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Effects of Silence, Sound, and Singing on Melodic Dictation Accuracy

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Abstract

This study continues a line of inquiry testing strategies commonly used in melodic dictation. Undergraduate music majors (N = 44) completed short tonal dictations in a within-subjects design to determine effects of silence, audible sounds, and singing on test scores. Participants scored significantly lower when required to sing the melody prior to notating it compared with either of the other conditions. In the singing condition, only 18% of participants sang all target melodies completely correctly, and a significant positive correlation was found between singing accuracy and dictation scores in that condition. In light of previous studies, these results suggest that singing may be a distraction during dictation and that if it is employed for memory reinforcement, it must be executed accurately. The lack of a significant difference in scores between the silent and audible sounds conditions, coupled with the finding that 82% of participants made audible sounds when allowed, suggests that silence should be maintained during dictation when necessary but that students should be allowed to make sounds when feasible. Technological tools could aid instructors in physically isolating students so they do not distract each other during dictation.

Keywords

aural skills, melodic dictation, melodic memory, singing, strategies

High school and college aural skills training in the United States focuses on students' ability to transfer sound to sight and vice versa. For example, dictation requires students to comprehend an aural target and transfer it to notation, error detection requires similar comprehension of an aural target to compare it to given

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notation, and sight-singing requires comprehension of notation to transfer it to vocal sound. These tasks differ in output, but the transfer stage is common to all three. That is, a crucial component of aural skills success is the ability to comprehend a musical passage both visually and aurally and maintain images of both versions clearly enough to reproduce one from a prompt of the other (Foulkes-Levy, 1997).

The voice may be useful for reinforcing the transfer process for dictation skill development. Singing has been shown to help students recall musical themes (McLean, 1999), memorize melodies (Oura & Hatano, 1988; Zielinska & Miklaszewski, 1992), identify intervals (Ponsatí, Miranda, Amador, & Godall, 2016), determine tonal and metric contexts (Karpinski, 2000), and check dictation output (Buonviri, 2014a). More specifically, students may be able to use their voice to reinforce transfer from aural percept to inner hearing (Garner, 2009; Johnson & Klonoski, 2003; Klonoski, 2006), which can serve as a helpful reference during notation.

Pembrook (1986), however, found that when undergraduate music theory students sang back melodies just prior to notating them, their scores after two trials were significantly lower than when they worked in silence. He concluded that singing may have hindered participants because they did not consistently sing the melodies—especially the longer ones—accurately. In a subsequent study, Pembrook (1987) found that undergraduates who compared a second melody to the first immediately or after a 19-second silence aurally identified correct/incorrect pairs more accurately than those who sang the first melody prior to hearing the second. Participants in the third group sang correctly only 11% of the time. In combination with results from his previous study, Pembrook concluded that participants' inaccurate singing hindered their ability to remember and notate the melodies correctly. He found that atonal melodies were especially difficult for participants and recommended that instructors encourage singing as a melodic memory tool only when students can do it accurately consistently. Adapting Pembrook's design to test students with shorter tonal melodies might provide insights about the relationship between singing and dictation that are more relevant to high school and freshman college music students, who typically do not take dictation of long atonal melodies.

Using the voice for dictation does not necessarily imply singing back an entire melody. Vocalization may be helpful to check a specific note or rhythm, reinforce the tonic, or analyze a particular interval. In other words, dictation students may use the voice audibly in a customized way, depending on the target and their comprehension of it. In a study of a small sample of highly successful dictation students, Buonviri (2014a) found that some of them engaged their voice when completing and checking isolated spots of melodic dictations during individual testing. Their choice to do so voluntarily (and successfully) suggests a need to examine specifically the potential effects of using the audible voice freely during dictation. In classroom practice, and especially during testing, students are usually required to be silent during dictation so their peers will be able to focus on their own work without distractions (Klonoski, 2006; Potter, 1990). Many students seem to prefer to make audible sounds, as evidenced by their surreptitious attempts to sing to themselves undetected by their peers and instructor. Testing the efficacy of engaging the voice voluntarily during dictation might offer insights to teachers regarding both instructional strategies and assessment environments in high school and college programs.

