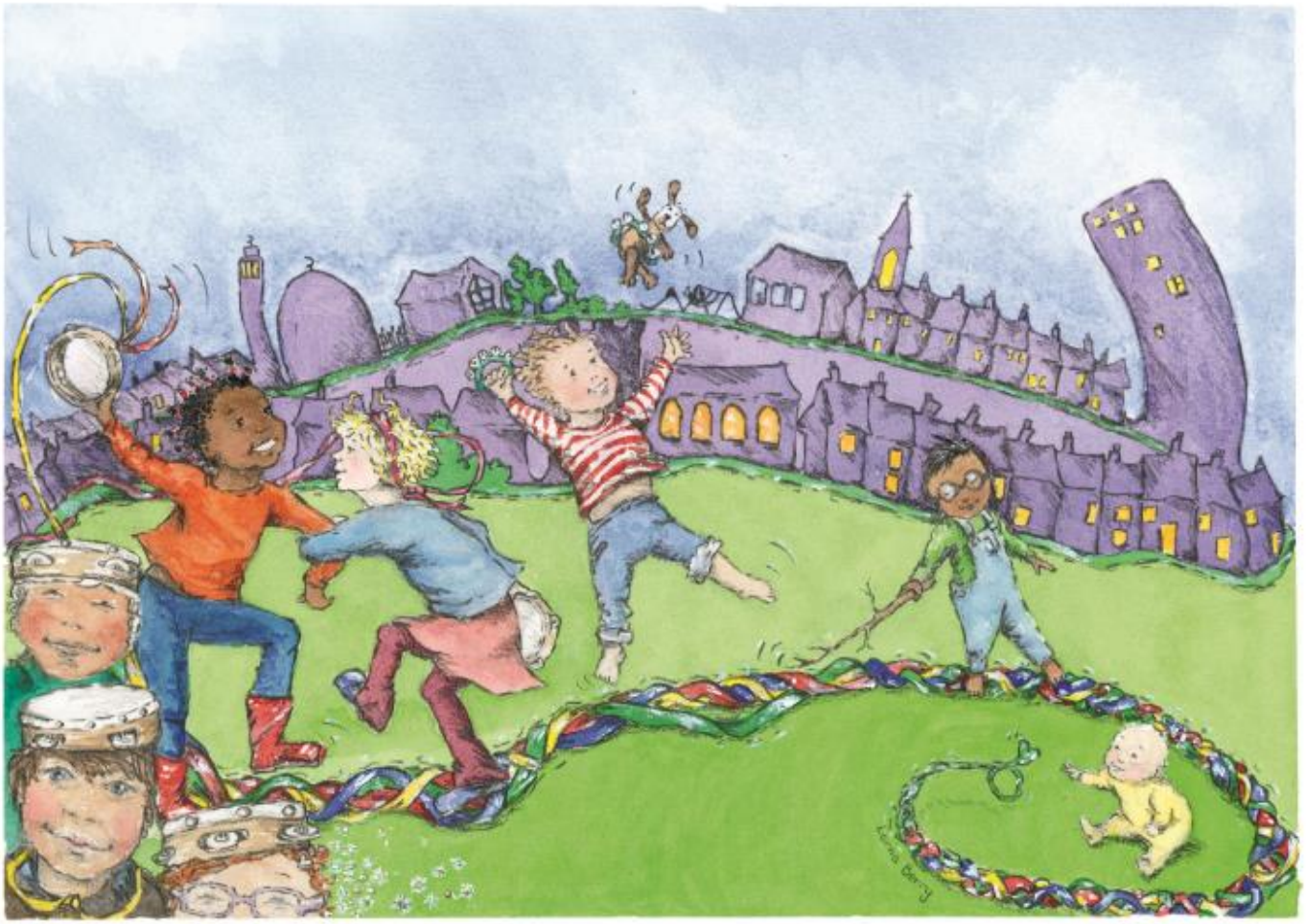
# MERYC2017



**Proceedings of the 8th Conference of the European Network of Music Educators and Researchers of Young Children**
**20th – 24th June 2017, Cambridge, UK**

