

INFANT RESPONSES TO BARITONE AND FALSETTO SINGING  
DURING FACE-TO-FACE INTERACTIONS

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Peter Matthew Santucci

Bachelor of Music  
California State University at Long Beach, 1994

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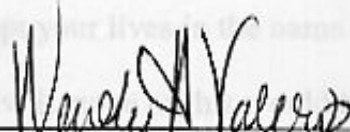
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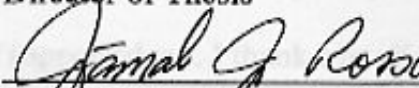
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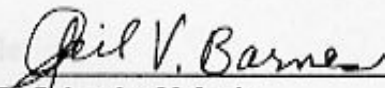
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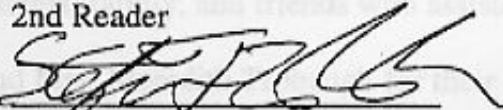
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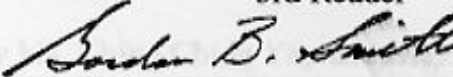
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Dean, School of Music

  
School of Music  
2nd Reader

  
School of Music  
3rd Reader

  
Dean of the Graduate School

## ABSTRACT

The purpose of this study was to compare infant responses to a man's live baritone singing and falsetto singing, during repeated presentations and over time. Fourteen 6-month-old infants were each individually video-recorded during each of 3 data collection sessions on consecutive days. At each face-to-face data collection session, a man sang 2 presentations of a researcher-composed song in a baritone voice using pitches ranging from D3 to B3, and 2 presentations of the same song in a falsetto voice, 1 octave higher, using pitches ranging from D4 to B4. On average, infants in this study found a man's live singing highly engaging. Differences in infant responses to baritone singing and falsetto singing were so slight that they would not be noticeable in real life situations.

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## CHAPTER ONE INTRODUCTION

Researchers, childcare professionals, music educators, and parents consider music to be an important component of infant care programs and continually strive to determine optimum modes of music interaction with infants (Daniels, 1991; Fiese, 2000; Hart, Burts, & Charlesworth, 1997; Nichols & Honig, 1997). In *Developmentally Appropriate Practice in Early Childhood Programs* published by the National Association for the Education of Young Children, Bredekamp and Copple (1997) urge adults to frequently sing to infants. The Music Educators National Conference (MENC) Task Force for National Standards in the Arts (1994) recommends that infants experience music daily while receiving caring, physical contact, and that adults should encourage the musical development of infants by singing and chanting to them.

Though experts agree that music interactions with infants are enjoyable and important, their suggestions for investigating, maintaining, and developing those interactions are incomplete, especially for men. Perhaps that is because the majority of infant music interactions occur with women. In a study of 67 families, Trehub et al. (1997) found that, on average, fathers performed only 14% of all singing to infants in the home environment. Not surprisingly, very little information exists regarding optimum practices for men who do participate in infant music development. With such

information, specific suggestions may be given to men, and infant music development may be enhanced.

In laboratory settings, some researchers who have investigated infant responses to adults' singing have used a preferential-looking paradigm (O'Neill, Trainor, & Trehub, 2001; Trainor, 1996; Trainor & Zacharias, 1998). In studies with those designs, one loudspeaker was positioned to the left of the infant, and another loudspeaker was positioned to the right of the infant, with each loudspeaker readied to transmit a different version of a recorded song. After the infant's attention was attracted to one of the loudspeakers by illuminating a toy located directly below the loudspeaker, the experimenter transmitted one of two versions of a song through that loudspeaker until the infant looked away from the loudspeaker. The infant's attention was then attracted toward the other loudspeaker, and the experimenter transmitted the second version of the song through that loudspeaker until the infant looked away from that loudspeaker.

Researchers using that preferential-looking paradigm found that infants displayed a longer performance of visual attention toward recordings of an adult singing a higher-pitched version of a song than to recordings of an adult singing a lower-pitched version of the same song (O'Neill et al., 2001; Trainor, 1996; Trainor & Zacharias, 1998). The researchers interpreted longer performance of visual attention as an indication of infant preference for the higher-pitched version. Utilizing a different research design, Trehub and Kamenetsky (in preparation, cited in Trehub and Trainor, 1998), concluded that, in a laboratory setting, infants display greater affective signs of enjoyment when listening to recordings of women's high-pitched singing than when listening to recordings of men's

lower-pitched singing. Trehub and Trainor (1998) concluded, therefore, that infant recorded-song preferences are based partly on a preference for high-pitched vocal sounds.

Those researchers have provided evidence that, in laboratory settings, infants can discriminate between different recorded versions of a song. Moreover, those infants display distinct attention responses and affective responses to each recorded version of a song. Those differences may be based, in part, on the performed pitch-level of each song.