Rationale

Results of a previous study in the current line of inquiry (Buonviri, 2015) showed that when students sang a preparatory pattern prior to taking short tonal dictations, they scored lower even though they sang the pattern completely correctly. This prescribed use of the voice seemed to have distracted from students' ability to process and notate the dictation accurately. Combined with Pembrook's (1986, 1987) and Buonviri's (2014a) findings, it seems that testing the effects of singing melodies and making voluntary sounds—using short tonal melodies of parallel length and difficulty—could yield further insights about the efficacy of using the voice as a dictation tool. Specifically, comparing how students perform when allowed to use their audible voice freely and when directed to sing back the melody completely might shed light on how the voice contributes to or detracts from melodic memory and subsequent transcription. Similarly, comparing how students perform when allowed to use their voice audibly and when required to remain silent might help us understand how audible reinforcement of aural percepts affects students' memory of them. The purpose of the current study was to determine effects of participants' silence (no audible sound produced), sound (voluntary audible sounds allowed), and singing (audible repetition of the melody required) on melodic dictation test scores. The primary research questions were: (1) Do dictation students perform better when they maintain silence, make voluntary audible sounds, or sing the melody prior to notation? and (2) What is the relationship between participants' singing accuracy and their dictation scores when required to sing the melody prior to notation?

Method

Participants

Similar to Buonviri's (2015) previous study, participants ($N = 44$) were sophomore, junior, and senior undergraduate music majors. All participants (27 females, 17 males) had passed at least the first two semesters of aural skills at a large university in the northeastern United States. None of them possessed absolute pitch, as confirmed by self-report. All participants had completed periodic solo singing and sight-singing assessments throughout their aural skills coursework.

Design

In a within-subjects design, participants completed short dictations in all three conditions: silence, audible sounds allowed, and required singing before notation. As in the previous study, I counterbalanced the three sets of melodies and order of conditions to maintain internal validity; I administered each test according to a chart of predetermined rotating orders of melodies and conditions to eliminate effects of melody difficulty and testing order. Descriptions of reliability and validity tests for target melodies appear in a previous report (Buonviri, 2015).

Pilot Testing

I adapted all melodies, testing equipment, answer sheets, and scoring procedures directly from a previous study (Buonviri, 2015), with appropriate modifications to the procedural instructions for the three conditions currently examined (answer sheets and target melodies are available as Supplemental Appendices S1 and S2 in the online version of the article). With formal approval from the Temple University Institutional Review Board, I piloted procedures with 10 participants to check clarity of instructions, feasibility of tasks, and scoring of tests. The pilot demonstrated that all aspects of procedures and analysis were working appropriately, initiating formal data collection.

Procedures

Participants completed all dictations individually in one sitting in a small, quiet office with only the researcher in the room. To control for testing fatigue, they heard each melody only once, completing the entire process in approximately 17 minutes. As in the previous study, each condition consisted of four melodies, one for practice and three targets, and all audio instructions and target melodies were self-contained in GarageBand audio files. Three answer sheets, one for each condition, consisted of two notated measures of orienting chord sequence followed by two blank measures of musical staff for each melody.

Instructions for all conditions contained uniform general information for completing the task (for full instructions, see Supplemental Appendix S1 in the online version of the article). The unique language in the instructions for each condition, respectively, was "You must not make any audible sounds as you complete each example" (Condition 1), "You are welcome to make any audible sounds that may help you complete the examples accurately" (Condition 2), and "Sing [the melody] back aloud on any syllable you wish, and then write it in the blank measures of the staff" (Condition 3).

