THE SOUNDS IN SONGS WITHOUT WORDS

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ABSTRACT

Background. When singing songs, there is an interaction of music and language. These are the two main forms of culturally acquired vocal behaviour. To understand more about the role of language in singing, we have studied an exceptional case of a child who sings songs although her language development is completely absent. This is a girl with an autistic disorder (early infantile autism) and severe mental handicap.

Aims. The presentation describes the musical activity of the autistic child, focussing on her implementation of speech sounds in singing.

Method. The study is based on a long-term video documentation of the single case, covering the period from age 3 - 15. The recorded singing events amount to about two hours of audio data or 269 instances of singing covering 28 different songs. Phonetic and musical transcriptions were prepared. The subject's musical abilities were assessed. Her phonetic output was compared with that of normal, developing and disordered speech.

Results. The subject reveals good musical abilities in singing. Her way of handling the model songs, though, is somewhat different from normal song reproduction. As to her phonetic production, the vowels reveal a great similarity to the speech input, but the consonants show striking differences in the inventory and in the relative frequencies of phone types. The subject's consonant production is not typical for any form of spoken language.

Conclusions. The autistic girl's musical ability in singing has developed even in the absence of language. We interpret her deviant sound production as a radical adaptation of speech sounds to musical purposes.

1. INTRODUCTION

What are the respective roles of text and melody in the reproduction of songs?

In singing songs, there is an interrelation between the linguistic structure of the words and the musical structure of melody and rhythm. There has been a growing interest in this issue in recent years (Chen-Hafteck, 1999; Overy, 2000; Deutsch, Sommer & Pischel, 2003). Nevertheless, it is still not clear exactly how these two systems interact in singing.

What would singing be like if there were no linguistic system to influence it? Normally developing individuals acquire both singing and speaking in early childhood. However, we have at hand the documentation of an exceptional case of a child who has developed singing abilities but no language abilities whatsoever. This is a girl with autistic disorder (early infantile autism) and severe mental handicap. Although she has no language, the child does produce speech-like syllables in the context of singing. This exceptional case gives us the opportunity of observing singing activity that is not influenced by language structure. In doing so we hope to provide some clue to the issue of the kind of influence that language exerts on singing.

We present an assessment of the girl's singing performance and a description of her musical and phonetic production. We aim to find out whether there is anything substantially different in her musical or articulatory behaviour that could be attributed to her lack of speech.

2. CASE DESCRIPTION

The child in question, a girl named Samantha, is afflicted with early infantile autism, a pervasive developmental disorder which manifests itself in impairments of interpersonal interaction and communication and in restricted, repetitive and stereotyped patterns of behaviour.

Samantha was born in 1985 near Wolfenbüttel, Germany. Birth complications included brain oedema, oxygen deficiency and a cardial arrest. During infancy, hypotony, unusual EEG's, delayed motor development and lack of speech were attested. Samantha attended a therapeutic nursery school from the age of three and a school for mentally handicapped children from the age of seven. In early childhood Samantha showed strong symptoms of autistic disorder: motor stereotypes (spinning, jumping, waving of objects), lack of interest in social contact and communication, apparent indifference to familiar persons, lack of eye contact. In the course of time, most of these symptoms have improved substantially.

Samantha's general development is extremely retarded: in a PEP developmental test administered to her at the age of 9,11 she proved not testable on verbal and imitation tasks and her best score (for gross and fine motor skills) was on the level of a normally developing two-and-half-year-old (Wenglorz, 1995). Samantha's intellectual abilities are on the level of severe mental handicap. She has no command of productive language

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whatsoever and understands only rudimentary utterances such as her name or simple requests. Moreover, she has not acquired any alternative form of symbolic communication. Viewed on this background, Samantha's aptitude for singing is quite remarkable. From early childhood on singing has been one of Samantha's favourite occupations, and it is only in the context of singing that she produces speech-like syllables. These syllables have no relation to a linguistic content. In this case, the production of speech-like sounds is facilitated not by the communicative function of language but by the musical impulse in singing.

3. METHOD

Our presentation is taken from a long-term video documentation of the nonverbal autistic girl Samantha, covering a period of twelve years from age 3 to 15. Initially, this documentation was not part of a scientific study, but was intended by her therapist as a record of possible developmental changes manifested in everyday situations, which included her regular therapeutic interventions.

For the study of Samantha's singing a digital copy was made of those parts of the recordings in which Samantha sings. These amount to a length of about two hours and encompass 269 instances of singing covering 28 different songs, mostly children's songs and folk songs.

A musical transcription of the song reproductions was prepared by a composer (IL) and checked by a musically trained team member (GS). A qualitative assessment of Samantha's musical performance was carried out.

Two independent broad phonetic transcriptions were prepared using the IPA standard. The inter-rater reliability was .62. Most of the transcription differences were minor differences in only one feature (e.g. vowel height, voicing). These were resolved by consensus. Greater discrepancies were classed as non-transcribable items. The corpus totalled 15227 transcribed phones or 8030 syllables. A quantitative analysis of Samantha's phonetic productions (phones and syllable structure) was carried out. In order to assess Samantha's phonetic output in relation to the ambient language and to developing speech, we compared the results with frequency counts of German phonemes and of the babbling of infants acquiring German (see Deutsch, El Mogharbel, Laufs, Sommer and Wenglorz, 2002; Wenglorz, 2003).