# MERYC2017

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Cambridge, UK

Edited by Jessica Pitt and Alison Street

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We are grateful to Prof Pam Burnard for her unfailing enthusiasm and positive support, and to the schools and settings who have opened their doors for visitors

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# The influence of two song-teaching strategies on vocal performance in 6 to 7 year-old children and its relationship with their use of voice registers

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## Abstract
Research on the influence of teaching songs with melody and words or with the melody sung with a neutral syllable, adding the words later, on children's vocal performances has not been addressed in depth (Jacobi-Karna, 1996). Furthermore, research on vocal development has shown that singing is also affected by children's ability to access their full voice (Rutkowski, 2015; Welch, 2006). However, even when the full register is accessed, singing accuracy may be compromised due to a vocal-motor deficit.

This study aims to determine (a) if children sing better depending on the teaching strategy, (b) if the inaccurate first pitches for both songs fall into the registers of the children's Singing Voice Development Measure (SVDM) classification, and (c) if there is a relationship between the tonal dimension scores for both songs and SVDM classification.

Children aged 6 to 7 (N=49) attending a private school in an urban area participated in a two-phase study. Phase one occurred over a period of eight weeks in regular music sessions presenting a song A with melody and words and a song B with a neutral syllable, adding the words after five sessions. Phase two consisted of individual singing of both songs with the teacher providing an auditory cue.

Inter-judge reliabilities on rating scales were high (song A: ICC(3, k) = .928; song B ICC(3, k) = .885). Results showed no significant differences between the mean of ratings on both songs ($t_{(48)}$= -.563; $p$= .288). A closer comparison revealed different singing achievements: better on song A (22.4%), better on song B (24.5%) and no relevant differences (53.1%). 89.8% of the inaccurate first pitches fell into the range measured by SVDM, with 30.4% of the children classified as singers. There was a positive correlation between the tonal dimension scores and SVDM classification (song A: $rho_{(49)}$ = .558, $p$ < .001; song B: $rho_{(49)}$ = .385, $p$ < .05).

The song-teaching strategy is relevant when considering individual differences, suggesting that vocal performance can be improved depending on it. Results suggest that children can be more accurate if they sing in their usable voice register. Tonal achievement on song B is less related to SVDM classification.

### Keywords
Children's vocal performance, performance rating scales, Singing Voice Development Measure, song-teaching strategies, vocal-motor deficit

## Background
In music education, numerous studies have focused on children's ability to sing in tune, investigating the influence of a wide variety of factors (for a

literature review, see Hedden, 2012). Research on the influence of teaching songs with melody and words or with the melody sung with a neutral syllable, adding the words later, on children's vocal performances has not been addressed in depth (Goetze as cited in Phillips, 1989; Jacobi-Karna, 1996; Levinowitz, 1989; Welch, Sergeant, & White, 1998). Findings are inconclusive and, in some cases, contradictory. However, presentation and response variables vary substantially between studies. For example, Levinowitz (1989) presents a song with words and a song without words, asking kindergarten children to sing the songs as taught in music sessions. On other hand, Goetze (as cited in Phillips, 1989) presents 2 songs with words, asking the participants (kindergarten, first-, and third-graders) to sing those songs first with words and after without words. In both cases, results were similar: children sing more accurately without words (using a neutral syllable) than with words.

For the purpose of this study and in order to provide more insight into the influence of teaching songs with or without words, children will be asked to sing songs as it were presented in classroom.
However, research on vocal development has shown that singing is also affected by children's ability to access their full voice range(Rutkowski, 2015; Welch, 2006). In the past decades, two independent measures of children's singing development were developed and have been widely used: the Singing Voice Development Measure (SVDM) by Joanne Rutkowski and the Vocal Pitch-matching Development (VPMD) by Graham Welch (e.g., Rutkowski & Chen-Hafteck, 2001; Welch *et al*., 2008). So, as in Welch et al. (2008), the present study intended to create an initial baseline profile for each participant, measuring their use of voice registers using the SVDM.