Participants complied with the instructions for all conditions. They produced a wide range of sounds in Condition 2 and sang with a wide range of accuracy in Condition 3. I scored each participant's singing in Condition 3 per beat for data analysis regarding Research Question 2. When finished, participants submitted their answer sheets anonymously in a large folder. As in the previous study, I scored the dictations per beat for rhythm and pitch, generating 2 points possible per beat, 16 points per melody, and 48 points per condition.

Results

In this study, I compared participants' dictation scores in a within-subjects design of three conditions, with a total possible score of 48 points in each condition. Mauchly's test of the assumption of sphericity was nonsignificant, $\chi^2(2) = 3.63$, $p > .05$, so I used the repeated measures analysis of variance (ANOVA) to detect differences in participants' scores by condition. Results of the ANOVA showed a significant difference in dictation scores, $F(2, 86) = 6.18$, $p = .003$, partial $\eta^2 = .13$ by conditions of silence ($M = 33.32$, $SD = 9.98$), audible sounds ($M = 32.82$, $SD = 10.49$), and singing before writing ($M = 29.82$, $SD = 10.78$). I then compared scores by condition pairwise post hoc; participants' scores were significantly different in both Conditions 1 ($p = .001$) and 2 ($p = .029$) compared with Condition 3. There was no significant difference between scores in Conditions 1 and 2 ($p = .999$). Participants scored higher when they remained silent and made voluntary audible sounds than when they sang the melody.

In Condition 3, participants' singing accuracy varied widely, with only eight participants (18%) singing all three target melodies completely correctly in rhythm and pitch. Condition 3 dictation scores were normally distributed, but Condition 3 singing scores were not. Therefore, to address the second research question, I used Spearman's rank-order correlation to test the linear relationship between singing scores and Condition 3 dictation scores. The result was a significant moderate positive correlation between the two variables, $r_S(44) = .56$, $p < .01$.

Discussion

Music theory teachers often direct students to sing a dictation target prior to notating it, presumably to secure it in their memory for accurate processing. Prior research by Pembrook (1986, 1987) and Buonviri (2015) suggested that incorporating singing into dictation exercises might actually distract students from the task and lower their performance. Results of the current study corroborate these findings, specifically contributing to knowledge in this area that singing short tonal melodies prior to notating them yielded lower dictation scores.

Given that participants' singing seems to have had a negative effect, one might question whether vocalists would perform differently than instrumentalists. Prior research on this topic is inconclusive (Mang, 2007), and results can even be misleading given that so many music students possess some combination of vocal and instrumental experience (Pembrook & Taylor, 1986). I purposefully did not recruit or separate participants into vocal and instrumental subgroups in this study, producing a sample that reflects diverse enrollments in music theory courses and increases generalizability of results.

Instructors may view singing as a way to build all students' melodic memory skills, but they must also consider the reverse, that melodic memory is necessary for successful echo singing skills (Nichols, 2016). Developing auditory imagery skills may improve students' echo singing skills (Pfordresher, Halpern, & Greenspon, 2015), and taking dictations in silence may prompt the practicing of imagery skills, ultimately contributing to more accurate echo singing skills. The correlation between singing accuracy and dictation accuracy in Condition 3 suggests that if singing is employed for memory reinforcement, it must be accomplished correctly. Even then, when taken together with results of Buonviri (2015), in which participants sang a preparatory pattern correctly, it may serve as a distraction during testing.

Music teachers should consider combining silent dictation and audible singing practice in cyclical fashion during class activities to help students improve both. Such explicit guided practice might also encourage students to continue to rehearse these skills together informally on their own. Klonoski (2006) encouraged the use of dictation as a long-term learning exercise to improve musicianship, not simply as an assessment to generate a grade. Perhaps instructors should continue to connect dictation and singing skills in the overall curriculum, but they should be aware that singing during dictation may not be helpful. Based on the results of the current study, required singing could lower students' scores, perhaps even consequently having a long-term impact on their attitude toward aural skills study (Buonviri, 2014b).

