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Evaluating the impact of a generalist teacher-led music program on early childhood school children's singing skills and attitudes to music

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Abstract

This article reports on the impact of a generalist teacher-led music program on early childhood school children's singing skills and attitudes to music. Singing tests and class surveys were administered to students in 11 Australian primary schools where music specialists mentored classroom teachers over the period of one to two school terms. The results show that implementing music activities in early education settings can positively impact young children's singing skills and attitudes to music regardless of gender, ethnicity and socio-economic standing of the school. The study provides empirical evidence of the benefits accrued by children through access to music education.

Keywords

early childhood, generalist music education, music development, singing, teacher development

The literature documenting the beneficial effects of music participation on intellectual development of children is growing. Nevertheless, what counts as effective music education to promote such benefits is still somewhat contested. Part of this debate relates to the extent to which non-music specialist/generalist primary school teachers are able to support their students' musical development, particularly if the teachers either lack sufficient music education knowledge and/or confidence to teach music (e.g., Hennessy, 2012). This pedagogical challenge should be seen within a context where considerable evidence from across the world is indicating that

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music instruction is associated with improved measures of intellectual functioning, spatial and verbal skills (Costa-Giomi, 2012), as well as literacy, numeracy, and aspects of executive function (Williams et al., 2015; Sachs, Kaplan, Der Sarkissian, & Habibi, 2017). For example, a study of 132 Canadian 6-year-olds documented greater improvement in general IQ in students undertaking one-year tuition in keyboard and voice than those in control groups (Schellenberg, 2004). A large survey of American children ($n = 4{,}376$) showed that participation in music activities was associated with academic achievement (Southgate & Roscigno, 2009). In Israel, a 2-year music enrichment program consisting of music appreciation, performance, and creativity with 45 high-risk elementary school children showed that children's growing understanding of musical structures enhanced their cognitive development in relation to general organizing structures in other disciplines (Portowitz, Lichtenstein, Egorova, & Brand, 2009). Music listening has also been found to play a crucial role in mood maintenance and have beneficial impact on well-being and physical health (Macdonald, 2013).

In addition to enhanced academic achievement (Brown, Benedett, & Armistead, 2010; Hallam, 2011; Johnson & Memmott, 2006; Moreno et al., 2011; Moritz, Yampolsky, Papadelis, Thomson, & Wolf, 2013; Rauscher & Hinton, 2011; Ritchie & Williamon, 2011; Williams, Barrett, Welch, Abad, & Broughton, 2015) and positive social impact (Costa-Giomi, 2004; Hallam, 2011; Rickard et al., 2013; Ritchie & Williamon, 2011; Welch, Himonides, Saunders, Papageorgi, & Sarazin, 2014; Williams et al., 2015), music learning is reported to produce positive music outcomes for children, such as in the development of their singing ability and enhanced attitudes towards music. Most recently, a major longitudinal study provides evidence of the basis for music's impact by examining the effects of music training on the developmental trajectory of children's brain structure, beginning at age six (Habibi et al, 2017). Their evidence suggests that two years of music training induces macro- and microstructural brain changes in school-age children.

Various interventions have been trialled to improve music skills in primary school-age children. For example, in the USA, early childhood specialists implemented a music curriculum after intensive professional development in music teaching, resulting in significant improvement in children's tonal patterns (Runfola & Etopio, 2012). Additional benefits of the music intervention in this study included increased vocabulary and grammar understanding, particularly for students with weaker literacy skills. Daily singing instruction for kindergarten-age children by a music specialist enhanced accurate singing on pitch-matching tasks significantly more in comparison to a control group (Demorest, Nichols & Pfordresher, 2017). However, in this study the singing of a well-known song did not improve for either group. These results suggest the need to consider multiple developmental and musical factors when designing age-appropriate singing tests for children. In a slightly older age group (10–11 year olds) singing intonation was improved through the use of gesture and movement in choral rehearsal (Liao & Davidson, 2016). This study supports the notion of developing age-specific music training interventions to enhance positive music outcomes for children, an idea that has been reinforced by data from a new interview study of teachers of singing for young children (Pecina, 2017). This emphasizes the need for individual differentiation, as well as the use of student-led and technological feedback in the development of young children's singing behaviors.

The research literature also highlights gender and age differences in early music learning, with girls and younger children demonstrating more positive attitudes towards music in general and singing in particular (Roberts, 2016; Saunders, Varvarigou & Welch, 2010). For example, a study of 60 English-Cantonese bilingual children identified gender differences in singing competency, with girls outperforming boys, particularly on singing tasks that required text recollection (Mang, 2006). This finding is supported by a 5-year longitudinal study of

American children investigating gender differences in early childhood, in particular during transition from pre-school to elementary school, that showed girls outperforming boys on behavioral self-regulation (Matthews, Ponitz & Morrison, 2009). However, the study found no significant gender differences on five academic outcomes. The available literature seems to suggest that some gender differences may exist in early music education with girls scoring higher on singing competency, self-efficacy, and behavioral regulation. Developmental changes tend to occur earlier for girls than boys, with both genders developing greater vocal pitch range by the age of 10 (Sergeant & Welch, 2009). For young boys, observing other boys singing seems to motivate their participation and skill development (Hall, 2005).