Nonetheless, even if children access all their voice registers, singing accuracy may be compromised due to different sources, namely the motor and sensorimotor, memory, imitative, motivation, or perceptual, referred to as models for poor-pitch singing (Hutchins & Peretz, 2012; Pfordresher & Brown, 2007).

One of the explanations for the vocal motor deficit is related to the inability to control one's vocal tract apparatus, despite their ability to use the vocal register of the pitches to imitate or produce (Hutchins & Peretz, 2012). Yet, if a child is not able to use all the voice registers, it is possible that she has a good-pitch singing in her comfortable singing range. On the other hand, singing inaccuracy can also be observed if there is has a lack of detail in the representation of the song musical structure in memory (Pfordresher & Brown, 2007). To this matter, it is interesting to investigate the influence of two song-teaching strategies, where the interaction between words and melody is taken into account. Therefore, this study will focus on the motor and memory deficit, crossing over children's ratings on two songs and their SVDM classification.

## Aims

The purpose of this investigation was twofold. First, this study examined if first and second graders' vocal performance of two songs was influenced by two different teaching strategies. Second, to investigate the relationship between children's tonal achievement in both songs and the use of their singing voice as measured by the Singing Voice Development Measure (SVDM).

The specific goals of this study were (a) to determine if children sing better depending on the teaching strategy, (b) to find out if the inaccurate first pitches for both songs fall into the registers of the children's Singing Voice Development Measure (SVDM) classification, (c) to determine if there is a relationship between singing (in)accuracy for the first pitch and the tonal dimension scores for both performance rating scales, and (d) to find out if the tonal scores for both songs are related to the SVDM classifications.

## Method

### *Participants*

Forty-nine children aged six to seven attending a private school in an urban area (Lisbon) and belonging to families with medium/high income levels participated in this two-phase study.

### *Materials*

The songs used in this investigation were song A (always taught with words and melody) and song B (taught with neutral syllable, words added later).

Figure 1. Song A.

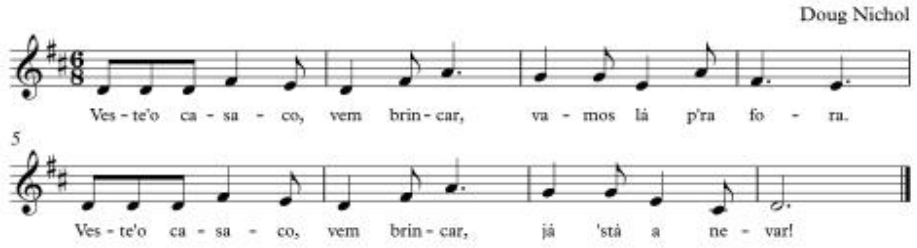
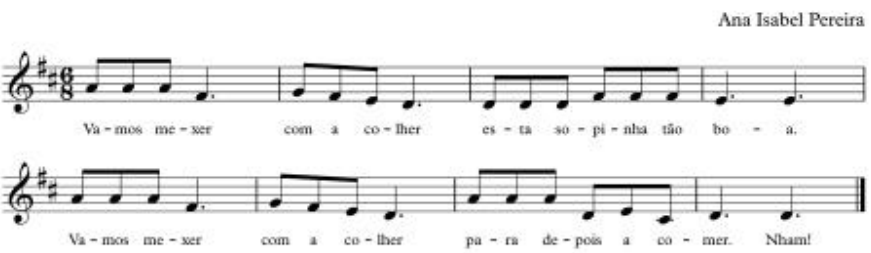





Figure 2. Song B.



A performance rating scale was developed for each song. These scales are additive.

Figure 3. Performance rating scale for song A.

