3.39$, $p = .02$ #*	

Assumption of homogeneity of variance met * Significant effect

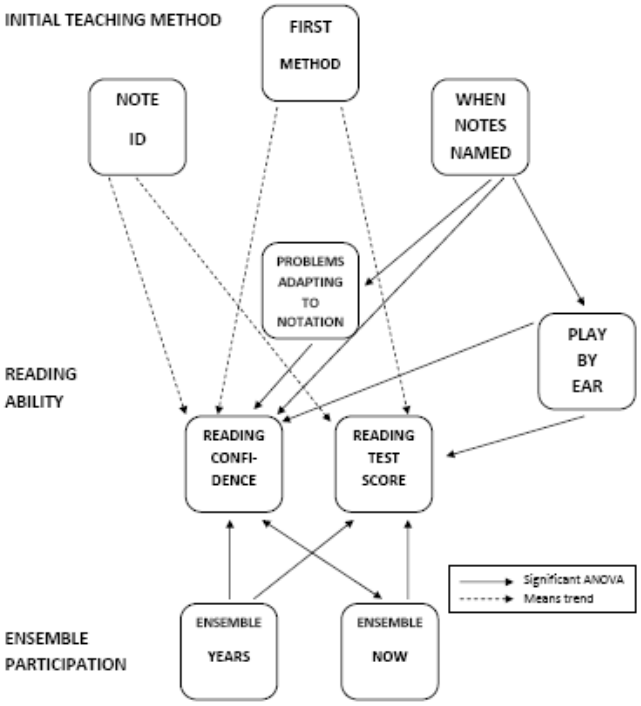

Figure 2. Schematic model of the results, showing significant effects observed in ANOVAs, and trends suggested by means

F. Motivation and Other Factors

Previous researchers have acknowledged the importance of visual memory for notation (Sloboda,1984), pattern recognition (Waters, Townsend, & Underwood, 1998), meta-cognition (McPherson, 2005), musical self-concept, and motivation (Asmus, 1986) in contributing to music reading skills and continued participation in music. The following sample comments from participants in this study supported some of the above factors as contributing to their music reading abilities: "recognising patterns", "studying finger exercises and

identifying patterns", "careful analysis of the process", "musical sense (harmony, melodic progression)", "frequency of practice, especially SR", "self-motivated to read well", "tackling music, especially if it was at a harder level than what I was up to", and "persistence". Those with strong motivation were able to overcome earlier difficulties with reading, and ensemble playing provides both a catalyst and environment for this to occur. These shared musical experiences are motivation for sustaining musical involvement throughout the lifespan (Lamont & Marshall, 2008).

G. Benefits and Limitations of the Online Questionnaire

The online questionnaire was found to be an efficient, low-cost means of data collection, with the ability to target specific populations, as well as the potential for snowballing of participants globally. The software used had the flexibility to allow the music reading task to be inserted, complete with graphics and sound. The response rate and completion rate was good, but self-selection, especially on the music reading task, resulted in a biased sample. Reliance on retrospective data, in addition to the adult ages of the participants, may have reduced the accuracy of some of the questionnaire responses, although it did provide insight into how individuals overcame difficulties. Future studies are recommended using younger participants to reduce such confounds which occur over time.

IV. SUMMARY and CONCLUSIONS

Results of this preliminary study, as summarized in Figure 2, were supportive of the initial hypothesis that note methods produce better music reading outcomes than rote methods, that ensemble playing improves music reading skills, that better reading skills make ensemble participation more likely, and that ensembles help develop music reading skills. With the important role of ear-playing skills in SR ability also supported, results pointed towards the need for a holistic approach to teaching music reading to beginner instrumentalists, including introduction to notation from the earliest lessons, as well as development of aural skills through playing by ear. Previous research also recommended simultaneous use of auditory and visual (Shehan, 1987), or aural and literate approaches (Campbell, 1989). A teaching approach that incorporates the recognition of common rhythmic and melodic patterns would promote the development of SR skills. Early opportunities for ensemble participation are also indicated.

The biased sample and the risk of type-one errors from repeated ANOVAs means these results are not considered to be conclusive, but are indicative of a wider population. Further analyses carried out using multivariate methods such as structural equation modeling may contribute more to understanding the issues examined in this research paper.

In conclusion, reading music is empowering, allowing music students to take control of their own learning processes and musical engagements with others.

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