

Factors Influencing the Pitch Matching of Junior High Boys

The skill of vocal pitch-matching is often a prerequisite for participating in even the most casual singing activities. The absence of singing ability can lead to self-perceptions of non-musicality or tone “deafness” (Sloboda, Wise & Peretz, 2005) that can inhibit participation in any form of music making (Clements, 2002). While the development of vocal pitch matching skills has been studied with a number of different age groups and under different conditions, a clear picture of the nature of those skills (of what? perception and pitch production?) has yet to emerge. The lack of clarity may be due to the complex and internal nature of the process, to differences in research approaches, or to the fact that pitch-matching skills seem to emerge quite naturally in a majority of people without formal training (Bentley, 1969).

When pitch-matching problems persist past the elementary years, it can have a negative impact on an individual’s perception of their musicality. A recent interview study (Sloboda, Wise & Peretz, 2005), found that many adults who labeled themselves as unmusical or tone deaf, were really referring to an inability to sing well. Clements (2002) found that musical self-image, not musical ability, was the single biggest predictor of male elementary students’ music participation decisions when moving to middle school. For adolescent boys, the development of matching skills can be further complicated by the voice change process. If boys have not mastered pitch-matching by the time they reach adolescence, their efforts to match pitch might become complicated by the register shift they experience while going through the voice change (Yarbrough et al. 1995a). These difficulties can interfere with boys’ enjoyment of singing activities or, worse, lead boys to assume that they are not musical. Secondary music educators need more information on the factors that can influence pitch matching performance, particularly in adolescent boys, so that they can begin to identify the skills and experiences that lead to

improvements in singing accuracy. This study explored the pitch matching skills of adolescent boys as they related to perceptual skills, type of task, and vocal range.

The bulk of research on singing accuracy has been done with elementary students, perhaps because accurate singing is a primary goal of elementary music instruction. Researchers have explored a number of variables that affect singing accuracy including the characteristics of the model pitch (Green, 1990; Hermanson, 1972; Petzold, 1966; Sims, Moore & Kuhn, 1982; Small & McCachern, 1983; Yarbrough, Bowers & Benson, 1992; Yarbrough, et al. 1995a), age (Bentley, 1968; Green, 1990; Klemish, 1974; Petzold, 1966; Yarbrough, et al. 1991), gender (Phillips & Aitchison, 1997; 1999), and perceptual skills (Apfelstadt, 1984; Boardman, 1964; Feierabend, 1984; Geringer, 1983; Jones, 1993; Phillips & Aitchison, 1997, 1999; Zwissler, 1971). More recently, researchers have begun to address the impact of these variables on adolescent singing accuracy as well.

A 1991 study (Yarbrough et al.) explored the variables that influenced the pitch-matching of inaccurate singers in grades K-3 and 7-8. They found that children in all grades responded best to the female vocal model, there were no differences based on using hand signs or syllables to respond, and there were significant differences in accuracy only between kindergarteners and 8th graders but with the greatest differences between kindergartners and all other ages. Bowers (1993) examined the influence of male and female models in different ranges for adolescent male singers. She found that boys responded best matching pitches located around middle C and that uncertain male singers were least accurate in response to a female high and most accurate with a baritone model. Yarbrough, et al. (1995a) explored the effect of a male falsetto timbre on the accuracy of uncertain boy singers in grades K-8. They found that uncertain boy singers in grades six and seven were most accurate in response to high voice and falsetto models, while the

grade eight subjects were most accurate in response to a baritone low model. It should be noted that all subjects matched the same interval g-e in the appropriate octave. Additionally they found improvement in students' pitch matching accuracy between grade levels at the younger ages but noted pitch matching ability losses between fifth and sixth and seventh and eighth grades. They believed these losses may be due in part to male voice change, but could not accurately judge this from their data.

While the affect of model characteristics has been carefully examined, the role of the matching task itself has not been explored. The numerous studies on singing accuracy have employed a variety of tasks to measure students' ability including matching to a single-pitch (Demorest, 2001; Porter, 1977; Roberts & Davies, 1975), an interval (Green 1990; Klemish, 1974; Price, et al 1994; Roberts & Davies, 1975; Yarbrough, et al. 1991; Yarbrough, Bowers, & Benson, 1992), a single pitch within a melodic context (Geringer, 1983) and accuracy of patterns and whole phrases (Apfelstadt, 1984; Joyner, 1969; Petzold, 1966; Roberts & Davies, 1975; Zwissler, 1971). Some of the variability in the findings of singing accuracy research might be explained by the differences in task difficulty, yet most studies to date have not directly compared students' performance on more than one kind of vocal matching taskⁱ.

Perception and Production

Researchers have also explored the possible relationship between singing accuracy and other musical skills, most notably perception. It is logical to assume that if students are having difficulty with accuracy, it may be due, not to a vocal deficit, but to an inability to hear pitch differences. Early research in singing accuracy consistently hypothesized a relationship between singing accuracy and melodic perception (see for example Boardman, 1964; Zwissler, 1971) and more recent findings (Feierabend, 1984; Jones, 1993; Phillips & Aitchison, 1997; Watts, Moore

& McCaghren, 2005) seemed to support that belief. Other research has gotten mixed results when examining relationships between perception and singing accuracy.