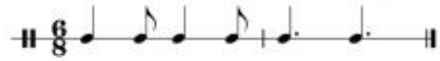
**Tonal dimension**

a. First pitch is accurate (according to the auditory cue provided) (bar 1)
b. Tonic function pattern is accurate (bar 2)
c. Dominant function pattern to tonic resolution are accurate (bars 7-8)
d. Phrase a is acurate (bars 1-4)
e. Phrase b is acurate (bars 5-8)

**Rhythm dimension**

a. Consistency of tempo is maintained throughout phrase a (bars 1-4)
b. Consistency of tempo is maintained throughout phrase b (bars 5-8)
c. Rhythm pattern is accurate (bars 1-2)

d. Rhythm pattern is accurate (bars 3-4)



e. Rhythm pattern is accurate (bars 7-8)

Figure 4. Performance rating scale for song B.

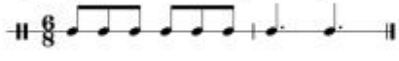
**Tonal dimension**

a. First pitch is accurate (according to the auditory cue provided) (bar 1)
b. Dominant-tonic interval is accurate (bar 7)
c. Leading tone – tonic interval is accurate (anacruse to bar 8)
d. Phrase a is acurate (bars 1-4)
e. Phrase b is acurate (bars 5-8)

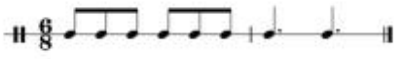
**Rhythm dimension**

a. Consistency of tempo is maintained throughout phrase a (bars 1-4)
b. Consistency of tempo is maintained throughout phrase b (bars 5-8)
c. Rhythm pattern is accurate (bars 1-2)

f. Rhythm pattern is accurate (bars 3-4)



g. Rhythm pattern is accurate (bars 7-8)



The Singing Voice Development Measure is described in Rutkowski (2015).

### *Procedure*

Phase one (instruction phase) occurred over a period of eight weeks in regular music sessions presenting two unfamiliar songs. Two teaching strategies were used: song A was taught with melody and words during the eight sessions and song B was taught with a neutral syllable, adding the words after five sessions. The instruction of both songs took 15 minutes of each session. Songs were similar in tonality (major), meter (duple), length and range ($C\#_3$–$A_3$; $A_3$ = 440 Hz).

In phase two (test phase), participants were individually asked to perform two singing tasks: (a) to sing both songs with the teacher providing an auditory cue and (b) to echo eight three-tone patterns, one pattern at a time, sang by the music teacher. As recommended by Joanne Rutkowski, the author of the tool to measure children's use of singing voice (not vocal accuracy), those patterns were echoed with the text and with the neutral syllable "bá" (half of the children echoed all patterns with text first, the others with the neutral syllable first). For the purpose of this study, only the results of the assessment for the text patterns were considered.

Children's singing voices were audio recorded as each sang individually, after being escorted to a private room at their school.
Three independent judges—music educators who work regularly with these grades —rated children's performances using a researcher-developed performance rating scale for each song. Each scale comprised tonal and rhythmic dimensions with five criteria each. They also rated the children's use of their singing voice (voice registrations) using the SVDM.

## Results

### *(a) Do children sing better depending on the teaching strategy?*

Inter-judge reliabilities were high for both rating scales (song A: ICC(3,k)= .928; song B: ICC(3,k)= .885). T-test results for paired samples revealed no significant differences between the mean scores of song A and B (song A: M = 7.04, SD = 2.52; song B: M = 7.19, SD = 2.37) [$t_{(48)}$ = -.563; $p$ = .288]. Nevertheless, the means for each song reveal that there is a tendency for this age group to perform better on song B (the song first taught with neutral syllable, adding the words later).
To find out if there were individual differences between vocal performances of song A and B, we calculated the difference between both mean scores (M = -.15, SD = 1.86) for each child. Since possible scores ranged from -4.33 and 4.33 and SD was high, we considered the scale unit (= 1.00) to define three groups when analyzing the difference between means. Criteria established were: a better performance for song B if $\bar{c}_A - \bar{c}_B \leq -1.00$; no relevant differences if $-1.00 < \bar{c}_A - \bar{c}_B < 1.00$; and better performance for song A if $\bar{c}_A - \bar{c}_B \geq 1.00$). Results revealed that 22.4% of the participants (N = 11)

performed better on song A, 24.5% performed better on song B (N = 12) and 53.1% showed no relevant differences between both songs (N = 26).