There is growing evidence that music learning can have significant positive outcomes for disadvantaged children living in low socio-economic areas (Osborne et al., 2016). Interestingly, McPherson, Osborne, Barrett, Davidson, and Faulkner (2015) reported that children from low socio-economic backgrounds have a greater desire to learn a musical instrument than children from better-off families. This study illustrates that socio-economic disadvantage need not be a barrier to music learning, and echoes findings concerning measures of actual singing behaviors in a national dataset of $n = 8{,}162$ children in England (Welch et al., 2009). Despite being in areas of multiple deprivation, child participants within the National Singing Programme *Sing Up* achieved significantly more advanced singing behaviors than comparison child controls from outside the program who were attending schools in less deprived areas of England.

To evaluate the effectiveness of any music learning intervention on improvement in singing skills, it is necessary to test participating children before and after training and also to compare results to controls. Literature has shown that accurate testing of children's singing is possible, with researchers demonstrating high reliability of results (Mecke & Sundberg, 2010; Nichols & Wang, 2016). However, when designing singing tests, it is important to consider the types of items being assessed, as item and task difficulty level are amongst various factors affecting singing voice development (Nichols, 2016a). For example, one of the factors that positively impacts children's singing performance during testing is singing alone or with others (Nichols, 2016b).

Despite the steady accumulation of research evidencing the multiple benefits of quality music education, and singing in particular, children's access to music education and engagement in formal schooling is variable in both extent and quality. Within Australia despite repeated calls for increased provision of music education the decade following the *National Review of School Music Education* (Department of Education Science & Training (DEST), 2005) witnessed a continuing decline in provision of music in school education and teacher education for generalist teachers (Letts, 2015). To remedy this situation and to enable generalist music teachers to deliver quality music teaching in their classrooms, an intervention funded by the Federal Government was implemented in Australia from 2015. The National Music Teacher Mentoring Program (NMTNP), an initiative of educator Richard Gill, a Member of the Order for Australia (AM), and funded by the Federal Ministries of Arts and Education with contributions from relevant Ministries in NSW and Victoria, has provided a mechanism for specialist music educators to mentor generalist early childhood (kindergarten to year 2, ages 4 –8) classroom educators over an extended period of time. This article reports on the impact of this mentored generalist teacher-led music program on early childhood school children' singing skills and attitudes to music and addresses the following research questions:

(1) What improvements in young children's singing are evidenced following the implementation of the mentoring program?
(2) What impact did the mentoring program have on children's attitudes towards music?

Method

Design of the study

The authors evaluated the implementation of the National Music Teacher Mentoring Program (NMTMP) in 11 Australian primary schools in New South Wales (20-week implementation in eight schools) and Victoria (10-week implementation in three schools). The success of the program was measured by pre-to-post changes in singing of participating children and class surveys of children's attitudes to music. Within the participant schools there were mentored classes and non-mentored control classes of matching year level and demographic profile to that of the experimental groups.

Mentoring procedures

The mentoring program began with a two-day master class that provided mentors with a good understanding of the fundamentals of mentoring and music, and enabled them to share simple strategies, practices and resources for engaging students in quality music education. The experienced music educators were paired off with generalist classroom teachers who volunteered for the program. Each mentor worked collaboratively with their mentees to develop lesson plans and music activities that utilized existing resources and were integrated into the daily program of the class, often occurring during transitions between lessons.

Participants

Seven mentors worked with 19 classroom teachers. One school in the evaluation had a resident music specialist, but with no music provision in the remaining schools. Two hundred and ninety-two children participated in singing tests and surveys. The children were aged 4–8 years and were drawn from early years (reception classes) and primary school years 1 and 2. The number of children in the mentored classes was 237, with 55 children in the control classes of matched year level.

Data collection procedures

Mentors administered the singing test individually to each child in a space that was familiar outside the classroom, with assistance from the classroom teachers, to ensure that children were comfortable. Mentors' musical expertise was required to assess the quality of singing. No starting pitch was given for the two test songs. Mentors completed hard copies of individual singing test ratings and these were then provided to the researchers for data analyses. Classroom teachers administered a class survey (see below) as a group activity with their students. If children needed support with reading, or comprehension for individual items, this was provided by the teachers and support staff as the survey was being completed. Researchers collated and analyzed the survey data.

Data gathering instruments

Demographics. Both singing tests and surveys included demographic data, such as date of birth, gender, school year level, and ethnicity of children. Teachers provided this information from the relevant school records. The age of each participant was calculated in full years from the date of birth at the time of pre-test administration. The Australian Bureau of Statistics (ABS)

classification of countries (ABS, 2014) was used to code the ethnicity of the participants. The ABS classifications of socio-economic indexes by postcode (ABS, 2013) were used to code each school by its location. A socio-economic category was assigned, based upon the region in which the child's school was located, rather than on an individual child basis sourced from family income. The school's socio-economic index was considered to be indicative of the educational resources available at the school. The socio-economic status is divided into 10 deciles, with 1 being the most disadvantaged and 10 being the most advantaged.

