

A Protocol for Cross-Cultural Research on the Acquisition of Singing

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As part of a major collaborative research initiative, Advancing Interdisciplinary Research in Singing (AIRS), we developed a protocol for obtaining audiovisual information reflecting aspects of the ability to sing. We also developed a digital library prototype, the Children's International Media Exchange for Singing (CHIMES), to index and store the data for access through the Internet by researchers worldwide. The protocol was piloted at five monthly intervals with 20 individuals (children 3, 5, and 7 years of age and adults differing in vocal training level), validating its feasibility in Western culture and producing rich data amenable to numerous levels and kinds of analysis.

Key words: singing; development; critical period; cross-cultural; digital library; Child Language Data Exchange System (CHILDES); AIRS

Introduction

Singing is a natural human ability¹ entailing sensory, motor, cognitive, social, and emotional aspects.² Little is known about its acquisition with respect to individual, cultural, or universal influence. Researchers variously emphasize the accuracy of pitch and musical intervals, contour, and motor activity and play. Papoušek and Papoušek³ revealed their daughter's early sensitivity to major triad relations and tonality. Analysis by Dowling⁴ of his daughters' singing suggested that accurate interval production played a role only later in childhood, a point further supported by Davidson, McKernon, and Gardner⁵ for groups of young children. Kreutzer's⁶ analysis of videotapes of Zimbabwean children's singing suggested the later development of pitch accuracy. Stadler Elmer's⁷ work emphasized links between early childhood singing and both motor activity and

play—consistent with the Zimbabwean videotapes, although not emphasized by Kreutzer. Questions remain concerning posited stages of singing development: particular ages associated with stages, universality of stages, and the link between intelligence and singing proficiency associated with higher stages. Resolution of these issues requires sufficient examples of singing under controlled conditions to enable cross-cultural, cross-sectional, and longitudinal comparison. We suggest the expedience of a short (15-min) test battery of singing skills that could be enjoyable and easily completed by young children and older participants alike.

Material and Methods

The Advancing Interdisciplinary Research in Singing (AIRS) Test Battery was developed as part of the AIRS major collaborative research initiative (MCRI).⁷ The project focuses on singing from the perspectives of acquisition, education, and well-being. The battery directly addresses the acquisition theme with implications for the two other themes. The 11 components of the

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TABLE 1. The 11 Components of the AIRS Test Battery

Component	Purpose
1. Opening conversation	Indicate level of speech and grammatical development; show participant's mood and interest; put participant at ease
2. Determine vocal range	Gauge vocal range; determine placement of remaining components with respect to range
3. Minor third participant-name call-back	Measure ability to sing minor third (soh-mi); begin with an easy task
4. Sing back "Brother John," all, as 8 phrases, and all	Measure ability to sing a highly structured and possibly familiar piece; provide training on one simple piece; for future use of a song accessible to many cultures (translated in 40 languages)
5. Sing favorite song	Obtain information about favorite songs and accuracy and consistency of its production; determine music preferences and consistency of preference
6. Sing back interval, triad, scale	Measure accuracy of singing musical elements; enable modeling song performance from performance on elements
7. Improvise ending of a song	Measure musical (singing) creativity and mean length of utterance (a verbal measure); enable modeling of development of musical creativity and compare with language creativity
8. Free composition to choice of picture	Measure song creativity and compare with results of Stadler Elmer, ⁷ who also used pictures; pictures constrain themes but inspire lyrics
9. Sing back unfamiliar song "We Are One"	Measure memory for unfamiliar tune with lyrics using an anthem for the natural environment and humanity, based on the "Earth Charter," translated into over 35 languages
10. Sing "Brother John" from recent memory	Measure song memory (immediate retention) over the intervening 9–14 min since first heard
11. Closing conversation	Provide data for indexing verbal level; provide a measure of mood, attitude, and activity level at end of test; encourage returning for the next session; end session in a pleasant way

battery and their significance are shown in Table 1.

Two student researchers (M.S.L. and J.D.C.) administered the battery to 20 individuals (four children at each of the ages 3, 5, and 7 years, and eight young adults [one-half with no vocal training, and the other with at least 2 years training]) monthly for 5 months. Sessions were videotaped.

Results

All but two participants completed five sessions, providing data on 97 of 100 sessions and indicating feasibility of repeated testing with the AIRS battery in a longitudinal design. Children appeared to enjoy the sessions, whereas adults were somewhat reserved.

Data Analysis

To date, attention has been directed to Component 10 (Singing "Brother John" from memory after reviewing it in Component 4) and Component 8 (creating a song from a picture prompt). For Component 10, vocal pitch was analyzed using the method of Stadler Elmer,⁷ producing two pitch measures and one duration measure for each syllable as both music-like notation and a text file. Data from the text file have been submitted to preliminary quantitative analysis revealing, as expected, greater pitch accuracy with age and vocal training. Because of missing notes in records of some of the youngest children, analysis has included only participants 5 years of age or older, although sensitivity to the higher-order structure as seen in the notated transcript (repetition of each line of the song whether the line was correct or not)

by the youngest participants was also striking. Component 10, which focused on creativity, revealed the willingness and ability of participants of all ages to create songs, and concurs with previous researchers regarding the priority of words over melody.

Database

The rich audiovisual data from the battery admits of many forms of analysis (e.g., acoustic, structural, verbal, human interactive, kinesthetic, and attentional). A researcher may wish to focus on one component of the battery or on another. It takes time to collect such data repeatedly from the same participant. Ideally, two experimenters are needed in field environments: one interacts with the participant; the other assists with filming. There is value in sharing these audiovisual records with the research community representing widely ranging expertise, interests and cultures. The Child Language Data Exchange System (CHILDES) provides a model of a shared database for the study of language acquisition.⁸ This inspired our development of a beta version of a secure digital library (CHIMES: Children's International Media Exchange for Singing) for indexing and storing the AIRS audiovisual data of singing. It offers worldwide access to researchers via the Internet (<http://vre.upei.ca/airs>).⁹ Representative audiovisual data records have been segmented into 11 components and are stored in the digital library. Current efforts entail developing protocols to allow collaborators access to selected records based on both their research requirements and permissions provided by the participants in studies or, in the case of children, their parents.

Continuing work with the AIRS Test Battery of basic singing abilities, conducted by Emily Gallant, is focusing on older adults and those with mental impairment. AIRS collaborators will soon add non-Western components to the protocol for cross-cultural comparative studies.

Conclusions

CHILDES has revolutionized research in language acquisition,¹⁰ and a potentially similar impact may arise for singing research as a result of developments of the AIRS Test Battery and the CHIMES digital library. Together they will enable research on issues, such as the presence of critical periods for the acquisition of musical ability (cf. Refs. 11–14), early universal musical predispositions,¹⁵ and the intelligences underlying singing.¹⁶

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Conflicts of Interest

The authors declare no conflicts of interest.

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