### *(b) Do inaccurate first pitches for both songs fall into the registers of the children's Singing Voice Development Measure (SVDM) classification?*

Inter-judge reliabilities for the SVDM classifications were high (ICC(3,k)= .942), indicating that the judges used the measure in a consistent manner. An index was computed based on the mean of the three judges scores (M = 4.26, SD = 0.85). Table 1 shows the distribution of children according to their SVDM classification (the index was recoded in order to maintain the same classification levels).

Table 1. SVDM Classification.

| SVDM classification | N | Percent (%) |
|---|---|---|
| 1.5 (Inconsistent speaking range singer) | 1 | 2.0 |
| 2.5 (Inconsistent limited range singer) | 3 | 6.1 |
| 3 (Limited range singer) | 1 | 2.0 |
| 3.5 (Inconsistent initial range singer) | 7 | 14.3 |
| 4 (Initial range singer) | 8 | 16.3 |
| 4.5 (Inconsistent singer) | 6 | 12.2 |
| 5 (Singer) | 23 | 46.9 |
| Total | 49 | 100.0 |

According to the SVDM classification only four children (8.2%) would not be able to sing the first pitch of song B, which falls into a register that they cannot access yet (SVDM ≤ 3) and one child (2.0%) would not be able to sing both pitches (SVDM ≤ 1.5). All the other participants (89.8%) have access to the register of both first pitches ($D_3$ for song A and $A_3$ for song B).

Nevertheless, the scores on the first criteria of the tonal dimension for both rating scales revealed that 13 children (26.5%) did not sing $D_3$ accurately (song A) and that 21 children (42.9%) did not sing $A_3$ accurately (song B). Table 2 shows the inaccurate pitches sang by children, even after an auditory cue was provided, and their SVDM classification. If the pitch was accurate it is not mentioned on the table.

Table 2. First pitch sang for song A and B and the SVDM classification.

| Participant | song A pitch | song B pitch | SVDM classification | |
|---|---|---|---|---|
| #5 | $A_2$ | $E_3$ | 2.5 | Inconsistent limited range singer |
| #6 | - | $G_3$ | 4 | Initial range singer |
| #7 | $Bb_2$ | $D_3$ | 1.5 | Inconsistent speaking range singer |
| #8 | $Eb_3$ | $E_3$ | 2.5 | Inconsistent limited range singer |
| #10 | - | $G\#_3$ | 5 | Singer |
| #11 | $A_2$ | $D_3$ | 3.5 | Inconsistent initial range singer |
| #13 | $B_2$ | $F\#_3$ | 3.5 | Inconsistent initial range singer |
| #14 | $C_3$ | $F\#_3$ | 5 | Singer |
| #15 | $C_3$ | $G_3$ | 3 | Limited range singer |
| #16 | - | $F_3$ | 5 | Singer |
| #17 | $C_3$ | - | 4.5 | Inconsistent singer |
| #18 | - | $G\#_3$ | 4.5 | Inconsistent singer |
| #21 | - | $G_3$ | 3.5 | Inconsistent initial range singer |
| #24 | $Bb_2$ | $D_3$ | 2.5 | Inconsistent limited range singer |
| #25 | $C_3$ | $C\#_3$ | 5 | Singer |
| #27 | - | $G\#_3$ | 4 | Initial range singer |
| #28 | $C_3$ | $G_3$ | 4 | Initial range singer |
| #36 | $C_3$ | $G\#_3$ | 4 | Initial range singer |
| #39 | - | $F_3$ | 5 | Singer |
| #42 | $C_3$ | - | 5 | Singer |
| #45 | - | $G\#_3$ | 4 | Initial range singer |
| #47 | - | $G_3$ | 4 | Initial range singer |
| #48 | - | $G_3$ | 5 | Singer |