Singing test piece. Two well-known simple songs were chosen as test pieces: "Twinkle, Twinkle, Little Star" and "Happy Birthday." The first song requires an opening pitch of a fifth followed largely by descending stepwise movement and has a pitch range of a sixth; the second song contains an octave leap that is more challenging to pitch correctly and has a more complex melodic movement. Singing of each song was rated by music mentors using a template (see Appendix A), with a score of 1 representing a chant-like rendition, the words of the song appearing to be the initial center of interest rather than the melody; a score of 2 demonstrating outlines of the target melody and singing pitch range expanding; a score of 3 given when melodic shape and intervals were mostly accurate; and a score of 4 awarded when no significant pitch or rhythm errors were present. In addition to the evaluation of singing as outlined above participants' speaking voice range was also identified. The singing test has been validated in the evaluation of the National Singing Programme in the UK with over 11,000 children (Welch et al., 2014).

Student survey. The implemented survey was a shortened version of the survey devised by Welch et al. (2014), with the original 60 questions abridged to 24, due to the younger target population (see Appendix B). The student survey consisted of questions regarding general attitudes towards music and singing, in addition to demographics. The questions focused on musical context at school and home, identity as a musician, self and social inclusion, emotional engagement, health and happiness, and resilience. For each question, children were asked to choose one face from a range of seven faces, ranging from sad to happy; this was later collapsed into three faces (sad, neutral, happy) to facilitate implementation of the survey. The use of emojis was deemed more appropriate for the target age-group of children rather than numbering or word labels, as are typically used in survey scales.

Statistical analyses

An Excel file with results from the individual singing tests was created with school, socio-economic index by postcode, school year level, age, gender, and ethnicity coded for each participant. Quantitative data underwent statistical analyses using SPSS 22.0 software.

The procedures for singing test analyses included preliminary checks on categorical variables, demographic breakdown of the participants, preliminary analyses on continuous variables, descriptive statistics, missing data analysis, and focal data analyses of mentored children results versus control children results from pre- to post-test, and improvement in song 1 and song 2 from pre- to post-test. The results were also analyzed for potential socio-economic, school year level, age, gender and ethnicity effects.

The class survey data underwent similar data cleaning and preparation procedures as outlined above. The overall scale demonstrated a good level of reliability from pre- to post-assessment and was utilized as a measure of overall general positive attitudes toward music. These scores were calculated as the mean value of the attitude ratings across the 24 items. The survey

results were analyzed for changes in general attitudes towards music from pre- to-post-mentoring, and potential socio-economic, year level, age, gender, and ethnicity differences.

Results

Demographics

Table 1 reports sample demographics of children who participated in the singing tests and surveys. As seen from the table, a disproportionately larger number of participants came from the mentoring program compared to the control. This was due to practical constraints concerning the recruitment of control participants of matched year level and demographic profile to that of the intervention groups, as well as an emphasis on collecting maximal treatment data within the limited school resources made available. The gender breakdown of the sample provided a relatively equal split of male and female participants. As expected in the Australian context, the number of children who claimed Oceania ethnicity far outweighed that of the other categories. Whilst many children had an other than English ethnic/language background, the majority were born in Australia. Year 1 children were over-represented in the sample, while year 2 children were under-represented relative to kindergarteners. This was due to many classes in the participating schools being composite year 1/2 classes, resulting in greater concentration in the middle, year 1 level.

Singing tests results

Mentored versus control groups. Paired samples *t*-tests showed that, while children in the control groups showed no overall difference in rated singing ability between baseline ($M = 2.01$, $SE = 0.17$) and post-intervention ($M = 2.03$, $SE = 0.16$) performances, $t(34) = -0.17$, $p = .865$, children in the mentored treatment groups demonstrated significant improvement following intervention ($M = 2.94$, $SE = 0.05$) compared to baseline, pre-intervention singing ability scores ($M = 2.15$, $SE = 0.06$), $t(190) = 16.59$, $p < .001$ (see Figure 1). Insufficient data on children's speaking voice range was gathered across all groups. Consequently, these data have not been included in this analysis.

Gender. Statistical analyses (ANCOVAs) showed no gender differences between boys and girls on both songs.

Age and year level. Multiple regression analyses were conducted to explore the potential developmental influence of age on singing performance. Age was found not to be a factor in improvement for song 1. However, increased age was associated with higher performance scores on the more difficult song 2. This result needs to be interpreted with some caution due to very low numbers of participants in the youngest (4 years old) and oldest (8 years old) age bracket (see Table 2).