During dictation testing, music theory teachers often require students to maintain silence so they will not accidentally distract or influence one another (Potter, 1990). Many students in the current study anecdotally mentioned their predilection for making some audible sounds when allowed, and 36 of the participants (82%) made sounds in Condition 2. They exhibited a wide range of audible output, aligning with suggestions of relevant pedagogical literature, including humming the tonic and members of the tonic triad (Klonoski, 2006), softly whistling or humming at the speed of their writing hand (Johnson & Klonoski, 2003), and spot-checking pivotal notes within the melody with their voice as they notated (Buonviri, 2014a). This range of output suggests that students were choosing specific strategies based on their prior experiences and the target melody, consistent with previous findings regarding dictation (Buonviri, 2015) and sight-singing (Killian & Henry, 2005). Students may need help choosing their strategies during dictation, similar to Henry's (2008) findings with sight-singers. Music teachers should consider presenting students with several options for how to use the voice as a reinforcing tool during dictation practice and guiding them through choosing strategies in specific situations. Students could then practice these strategies individually with technology-assisted programs between classes. This audible practicing could gradually be guided toward silent processing for use in standard classroom situations.

Students also may draw on kinesthetic faculties when listening and encoding during dictation (Buonviri, 2014a; Mikumo, 1994; Thompson, 2004). None of the participants in the current study exhibited overtly visible signs of kinesthetic strategies (e.g., silent trumpet fingerings or cello left-hand position), but research suggests that kinesthesia can play a role in music perception in much more subtle ways (Miller, 2016). It is possible that participants silently engaged vocal apparatus kinesthesia while listening or processing in Condition 1 (Lévêque & Schön, 2015; Miller, 2016). However, given their relatively inaccurate singing performance in Condition 3, one would assume that such kinesthetic engagement would affect their scores negatively in

Condition 1 (silence), especially because decreasing audible feedback appears to decrease singing accuracy (Beck, Rieser, & Erdemir, 2017). More research targeting the possible role of kinesthesia during dictation is warranted, specifically regarding the combination of receptive and productive tasks required.

The lack of a significant difference between scores in Conditions 1 and 2 seems to suggest two additional implications for classroom practice. Students appear to take dictation equally well when required to remain silent than when allowed to make sound, so generally they should remain silent for the benefit of their peers during testing. On the other hand, when possible, they should be given a choice to honor their preference, encourage their best work, and demonstrate the clearest picture of their developing skills. Music teachers should consider the flexibility they may have to incorporate both possibilities across the course of instruction. During some practice sessions in class, for example, students could be allowed and even encouraged to make audible sounds, providing insights into their process that could be beneficial to both the instructor and their peers. In anticipation of testing, students could remain silent during some practice sessions, to help them solidify the use of inner hearing, modeled on previously practiced audible sounds.

The choice between these options depends on instructors' teaching philosophy and practical logistical considerations. Requiring students to remain silent may help them strengthen and clarify their internal skills of aural imagery, melodic memory, and aural-visual transfer. These skills, in silence, are invaluable to composers, performers, conductors, and audience members. On the other hand, when students are allowed to produce voluntary audible sounds, they may be effectively reinforcing the cycle *vocalization—outer hearing—inner hearing—vocalization*, a highly useful strategy for improving these same skills (Johnson & Klonoski, 2003). Music theory instructors have described the importance of teaching dictation and sight-singing in parallel progression through their curriculum (Paney & Buonviri, 2014), and the two activities appear to be mutually reinforcing long-term (Furby, 2016; Norris, 2003). Although required echo singing of the melody during dictation yielded lower scores in the current study, instructors can still encourage students to develop their voices overall as a tool for aural skills. Using their voices voluntarily during dictation—according to their own needs—may be a viable way to accomplish this.