As shown in table 2, 11 children did not sing accurately both pitches, two children did not sing accurately the first pitch on song A and 10 children did not sing accurately the first pitch on song B. Results also show that 30.4% (N = 7) of the children who sang inaccurately were classified as singers by SVDM, 8.7% (N = 2) as inconsistent singers, 26.1% (N = 6) as initial range singers, 13.1% (N = 3) as inconsistent initial range singers, 4.3% (N = 1) as limited range singers, 13.1% (N = 3) as inconsistent limited range singers, 4.3% (N = 1) as inconsistent speaking range singer.

In order to further investigate the relationship between singing the first pitch accurately and the use of children's voice registers (as measured by the SVDM), the means and standard deviations were also calculated for the SVDM classification on both songs, as shown in Table 3 (0 = first pitch is not

accurate; 1 = first pitch is accurate).

Table 3. Means and standard deviations for the SVDM classification related to first pitch accuracy.

| | First pitch | N | Mean | Standard Deviation |
|---|---|---|---|---|
| Song A | 0 | 13 | 3.57 | 1.13 |
| | 1 | 36 | 4.56 | .57 |
| Song B | 0 | 21 | 3.83 | .99 |
| | 1 | 28 | 4.64 | .56 |

Results showed that for both songs, singing the first pitch accurately is related to higher means in the SVDM classification. Also, results revealed a moderate association between the accuracy on first pitch and the SVDM classification for both songs (song A: $Eta_{(49)}$ = .577; song B: $Eta_{(49)}$ = .543).

### *(c) Is there a relationship between singing (in) accuracy on the first pitch and the tonal dimension scores for both performance rating scales?*

In order to investigate the relationship between the accuracy on the first pitch and the other criteria established in the tonal dimension of the performing rating scales (criteria 2 to 5 as shown in figures 3 and 4), we first analyzed the means (and standard deviations) for each song (song A: M = 2.52, SD = 1.56; song B: M = 2.84, SD = 1.27). Results show that tonal achievement in song B is slightly higher. Table 4 shows the distribution of the mean scores on tonal dimension along each song for the first pitch accuracy.

Table 4. Means and standard deviations for the scores on tonal dimension related to first pitch accuracy.

| | First pitch | N | Mean | Standard Deviation |
|---|---|---|---|---|
| Song A | 0 | 13 | 1.08 | 1.21 |
| | 1 | 36 | 3.05 | 1.33 |
| Song B | 0 | 21 | 1.87 | 1.20 |
| | 1 | 28 | 3.56 | 0.75 |