Consequently, these findings suggest it more prudent to employ comparisons of children's year level to identify key developmental periods in which singing education might be more effective. Overall improvement in rated singing ability for song 1 was significantly more pronounced for year 1 children ($M = 1.02$, $SE = 0.08$) than either their kindergarten ($M = 0.49$, $SE = 0.08$), $t(222) = 4.72$, $p < .001$, or year 2 counterparts ($M = 0.49$, $SE = 0.11$), $t(222) = 3.94$, $p < .001$ (see Figure 2). Similarly for song 2, year 1 participants ($M = 0.89$, $SE = 0.06$) outperformed both the kindergarten ($M = 0.36$, $SE = 0.07$), $t(222) = 5.56$, $p < .001$, and year

Table 1. Singing tests and survey demographics by treatment group, gender, ethnicity, year level, school and socio-economic index.

Variable	Categories/ levels	Frequency	Percent
Treatment group	Control	55	18.84
	Treatment	237	81.16
Gender	Male	144	49.32
	Female	148	50.68
Ethnicity	Oceania	126	43.15
	North Africa or Middle East	48	16.44
	North-East Asia	44	15.07
	Southern or Central Asia	33	11.30
	South-East Asia	17	5.82
	South-Eastern Europe	10	3.42
	North-West Europe	6	2.05
	Sub-Saharan Africa	6	2.05
	Americas	2	0.68
Year	Kindergarten	92	31.51
	Year 1	125	42.81
	Year 2	75	25.68
School	School 2	56	19.18
	School 5	50	17.12
	School 1	47	16.10
	School 7 (Music Specialist School)	43	14.73
	School 4	43	14.73
	School 3	38	13.01
	School 9	9	3.08
	School 8	6	2.05
Socio-economic	1	50	17.12
Index	2	0	0.00
(Based Upon	3	6	2.05
Deciles Set by	4	52	17.81
the Australian	5	0	0.00
Bureau of Statistics)	6	47	16.10
	7	0	0.00
	8	56	19.18
	9	43	14.73
	10	38	13.01

Note. $N = 292$. Percentages may not add up to 100.00% across categories within a demographic variable due to rounding. Decile 1 = most disadvantaged; decile 10 = most advantaged.

2 children ($M = 0.47$, $SE = 0.10$), $t(222) = 3.70$, $p < .001$, in terms of rate of singing improvement shown from pre- to post-intervention (see Figure 2).

Socio-economic index. ANCOVAs showed that children from schools falling in socio-economic decile 4 (relative deprivation) displayed significantly larger rates of singing improvement over time on song 1 than their counterparts from schools within deciles 1, 6, or 8. Participants attending schools within socio-economic decile 10 also demonstrated superior singing

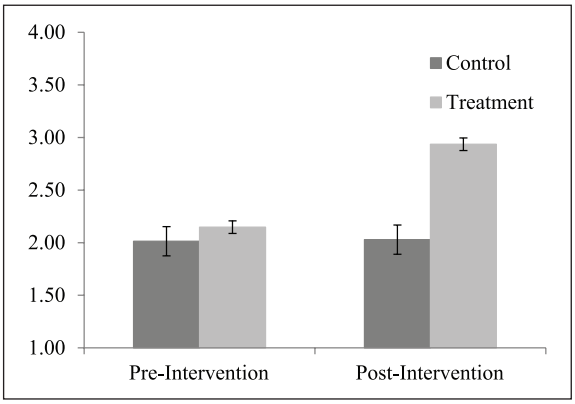

Figure 1. Mean ratings of student singing ability according to time of assessment, as moderated by intervention group. Error bars represent standard errors. Comparisons were performed between the pre-intervention and post-intervention time points within each of the control and treatment intervention conditions. * $p < .05$ ** $p < .01$ *** $p < .001$.

Table 2. Descriptive statistics for improvement in rated singing ability on song 2 according to age.

Age (in years)	*n*	*M*	*SE*
4	1	1.00	0.00
5	73	0.41	0.09
6	84	0.76	0.07
7	62	0.68	0.09
8	4	0.25	0.25

improvement rates than those from schools within either deciles 1 or 8. Findings for song 2 were similar, with the school from decile 6 also showing outstanding results (see Figure 3).

Student survey results

Change in general attitudes towards music and singing. The analysis was restricted to those children who had been in classes experiencing the mentoring program, as no control group children completed the survey at the second time point. A paired samples *t*-test was conducted comparing pre-intervention to post-intervention attitude levels. However, it should be noted that very few post surveys were returned and that post-intervention data was supplied only by schools in deciles 4 and 10. Results showed that attitudes towards music expressed by children following intervention ($M = 2.52$, $SE = 0.04$) were significantly more positive than those recorded prior ($M = 2.42$, $SE = 0.04$), $t(54) = 2.92$, $p = .005$, $\eta^2 = .14$ (see Figure 4). Therefore, the intervention appears to have been successful at promoting enhanced positive attitudes toward music.

Gender. An independent samples *t*-test assessing the effect of gender on pre-intervention attitudes revealed that girls ($M = 2.55$, $SE = 0.02$) reported significantly more positive general baseline attitudes toward music than boys ($M = 2.38$, $SE = 0.03$), $t(204) = 4.80$, $p < .001$, $\eta^2 = .10$ (see Figure 5).