Researchers, however, have not provided evidence that infants do not enjoy and attend to low-pitched singing, or that men, who generally have lower voices than women (Moore, 1991), should play recordings of women's voices rather than sing to infants. On the contrary, O'Neill et al. (2001) found that the proportion of visual attention that infants directed toward men's recorded singing (regardless of the pitch-level of the men's singing) was greater than the proportion of visual attention that infants had directed toward women's recorded singing in previous studies (Trainor, 1996; Trainor & Zacharias, 1998).

Trehub and Trainor (1998) acknowledged that "overt reactions in these [laboratory] situations are subtle, presumably because all of the songs tend to capture infants' attention, leading to a reduction in ongoing activity." Though their analyses did yield statistically significant results, findings by researchers who utilized the preferential-looking paradigm may have little practical significance due to small effect sizes and non-naturalistic settings.

For the sake of practical significance, researchers must study infant responses to human singing using experimental designs that include authentic practices of effective

infant music providers. Those practices include face-to-face interactive singing within a prescribed pitch range.

#### Face-to-face Interaction

Early childhood music specialists recommend that adults present songs to infants by singing artistically, using dynamic facial expressions and body movements (Feierabend, 1990; Gordon, 1997a, 1997b; MENC, 1994; Valerio, Reynolds, Bolton, Taggart, & Gordon, 1998). Papousek (1996) stated that “the didactic aspects of musical stimulation provided by caregivers directly and with respect to feedback cues from infants . . . cannot be sufficiently replaced by reproduced music” (p. 50). Trehub and Trainor (1998) also noted that, “presumably, the ‘live’ multimodal [singing] product, which would provide opportunities for seeing or experiencing the caregiver’s facial expressions, movements, and smells . . . would have even more dramatic consequences for the infant audience [than recorded audio stimuli]” (p. 67).

Researchers who studied infant development using face-to-face interaction designs found that changes in adults’ facial expressions (D’Entremont and Muir, 1999) and eye-contact (Symons, Hains, & Muir, 1998), substantially influenced infant visual-attention and affect. Few researchers, however, have used face-to-face interaction designs to investigate infants’ responses to human singing.

Moog (1968/1976) studied infant responses to both recorded music and live music. He found that infants younger than approximately four-months-old seemed to be soothed by high-pitched voices, but not by low-pitched voices. Moog also reported that between four-months-old and six-months-old, infant responses to music began to change.

Infants in that age range ceased activity in order to listen intently to music, and then performed affective responses (smiling), motor responses (swaying or bouncing), or vocal responses (cooing, speech babbling, or music babbling).

In another study (Wendrich, 1981), an experimenter sang individual pitches to 3-month-old to 6-month-old infants during face-to-face interactions. The individual pitches sung included D4, F4, or A4 (where C4 refers to middle C). He found that 55% to 90% of infant singing responses were an imitation of the most recently presented pitch. By using a face-to-face interaction design to study infant responses to a song (rather than individual pitches), researchers may gain additional information that educators may use when assisting actual infant music development.

#### Pitch Range

Female singers who recorded songs for Trainor & Zacharias (1998) were instructed to sing near "the pitch range that was most comfortable for their [adult] voices" (p. 800). Pitches in that study ranged from approximately D3 to A4. Pitch ranges for other preferential-looking paradigm studies were not reported. Moore (1991) found that the average singing tessitura (commonly used pitch range) of untrained adult women is from A3 to A4, and the average singing tessitura of untrained adult men is from B2 to B3. That is, men's self-selected singing ranges tend to be nearly one octave below women's self-selected singing ranges (Moore, 1991).

Rather than asking adults to sing to children in a comfortable adult singing range, several leading researchers recommend that early childhood music specialists purposefully sing to infants within a pitch range that approximates an infant vocal range

(Goetze, Cooper, & Brown, 1991; Moore, 1991; Valerio, Reynolds, Bolton, Taggart, & Gordon, 1998). There is, however, some disagreement among researchers regarding what that pitch range is. Some researchers (Simons, 1985; Alford, 1971; Michel, 1973) report the pitch range of infant vocalizations as being approximately an octave and a fourth, from A3 to D5. Others have reported a larger range of approximately two octaves, from G3 to G5 (Fox, 1990; Reis, 1982). Reis (1982) noted, however, that the pitches most often sung by infants were within the octave C4 to C5. That is approximately the same range that Moog (1968/1976) reported for infant music babblings. Similarly, McKernon (1979) found that toddlers' spontaneous songs comprised only pitches ranging from C4 to B4.

According to Gordon (1997a, 1997b) the initial singing range, in which infants are first able to produce a singing voice quality, is from D4 to A4. He also identified that range as the initial audiation range; that is, the initial range of infant music perception and cognition (Gordon, 1997b). He advised that songs to infants should be sung in this initial audiation range (D4 to A4) when possible, but recommended that men who cannot sing high enough should "sing in a head voice, not falsetto, one octave below" the initial audiation range in order to maintain a fully resonant vocal quality (Gordon 1997b, p. 99).