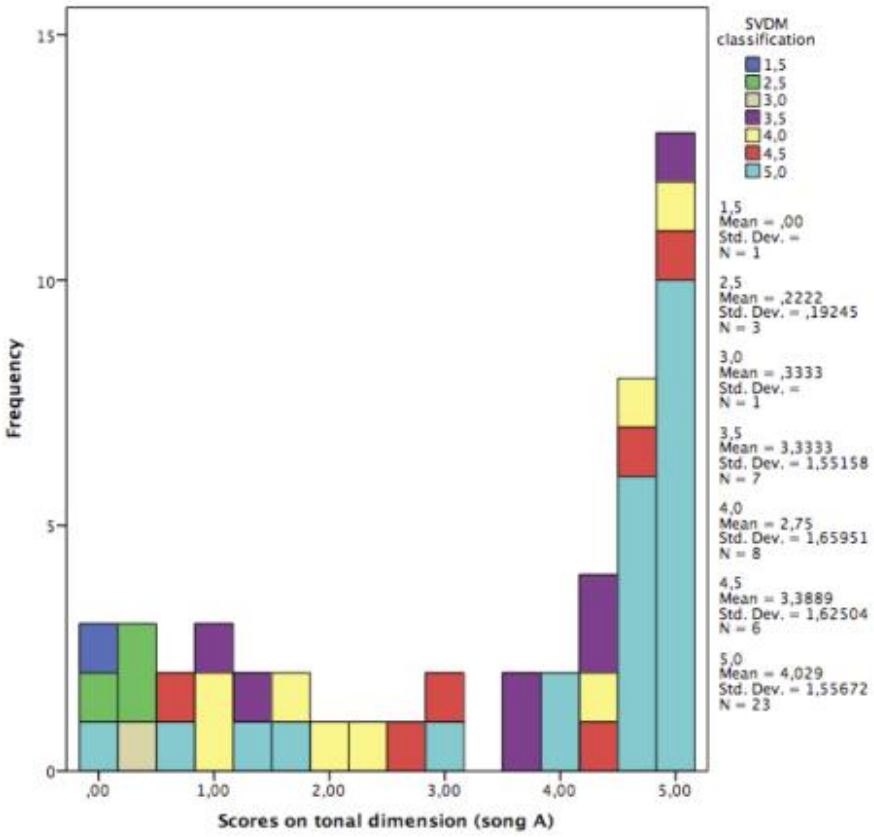
Following the results shown in table 3, also here the means for song B are higher and standard deviations are lower, regardless of the accuracy on the first pitch. Results also indicate a moderate association between the accuracy on first pitch and the tonal scores (criteria 2 to 5) for both songs, and higher for song B (song A: $Eta_{(49)}$ = .565; song B: $Eta_{(49)}$ = .662).

### *(d) Are the tonal scores for both songs related to SVDM*

***classifications?***

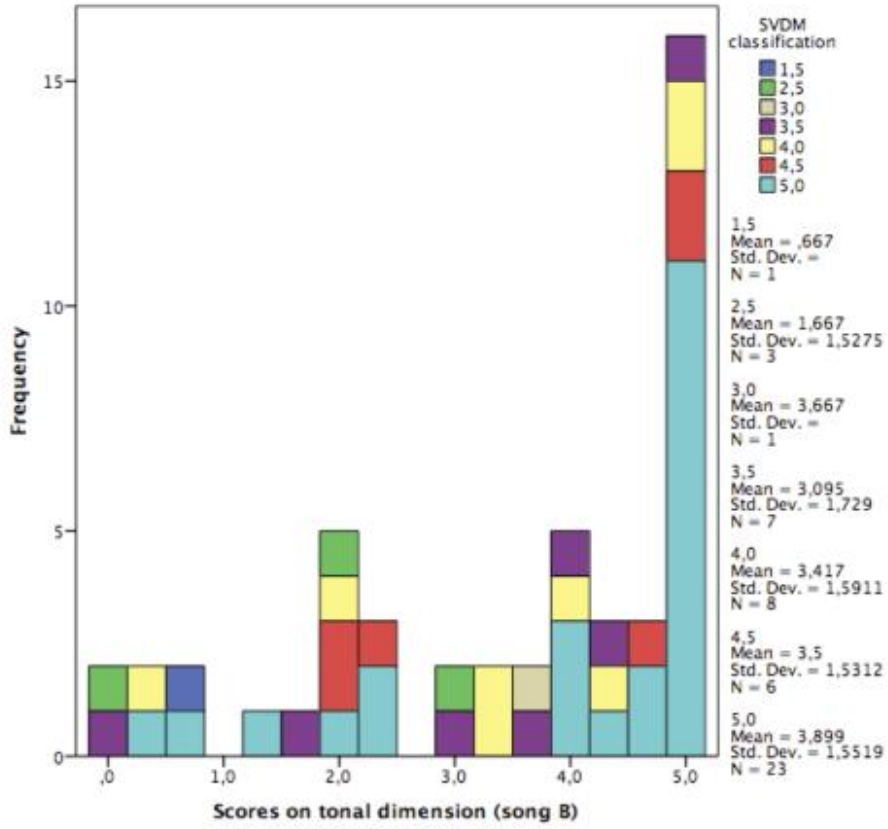
Correlation measures were also calculated to determine the nature of the relationship between children's tonal scores on each song (song A: M = 3.25, SD = 1.84; song B: M = 3.45, SD = 1.63) and their SVDM classification (song A: $rho_{(49)} = .558$, $p < .001$; song B: $rho_{(49)} = .385$, $p < .05$). Correlations were positive and statistically significant indicating a moderate relationship for song A and a weak relationship for song B. Figure 5 and 6 show the distribution of SVDM classification according to the tonal scores on each song.