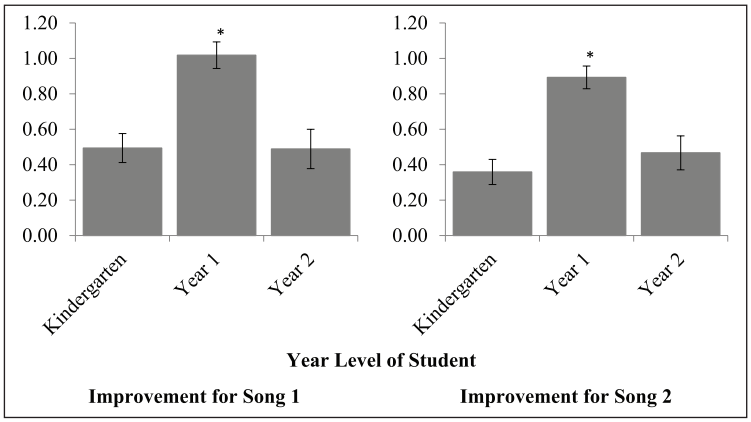

Figure 2. Improvement in rated singing ability on song 1 and song 2 according to student year level. Error bars represent standard errors. Comparisons were conducted among all year levels. * Denotes significant results once the $\alpha = .05$ critical level was adjusted via the Holm-Bonferroni technique to compensate for multiple comparisons on overall family-wise error rate.

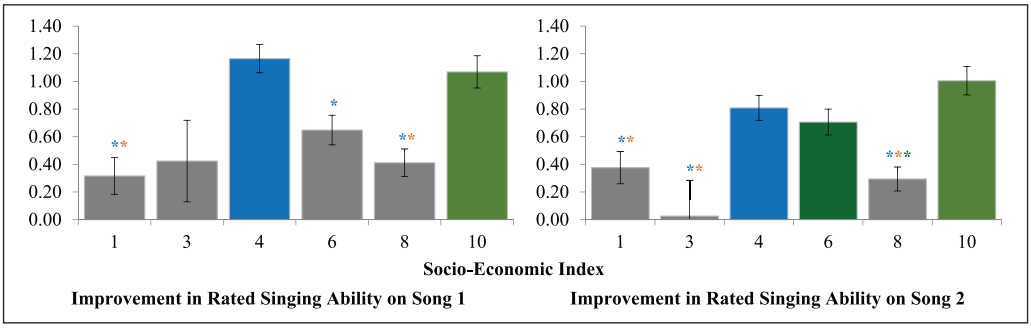

Figure 3. Mean improvement in student singing ability on song 1 and song 2 based on school socio-economic decile. Error bars represent standard errors. Comparisons were conducted among all decile category levels. * Denotes significant results once the $\alpha = .05$ critical level was adjusted via the Holm-Bonferroni technique to compensate for multiple comparisons on overall family-wise error rate. Decile groups denoted by an asterisk differed significantly from the group with a mean bar of the same color.

However, post-mentoring survey results demonstrated a similar rate of increase in positive attitudes toward music by both boys ($M = 0.09$, $SE = 0.06$) and girls ($M = 0.11$, $SE = 0.04$), where an independent samples t-test upon the attitude change scores showed no significant gender effect, $t(53) = -0.33$, $p = .744$, $\eta^2 < .01$.

Age and school year level. Investigation of the developmental impact of age on general music attitudes showed that younger age was associated with more positive overall views concerning music, $R^2 = .04$, $F(1, 204) = 7.74$, $\beta = -.19$, $p = .006$. However, age was not a significant predictor of the change in attitudes to music following intervention, $R^2 = .004$, $F(1, 53) = 0.22$, $\beta = -.06$, $p = .641$. This suggested that it may be more appropriate to explore this developmental effect not through use of a continuous variable such as age, but rather through a

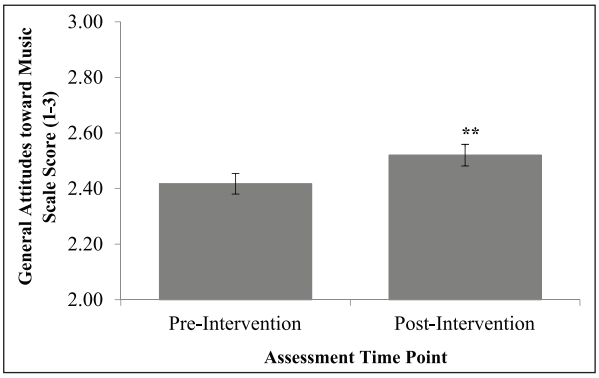

Figure 4. Mean expressed positive attitudes regarding music at each assessment time point. Error bars represent standard errors. * $p < .05$ ** $p < .01$ *** $p < .001$.