Other music education researchers have suggested that male music educators should sing in a falsetto voice, one octave higher than their natural voices, when modeling singing for elementary school children (Goetze, Cooper, & Brown, 1991). Price, Yarbrough, Jones, & Moore (1994) investigated the effects of different timbre models on the pitch matching ability of inaccurate child-singers in kindergarten through eighth-grade. They concluded that inaccurate child-singers are sensitive to pitch range, and that "both male and female music teachers need to be cognizant of the octave they

are modeling [singing] in, with regard to gender and age of students" (p. 281). Kelsey (1987) concluded that first-grade boys and first-grade girls sang with better pitch accuracy imitating a male falsetto singing model rather than a male baritone singing model, regardless of the vocal quality of the falsetto model. Currently, no researcher has compared infant responses to a man's baritone singing with infant responses to a man's falsetto singing.

Findings from new research using designs that include men's face-to-face interactive singing within prescribed pitch-ranges will allow researchers to make informed recommendations to male caregivers. Those recommendations may increase the effectiveness of men's music interactions with infants and, therefore, may enhance infant music development.

#### Purpose of the Study

With the intent of enhancing infant music development, the purpose of this exploratory study was to investigate infant responses to different pitch-ranges of men's live singing.

#### Problem Statement

The specific problems of this study were

1. to develop a reliable coding system for describing infant visual-attention, facial affect, vocalization, and movement responses during an adult man's live, face-to-face singing.

2. to describe infant responses, using the developed coding system, to live baritone song-version presentations, during repeated presentations and over time.

## CHAPTER TWO

### RELATED RESEARCH

3. to describe infant responses, using the developed coding system, to live falsetto song-version presentations (sung one octave higher than in problem 2) during repeated presentations and over time.

4. to compare infant responses to baritone song-version presentations and infant responses to falsetto song-version presentations, and to explore trends with regard to song-version and infant gender, during repeated presentations and over time.

#### Infant Recorded-Stimuli Music-Preference Laboratory Studies

##### *Trainor (1996)*

#### *Infant Preferences for Infant-Directed Versus Noninfant-Directed*

##### *Playsongs and Lullabies*

Trainor (1996) tested infants' preferences for mothers' recorded infant-directed singing or mothers' recorded infant-absent singing. The use of infant visual-attention as a preference indicator was employed previously by several researchers of infant speech perception (e.g., Fernald, 1985; Fernald & Kuhl, 1987; Werker & McLeod, 1989).

According to Werker and McLeod (1989):

Because these prosodic modifications [rhythmic and pitch changes made to speech directed toward infants] are common across many languages (Blount & Padgug, 1977; Ferguson, 1964; Fernald & Simon, 1984; Fernald, Taeschner,

Dana, Papoušek, Boysson-Bardies, & Fukui, in press; Griesler & Kuhl, 1988, Papoušek & Papoušek, in press) it has been suggested that they may function to facilitate language acquisition and/or emotional development. For this to occur, IDT (infant-directed talk) would be expected to at least attract and maintain infant attention more than ADT (adult-directed talk) (p. 231).

## CHAPTER TWO

### RELATED RESEARCH

Similarly, Trainor (1996) purposes of infant-directed singing may be to (a) attract infant attention toward the caregiver, (b) facilitate emotional

Categories of research most related to this study are (a) infant recorded-stimuli music-preference laboratory studies, (b) infant/adult face-to-face social interaction studies, and (c) infant music-response studies. The following summaries are grouped according to those categories. Relevance of those studies to the current study is discussed at the end of each category.

#### Infant Recorded-Stimuli Music-Preference Laboratory Studies

Before testing infant preferences, Trainor first individually recorded 15 mothers, each singing a song of her own choice. Trainor (1996) was recorded singing her song twice, once *Infant Preferences for Infant-Directed Versus Noninfant-Directed Playsongs and Lullabies* yielded 15 song-pairs, each consisting of an infant-directed

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Similarly, Trainor (1996) theorized that the main purposes of infant-directed singing may be to (a) attract infant attention toward the caregiver, (b) facilitate emotional communication and help regulate infant affective states, and (c) help infants develop auditory-pattern processing skills. The main goal of the study was to test the first theorized purpose by measuring whether mothers' recorded infant-directed singing maintained infant visual-attention longer than mothers' recorded infant-absent singing maintained infant visual-attention.

#### *Method*

Before testing infant preferences, Trainor first individually recorded 15 mothers, each singing a song of her own choosing. Each mother was recorded singing her song twice, once directly to her infant, and once when her infant was not present. This process yielded 15 song-pairs, each comprising an infant-directed song-version, and an infant-absent version of that same song. Trainor then examined 50 adult raters' perceptions of each song-pair. One group of adult raters correctly discriminated infant-directed song-versions from infant-absent song-versions 92.7% of the time. A different group of adult raters judged that infant-directed song-versions were sung in a "more loving tone of voice" (p.86) than infant-absent song-versions 82.7% of the time. Songs recorded included *Baa Baa Black Sheep*, *Itsy Bitsy Spider*, *Row Row Row Your Boat*, *Skinamerink*, *Puff the Magic Dragon*, *Rock-A-Bye Baby*, and *You Are My Sunshine*.