The challenge presented by allowing sounds during dictation is that students can distract each other. Instructors could be creative with the physical arrangement of student workstations, and technological tools can help (Kuzmich, 2011). Teacher-led technological transformation can be highly effective for both engaging students and solving spacing issues (Dammers, 2010). Practicing and testing dictation skills in a computer or listening lab, where each student hears the targets through noise-cancelling headphones, could be sufficient to isolate them aurally. Wearing headphones also causes people to hear their own voice more easily, allowing them to make sounds even softer than normal. If a school does not have such a centralized lab, students could spread out to remote workstations virtually anywhere. They could be tested through online platforms, with targets played and answers submitted directly through the program. When necessary, testing could be supervised through videoconferencing. This approach may seem impractical for some instructors, but in one-to-one high schools or for distance education, for example, it may be ideal.

Most participants in this study did not sing the melodies completely correctly, so future research might focus on students' ability to sing melodies by ear, with and without an adjoining dictation task. Results could shed light on students' baseline accuracy in echo singing and be compared with effects that an ensuing task may have on their attention and memory. Researchers should also explore effects of the assessment environment, including physical spacing of multiple students, use of headphones for aural isolation, and feasibility of remote electronic administration. Findings might be particularly helpful to instructors wishing to develop differentiated instruction and assessment in aural skills. Finally, the factor of student choice in musical tasks like dictation should be studied further; researchers might pursue in-depth qualitative investigation of students' preferences for various strategies and the impact they may have on their attitudes and task success rates.

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Supplemental Material

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References

Beck, S. L., Rieser, J. J., & Erdemir, A. (2017). Singing without hearing: A comparative study of children and adults singing a familiar tune. *Psychomusicology: Music, Mind, and Brain*, *27*, 122–131. doi:10.1037/pmu0000176

Buonviri, N. O. (2014a). An exploration of undergraduate music majors' melodic dictation strategies. *Update: Applications of Research in Music Education*, *33*(1), 21–30. doi:10.1177/8755123314521036

Buonviri, N. O. (2014b). Three music education majors' journeys through Aural Skills 101. *Journal of Music Teacher Education*, *25*(1), 95–106. doi:10.1177/1057083714552328

Buonviri, N. O. (2015). Effects of a preparatory singing pattern on melodic dictation success. *Journal of Research in Music Education*, *63*, 102–113. doi:10.1177/0022429415570754

Dammers, R. (2010). A case study of the creation of a technology-based music course. *Bulletin of the Council for Research in Music Education*, *186*, 55–65. Retrieved from http://www.jstor.org/stable/41110434

Foulkes-Levy, L. (1997). Tonal markers, melodic patterns, and musicianship training: Part I: Rhythm reduction. *Journal of Music Theory Pedagogy*, *11*, 1–24. Retrieved from https://music.appstate.edu/about/jmtp/articles?page=5

Furby, V. J. (2016). The effects of peer tutoring on the aural skills performance of undergraduate music majors. *Update: Applications of Research in Music Education*, *34*(3), 33–39. doi:10.1177/8755123314556547

Garner, A. M. (2009). Singing and moving: Teaching strategies for audiation in children. *Music Educators Journal*, *95*(4), 46–50. doi:10.1177/0027432109335550

Henry, M. (2008). The use of specific practice and performance strategies in sight-singing instruction. *Update: Applications of Research in Music Education*, *26*(1), 11–16. doi:10.1177/8755123308317675

Johnson, E. A., & Klonoski, E. (2003). Connecting the inner ear and the voice. *The Choral Journal*, *44*(3), 35–40. Retrieved from https://acda.org/ACDA/Publications-Root/Choral_Journal/Choral_Journal.aspx

Karpinski, G. (2000). *Aural skills acquisition*. Oxford: Oxford University Press.