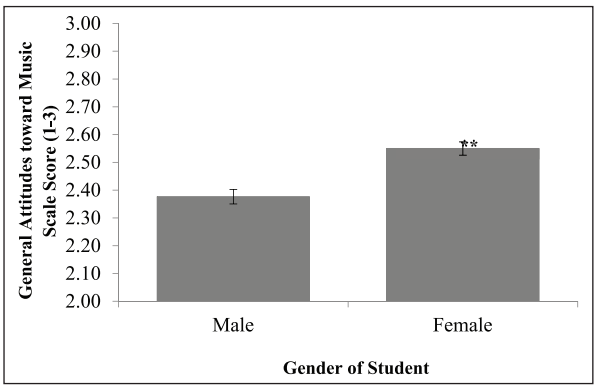

Figure 5. Average positive attitudes toward music at pre-intervention, broken down by student gender. Error bars represent standard errors. * $p < .05$ ** $p < .01$ *** $p < .001$.

categorical one such as year level. A one-way independent samples ANOVA was used to investigate this aspect and showed that year level significantly affected children's baseline general attitudes towards music, $F(2, 203) = 5.55$, $p = .004$, $\eta^2 = .05$. As shown in Figure 6, kindergarteners ($M = 2.61$, $SE = 0.05$) were found to express more favorable attitudes overall toward music at pre-intervention than either the year 1 ($M = 2.42$, $SE = 0.03$), $t(203) = 3.30$, $p = .001$, or year 2 children ($M = 2.46$, $SE = 0.03$), $t(203) = 2.42$, $p = .016$.

Socio-economic index. An ANOVA on pre-intervention attitudes revealed that the positivity of baseline general viewpoints regarding music varied significantly among the socio-economic index deciles, $F(5, 200) = 5.13$, $p < .001$, $\eta^2 = .11$. A series of post hoc *t*-tests were employed among each possible pairing of the decile levels. As shown in Figure 7, children who attended schools that fell within socio-economic decile 1 ($M = 2.59$, $SE = 0.05$) reported significantly more positive general attitudes about music than their peers from schools in either decile 6 ($M = 2.31$, $SE = 0.05$), $t(200) = 4.34$, $p < .001$, or decile 4 ($M = 2.39$, $SE = 0.05$), $t(200) = 3.11$, $p = .002$. Further, children attending schools within socio-economic decile level 8 ($M = 2.54$, $SE = 0.04$) also expressed more favorable music attitudes than their counterparts in

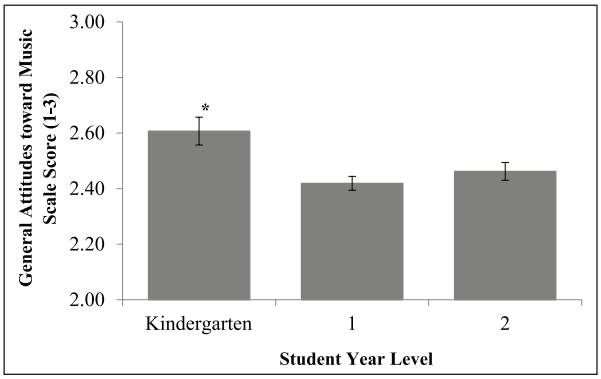

Figure 6. Mean general positive attitudes to music at pre-intervention assessment, according to student year level. Error bars represent standard errors. Planned comparisons were performed among all year levels, each at $\alpha = .05$. * $p < .05$ ** $p < .01$ *** $p < .001$, where the most conservative significance level was denoted to mark group differences.

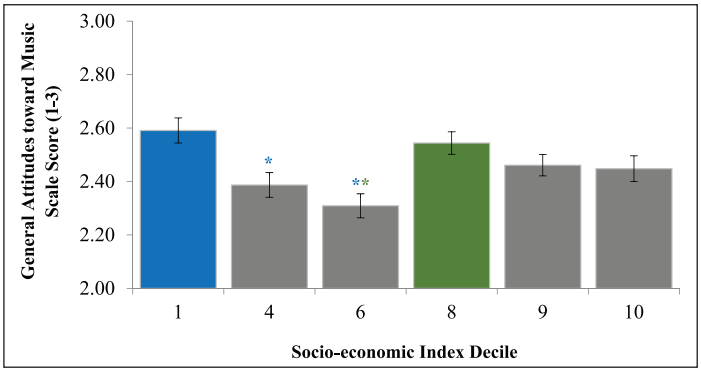

Figure 7. Average pre-intervention music attitude scores based on school socio-economic decile. Error bars represent standard errors. Comparisons were conducted among all index decile levels. * Denotes significant results once the $\alpha = .05$ critical level was adjusted via the Holm-Bonferroni technique to compensate for multiple comparisons. Decile groups denoted by an asterisk differed significantly from the group with a mean bar of the same color.

decile 6, $t(200) = 3.77$, $p < .001$. The remainder of contrasts produced non-significant results after adjusting the α critical level for multiple comparisons, $ts < 2.53$, $ps > .012$.