A frequently-cited study by Geringer (1983) examined the relationship of discrimination and pitch-matching abilities of pre-school (n=72) and fourth-grade students (n=72). Subjects were given both a pitch-discrimination test and a vocal pitch-matching test. The discrimination test consisted of 12 trials of tonal pairs, of which subjects were asked to verbalize if the tones had been the same, different, or if they were uncertain. The vocal pitch-matching test asked subjects to sing back the final pitch of a short do-re-mi-re-do sequence. Subjects were then assigned to ability level groups (high, middle and low) for each of the age groups based on their performance on the discrimination test. He found that vocal pitch-matching ability differed by age group, but that there was no difference between discrimination-ability groups on pitch matching scores. There was a moderate correlation between the two factors for the high ability fourth graders, although overall there appeared to be a lack of correlation between pitch-discrimination and vocal pitch matching. The findings of studies by Apfelstadt (1984) with kindergarten students, Roberts & Davies (1975) with 6-8 year olds, and Bradshaw & McHenry with adults (2005) seem to support the lack of relationship between perception and production.

Some of the differences in these findings might be due to differences in the pitch-matching task or the perceptual task employed. Studies have frequently used either same-different discrimination tasks or the Gordon tonal PMMA (Apfelstadt, 1984; Bradshaw & McHenry, 2005; Jones, 1993; Phillips & Aitchison, 1997, 1999; Watts, Moore & McCaghren, 2005) to measure perceptual skill. A number of researchers have questioned the efficacy of high/low or same/different judgments for young children (Abril, 2001; Costa-Giomi & Descombes, 1996; Flowers & Costa-Giomi, 1991; Hair, 1981) and Apfelstadt (1984) questioned

whether the PMMA was the best measure of melodic discrimination as it did not require directional judgments. In the first year of a longitudinal study, Phillips & Aitchison (1997) found a relationship between singing accuracy and the PMMA for third graders, but no relationship between accuracy and discrimination as measured by the MAT. Since the discrimination task of the MAT would be closer to Geringer's measure, it would seem that the nature of the perceptual task is significant. However, in reporting on those same students a year later (Phillips & Aitchison, 1999) they found no relationship between singing accuracy and scores on the IMMA. While the dependent measure did technically change between the two years (PMMA to IMMA) these tests are thought to measure the same skill. Two studies with adults used same-different discrimination paired with single pitch matching with conflicting results (Bradshaw & McHenry, 2005; Watts, Moore & McCaghren, 2005). The study that found a significant relationship between production and discrimination (Watts, Moore & McCaghren, 2005) used a more complex discrimination task and a sample that included both accurate and inaccurate singers.

A similar lack of relationship has been reported in studies examining instrumentalists' tuning ability and their pitch perception (Geringer & Witt, 1985; Yarbrough et al 1995b; Yarbrough et al. 1997). Geringer and Witt (1985) compared the tuning performance and perception of high school, collegiate and professional strings players and found no significant relationships. In a series of studies, Yarbrough and colleagues (Yarbrough et al. 1995b; Yarbrough et al. 1997) compared wind player's ability to tune their instrument to their ability to tune a dial controlling a pitch generator and found no relationship between the skills. The lack of relationship was particularly salient given that the dial-tuning task was an active rather than passive perceptual task making it very different from previous vocal studies.

Demorest (2001) examined the pitch perception and pitch-matching abilities of junior high boys. Subjects (N=34) were male general music or choir students in grades seven through nine whose voices had begun to change. Subjects were given both a perception task and a vocal pitch matching task. The perception task was a dial-tuning task similar to Yarbrough, et al (1995b) that required subjects to move a tuning dial on a synthesizer until the synthesizer pitch matched a prerecorded reference pitch. All reference pitches were between C-130.81Hz and A-220Hz. The vocal production task required subjects to match a series of single pitches from a prerecorded male vocal model singing with as little vibrato as possible within two range classifications: High A-220Hz to E-329.63Hz and Low C-130.81Hz to A-220Hz. The subject's comfortable singing range was taken into consideration when determining to which range classification he was asked to respond. Subjects were divided initially into two categories, certain, those who matched all five given pitches, and uncertain, those who missed two or more pitches. At this point, an interesting category emerged. Six boys matched four out of five pitches, but missed the fifth pitch by quite a large distance. These six were dubbed inconsistent singers. In the first analysis the inconsistent singers were grouped with the uncertain singers to examine relationships to perception scores and vocal range. There was a significant difference in the perception performance for the two groups with certain singers doing significantly better at tuning the dial. There were no differences by vocal range. Because the inconsistent group did not fit neatly into either category, a second analysis was done without those six singers. Results of both analyses indicated that there was a significant difference in the perception task performance between certain and uncertain singers, with the differences increasing when the inconsistent group was removed from the analysis. Analysis of the perceptual means indicated that the inconsistent group was most similar to the certain group in their perceptual performance.

The purpose of this study was to explore the influence of perceptual skills, type of pitch-matching task, and vocal range on the pitch-matching ability of adolescent boys. We tested two hypotheses based on the results of Demorest (2001).

1. There would be a significant difference in perceptual performance based on vocal matching skill.
2. There would be no difference in pitch matching skill by vocal range.

An additional purpose was to compare two types of matching tasks, single pitch and context pitch, to determine if less-accomplished singers would match pitch better under different task conditions.

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