Figure 5. Distribution of SVDM classification according to the tonal dimension scores for song A.




Results show that the lower SVMD classifications [inconsistent speaking range singer (1.5); inconsistent limited range singer (2.5); and limited range singer (3)] achieved the lowest scores on tonal dimension for song A. We also observe that children classified as singers (5) show scores within a wider range.

Figure 6. Distribution of SVDM classification according to the tonal dimension scores for song B.




For song B, results reveal that children with higher SVDM classifications [inconsistent initial range singer (3.5), initial range singer (4), and singer (5)] are distributed all across the x-axis. To further investigate this relationship, correlation measures were also calculated according to the first pitch accuracy. Thus, measures were calculated for all possible combinations: first pitch accuracy for song A and B = 0 (N = 11); first pitch accuracy for song A and B = 1 (N = 26); first pitch accuracy for song A = 0 and for song B = 1 (N = 2); and first pitch accuracy for song A = 1 and for song B = 0 (N = 10).

Results showed correlations statistically significant in two cases: when children are accurate in both first pitches, and for song A ($rho_{(11)} = .415$, $p < .05$); and when children are accurate in the first pitch of song A but not in the other song, and for song B ($rho_{(10)} = -.644$, $p < .05$). So, in the first case, results indicate that there is a positive and moderate relationship between the SVDM classification and tonal achievement on song B. On the other hand, when children are not accurate in the first pitch of song B but accurate for song A, the relationship between those two variables is negative and moderate, meaning that there is a moderate tendency to get lower scores on the tonal dimension when the SDVM gets higher.

## Conclusions

This study revealed that for this population (6 to 7 –years old) there is no significant relationship between vocal performance on two songs and its

teaching strategy. Yet, findings indicate that individual differences should be accounted for, since there are children who can perform better according to the song. Therefore, it is important to consider teaching songs using both methods, perhaps in a counterbalanced way.

Still, when considering vocal accuracy it is advisable also to measure children's use of their vocal registers (Rutkowski, 2015; Welch, 2006). The results of this study showed that although both songs' pitches fall into the voice registers of 89.8% of the participants, not all of them score high in the tonal dimension. In fact, for both songs, there are children classified as singers (using SVDM) who scored approximately zero in both songs. The opposite is also found, meaning that some children score high in the tonal dimension although classified in a middle SVDM ranking, for example. This suggests that it is possible to be accurate when singing in a comfortable voice register.

On the other hand, results pointed out that there is a moderate association between the singing accuracy in the first pitch and the other criteria on the tonal dimension for both songs. So, there is a tendency to have higher ratings if the first pitch is accurate.
At this point, it should be mentioned that only the first criterion in the tonal dimension of the performance rating scales was designed to take into account the register in which the song was taught.

Nevertheless, there is a tendency to get higher scores in both songs if the SVDM classification is higher, as suggested by the positive and significant correlation measures. Yet, this correlation is weak for song B. This result is reinforced when considering the relationship between the first pitch accuracy and the SVDM classification. For instance, if children did not sing accurately both first pitches or vice versa there was no significant correlation found. So, perhaps there is a slightly different vocal behaviour in song B, meaning that teaching the melody first may help those children who still do not access all their voice registers.

In conclusion, measuring the use of voice registers and vocal accuracy should be used in parallel in order to provide a singing profile for each child. Based on this profile, it should be possible to contribute to more effective singing in terms of individual differences. Further studies should replicate these procedures with different ages. In addition, longitudinal case studies should also be most valuable to further deepen our understanding on these issues.

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