A second one-way independent samples ANOVA on change scores, however, revealed that the socio-economic standing of the school did not impact significantly on the improvement rate of positive music attitudes from pre- to post-intervention, $F(1, 53) = 0.0002$, $p = .988$, $\eta^2 < .01$. However, it should be noted that post-intervention data was supplied only by schools in deciles 4 and 10.

Discussion

The study investigated the nature of the impact of the mentor-supported, generalist teacher-led music program in early childhood school settings on children's singing skills and attitudes to

music. The findings suggest that the intervention had been successful, with children whose teachers participated in the teacher-mentoring program demonstrating significant improvement, regardless of gender, with children in the control group showing no improvement over time. The positive results of this program are in line with previous research on singing interventions (Welch et al., 2010; Welch et al., 2014; Demorest et al., 2017; Runfola & Etopio, 2012). However, the findings contradict a number of gender-focused studies that showed girls outperforming boys in early music outcomes (Mang, 2006; Roberts, 2016; Saunders et al., 2010).

Children in year 1 produced superior rates of singing ability improvement over time on both the easier song 1 and the more challenging song 2, in comparison to their kindergarten and year 2 counterparts. This may imply perhaps that there may be a developmental window at this age for music learning, although this is not particularly evidenced in the research literature where music learning is typically reported at all ages across childhood (Saunders et al., 2010), or no differences are reported between different year levels (Roberts, 2016).

This age effect in favor of year 1 children might be masking a more important, and perhaps relevant, finding that there may be a greater chance of nurturing children's singing development at an age before musical identities as singer/non-singer become entrenched. Such an interpretation is in line with the research data from a large-scale study in England involving over 11,000 children (Welch et al., 2010). Here, nationwide singing pedagogy interventions had the greatest impact on the youngest age groups (ages 4–8) compared with older children.

Overall, the inference from the socio-economic data is that successful singing development can be nurtured irrespective of children's relative levels of deprivation. This finding is supported by recent Australian research (McPherson et al., 2015; Osborne, McPherson, Faulkner, Davidson, & Barrett, 2016) that evaluated the impact of music programs in low socio-economic schools. The generalist teachers of the schools in deciles 4 and 10 had the same mentor, perhaps implying that the results for socio-economic index for song 1 are more likely reflective of the skill and expertise of the intervention facilitator in question, than of any socio-economic advantage or disadvantage experienced by the schools. Similarly, results for song 2 highlight the expertise of another mentor who was solely responsible for mentoring of all participants falling into decile 6. This lends strength to our finding that quality music education can produce positive music outcomes for children regardless of the socio-economic background.

Children's participation in the mentoring program classes increased positive general attitudes toward music, regardless of gender, or socio-economic standing of the school. This result is in line with previous research that highlighted the impact of school-based music activities on children's social and life skills (Rabinowitch, Cross, & Burnard, 2013; Rickard et al., 2013; Rinta, Purves, Welch, Elmer, & Bissig, 2011; Welch et al., 2014). There was an effect of gender on baseline attitudes, but not on attitude change. The higher starting baseline for girls has been highlighted by the literature (Roberts, 2016; Saunders et al., 2010; Sergeant & Welch, 2009). Our study demonstrates that, despite this, the rate of increase in positive attitudes toward music due to the mentoring context was equivalent for both boys and girls.

Despite the higher baseline positive attitudes toward music in younger children, as previously flagged by research (Roberts, 2016; Saunders et al., 2010) age did not influence the rate of increase in positive music attitudes seen following intervention. There was an effect of year level on the pre-intervention scores, where kindergarteners showed more positive general baseline attitudes towards music than either their year 1 or year 2 counterparts. This may be explained by an increased interest in other life areas introduced in the formal schooling years that may overshadow music.

No clear pattern emerged regarding differences in attitudes towards music with regard to the socio-economic index, and the attitudes did not change over the mentoring period. This finding

is limited because the only participants to supply appropriate post-intervention data came from the deciles 4 and 10, thus restricting any strong conclusions that can be drawn about the effect of educational socio-economic standing on student music attitude change over time.

Conclusions

This study provides evidence that a mentored, generalist teacher-led music program in early childhood education settings can positively impact young children's singing skills and attitudes to music. Children's singing improved regardless of gender or socio-economic standing of the school. Overall, the intervention was also successful at improving general positive attitudes toward music in children, whilst noting that there was a general bias towards reasonably positive attitudes at baseline. Further, these attitude improvement rates were generalizable across gender, age, and socio-economic standing of the school and not limited to specific sub-groups.

Overall, the findings suggest that employing specialist music mentors to guide and support generalist teachers in an intensive program can deliver positive changes in their students' singing skills and attitudes to music. The presence of a formal mentoring program, as exampled by the NMTMP, can greatly enrich provision and, arguably, make excellent use of relatively sparse specialist expertise across a broad school population. Whatever the school context, there is a growing wealth of research evidence to suggest that sustained successful music education can provide wider benefits for all children, socially, emotionally, and intellectually. The results of this intervention study provide further empirical evidence of the benefits accessible in music, as well as, by implication, that are likely to accrue through music.