4. MUSICAL ASSESSMENT

4.1. Introduction

The astonishing musical feats ('savant skills') of autistic individuals have been the subject of a good deal of research work (e.g. Hermelin, O'Connor, and Lee, 1987; Heaton, Pring and Hermelin, 1999). Most of the persons investigated, though, had at least some language capacity and were usually tested on instrumental performance. They must have had at least enough intellectual and communicative ability to participate in a musicality test. Our subject, however, is severely mentally handicapped and developmentally retarded and is not able to comply to a request of performing music. Samantha's musical activity is confined to singing. She makes no attempt to play on a musical instrument. Furthermore, she does not exhibit the ability of rhythmic clapping.

Our first question, then, is to which degree our autistic, severely mentally handicapped and non-verbal subject has acquired an implicit 'musical grammar' as expressed in her implementation of the harmonic system of major and minor. This is assessed by evaluating her spontaneous singing.

One thing is definite in Samantha's case: she has not received any formal music tuition nor has she had the opportunity of acquiring musical competence informally through joint singing or the like, as she never sings together with somebody else.

The evaluation of Samantha's musical competence focuses on tonality, stability of intonation and rhythm, voice range and expressive means. Furthermore, it is discussed whether Samantha's playful way of song reproduction can be interpreted in musical terms as variations or improvisations.

4.2. Handling of the Model Tunes

Instead of singing a song tune from beginning to end, Samantha usually picks out single phrases or themes which she repeats over and over again. Another typical feature of her singing is that most of the tunes sung by Samantha are not plain reproductions of the model tunes but quite elaborate variations which are musically consistent and aesthetically convincing. It appears that Samantha draws great pleasure from singing and is completely absorbed in this activity. An example of Samantha's singing activity is given in the audio sample [Hopp hopp hopp.wav], a series of variations on the German children's song "Hopp hopp hopp, Pferdchen lauf Galopp".

4.3. Timing Features

Changes of tempo and metre are quite common in Samantha's singing. These fluctuations are employed in a musically meaningful way and point to a high degree of expressiveness on Samantha's part. Samantha's rhythmical patterns generally follow those of the models, but deliberate alterations are also common.

4.4. Tonal Features

Tone intervals are usually intoned justly, allowing for occasional indisposition of voice on Samantha's part. In her melodic variations Samantha demonstrates her ability to identify harmonic progression and to select one of several possible harmonic tones.

A good indication of Samantha's tonality concept is her confident implementation of octave identity: when a melody goes out of her range she unerringly leaps to the higher or lower octave and can thus continue her singing. [Augustin.wav]

Samantha's singing at three years of age displays a musical performance that is well above average regarding tonality concept as well as creativity. Her further musical development, however, shows hardly any qualitative progress. Rather, Samantha's musical development seems to have stagnated on the initial level.

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5. PHONETIC PRODUCTION

5.1. Introduction

Samantha sings songs without words (as she has no language) – but not without sounds, as the tones of the melodies are coupled with articulated syllables. The main question in our quantitative analysis of these speech-like sounds was whether they follow the phonetic form of the model songs or, if not, what could be the structural principles underlying her choice of phones.

5.2. Syllables

The syllables in Samantha's vocalizations are almost exclusively of the structure consonant-vowel (CV). This is the universally simplest and most wide-spread syllable structure. In German, however, the language of most of the model songs, complex syllables structures with more than one consonant (e.g. CVC, CCV) prevail. In this respect Samantha does not follow the model.

5.3. Phones

Considering the phonetic segments, there is a noticeable difference between vowels and consonants.

The vowel repertoire encompasses the whole of the vowel space (front to back, high to low). Those vowels that are rarely or never produced by Samantha are generally rare or structurally complex, such as front rounded vowels (ü, ö) or the diphthong oi. The frequency of occurrence of Samantha's vowels corresponds approximately to the distribution in German.

Samantha's consonant repertoire and distribution, however, are extremely unusual in relation to German as well as to speech sounds in general. The most favoured class of consonants are glottals (h and glottal stop) followed by liquids (l and r) and glides (w and y). Stops (t, d) and nasals are relatively infrequent. In normal speech, the proportions of consonant classes are almost reverse: stops are the most common consonants world-wide and belong to the first consonants acquired by children, whereas liquids are relatively infrequent and late to be acquired. A very conspicuous finding is the almost total absence of labial and velar stops (p, b, k, g) which are normally extremely common.

5.4. Discussion

To find an explanation for Samantha's peculiar sound production we must keep in mind that the motivation for her vocal activity is the performing of music. Not being restrained by linguistic matters such as sound-meaning-relationship, the nonverbal girl is free to employ phonetic sounds in a way that enhances or at least does not hinder her musical performance. For the purposes of singing, resonance features are the main criteria for the choice of phone types. This gives priority to vowels as the most resonant sounds which are best able to convey timbre in vocal music. Any obstruction of the oral tract by an oral consonant would only hinder the musically optimal shaping of the resonance cavity. This accounts for Samantha's simple syllable structure and the high percentage of glottals, which leave the oral tract open. If she does produce oral consonants, she prefers those that have vowel-like qualities like liquids and glides. In short, Samantha's vocalizations display a radical adaptation of speech sounds to musical purposes.

6. CONCLUSION

The musical and phonetic assessment of Samantha's singing has brought forth two main findings:

Though completely lacking language development, the non-speaking child has nevertheless developed musical competence in singing. Her rendering of the model songs is not a plain reproduction, but displays a rich amount of variation in melody, rhythm and timbre which adheres to an implicit musical grammar.

In the absence of a linguistic system, the sound production in singing is governed by musical criteria. This brings about phonetic preferences that deviate considerably from the typical structure of speech sounds.

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