Killian, J. N., & Henry, M. L. (2005). A comparison of successful and unsuccessful strategies in individual sight-singing preparation and performance. *Journal of Research in Music Education*, *53*, 51–66. doi:10.1177/002242940505300105

Klonoski, E. (2006). Improving dictation as an aural-skills instructional tool. *Music Educators Journal*, *93*(1), 54–59. doi:10.1177/002743210609300124

Kuzmich, J. (2011). Enhanced AP music theory instruction. *School Band and Orchestra*, *14*(4), 40–44. Retrieved from http://sbomagazine.com/technology/3073-12enhanced-ap-music-theory-instruction.html

Lévêque, Y., & Schön, D. (2015). Modulation of the motor cortex during singing-voice perception. *Neuropsychologia*, *70*, 58–63. doi:10.1016/j.neuropsychologia.2015.02.012

Mang, E. (2007). Effects of musical experience on singing achievement. *Bulletin of the Council for Research in Music Education*, *174*, 75–92. Retrieved from http://www.jstor.org/stable/40319480

McLean, C. (1999). Elementary directed listening to music: A singing approach versus a nonsinging approach. *Journal of Research in Music Education*, *47*, 239–250. doi:10.2307/3345782

Mikumo, M. (1994). Motor encoding strategy for pitches of melodies. *Music Perception*, *12*, 175–197. doi:10.2307/40285650

Miller, N. A. (2016). Musical listening and kinesthesis: Is there an audio-vocal tuning system? *Psychomusicology: Music, Mind, and Brain*, *26*, 117–131. doi:10.1037/pmu0000138

Nichols, B. (2016). Task-based variability in children's accuracy singing. *Journal of Research in Music Education*, *64*, 309–321. doi:10.1177/0022429416666054

Norris, C. E. (2003). The relationship between sight singing achievement and melodic dictation achievement. *Contributions to Music Education*, *30*(1), 39–53. Retrieved from https://www.jstor.org/stable/24127026

Oura, Y., & Hatano, G. (1988). Memory for melodies among subjects differing in age and experience in music. *Psychology of Music*, *16*, 91–109. doi:10.1177/0305735688162001

Paney, A. S., & Buonviri, N. O. (2014). Teaching melodic dictation in AP music theory. *Journal of Research in Music Education*, *61*, 396–414. doi:10.1177/0022429413508411

Pembrook, R. G. (1986). Interference of the transcription process and other selected variables on perception and memory during melodic dictation. *Journal of Research in Music Education*, *34*, 238–261. doi:10.2307/3345259

Pembrook, R. G. (1987). The effect of vocalization on melodic memory conservation. *Journal of Research in Music Education*, *35*, 155–169. doi:10.2307/3344958

Pembrook, R. G., & Taylor, J. A. (1986). Relationships between scores on a melodic discrimination test and the background variables of prospective college music students. *Bulletin of the Council for Research in Music Education*, *88*, 1–21. Retrieved from http://www.jstor.org/stable/40317997

Pfordresher, P. Q., Halpern, A. R., & Greenspon, E. B. (2015). A mechanism for sensorimotor translation in singing: The Multi-Modal Imagery Association (MMIA) model. *Music Perception*, *32*, 242–253. doi:10.1525/mp.2015.32.3.242

Ponsatí, I., Miranda, J., Amador, M., & Godall, P. (2016). Students' performance when aurally identifying musical harmonic intervals: Experimentation of a teaching innovation proposal. *International Journal of Music Education*, *34*, 445−458. doi:10.1177/0255761415619391

Potter, G. (1990). Identifying successful dictation strategies. *Journal of Music Theory Pedagogy*, *4*(1), 63−71. Retrieved from https://music.appstate.edu/about/jmtp/jmtp-volume-4

Thompson, K. A. (2004). Thinking in sound: A qualitative study of metaphors for pitch perception. *Journal of Music Theory Pedagogy*, *18*, 81−108. Retrieved from https://music.appstate.edu/about/jmtp/thinking-sound-qualitative-study-metaphors-pitch- perception

Zielinska, H., & Miklaszewski, K. (1992). Memorising two melodies of different style. *Psychology of Music*, *20*, 95−111. doi:10.1177/0305735692202001

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