This study evaluated the effectiveness of a pilot music mentoring program in formal education settings with young children. A national rollout of the scheme is now in progress. Future evaluations of larger numbers of children across the nation will provide more detailed and nuanced findings that will enhance music educators' understanding of best-practice approaches to developing singing skills in children and fostering their love of music. Future research could also focus on developing suitable interventions for the middle primary years as, although teachers and students may face different challenges during this period, the issues of generalist (non-specialist) teachers' confidence and perceptions of appropriate expertise in music education are commonplace.

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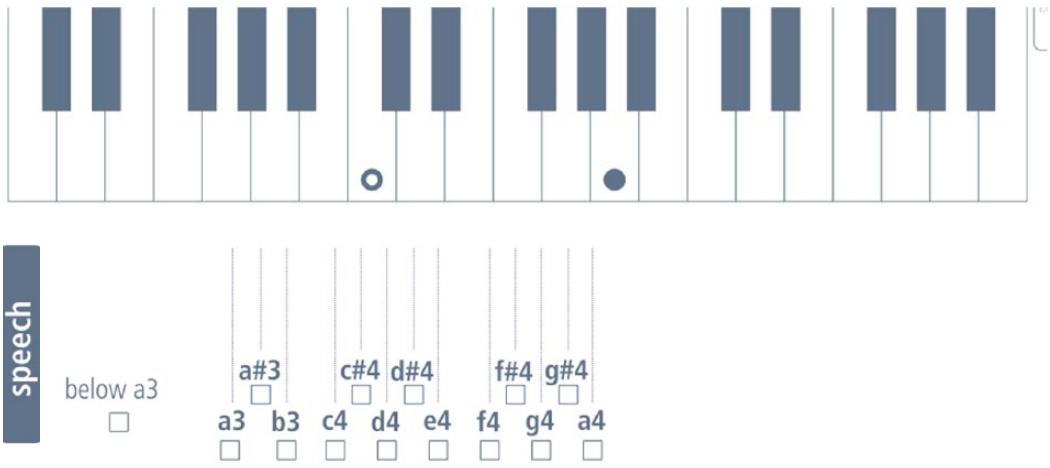
Appendix A. Student singing assessment.

School	Student Initials	
Year	Student DOB	__/ __ / __
Class Name	Student Gender	M F
Date	Special Needs	
Administered by	Ethnicity	



Speech-Centre Test: Ask the student to count backwards from 10 to get a sense of their speaking pitch (expected to be around middle C [C_4] and up to the E above middle C [E_4]). The marks on the keyboard are for reference and indicate Middle C (hollow circle) and concert A (filled circle).

Singing Test: no starting note is given; student is asked to sing alone.

Singing Assessment Criteria (after Welch, 1998).

1 The words of the song appear to be the initial centre of interest rather than the melody, singing is "chant-like," employing a restricted pitch range and melodic phrases. Descending patterns tend to predominate.

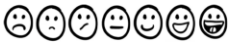
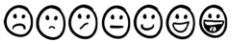
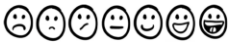
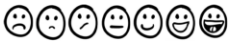
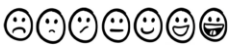
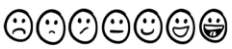
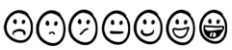
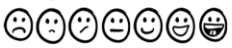
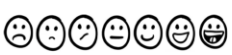
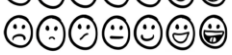
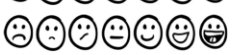
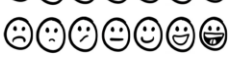
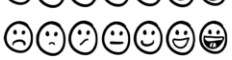
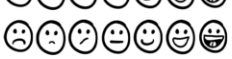
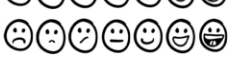
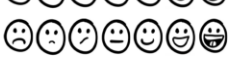
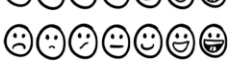
2 Sung melody outline begins to follow the general contours of the target melody and its phrases. Pitch range in singing expands.

3 Melodic shape and intervals are mostly accurate, but some changes in tonality may occur. Overall, the number of "different" pitches is much reduced.

4 No significant pitch or rhythm errors.

Appendix B. Class survey (developed by Author 4).

School	Student Initials	
Year	Student DOB	__/ __ / __
Class Name	Student Gender	M F
Date	Special Needs	
Administered by	Ethnicity	

1	I feel good about myself	
2	The boys in my class are better at music than the girls	
3	I like the music that I make at school	
4	I like making music	
5	Singing is fun	
6	I like listening to music	
7	I have many friends	
8	Members of my family tell me I am good at music	
9	I sing at home	
10	My friends teach me songs	
11	I like making music with my friends	
12	I like singing in the playground	
13	Singing is easy	
14	I am the best singer in my class	
15	Singing is something that everyone can do	
16	Singing makes me feel happy	
17	I prefer to sing on my own	
18	I find reading easy	
19	I like going to school	
20	Writing is hard	
21	I feel left out of things at school	
22	I am a friendly person	
23	I am very happy	
24	My body is healthy