Culturally sensitive, microgenetic analysis of melodic performance

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Culturally sensitive, microgenetic analysis of melodic performance

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Background in psychology. The analysis of actually performed melodies – either sung or produced by an instrument – had been an intricate issue. So far, performed melodies were analysed either by mere listening combined with approximated notation, by expert ratings with respect to certain criteria (e.g. accuracy), or by transformation into midi format. These methods are neither culture free nor satisfying. However, reliable descriptions are the basis for any theory of performance and melodic productions, and of theories that address change and development over time.

Background in physics. Acoustics and technology allow analysing, visualising, and representing the organisation of sounds and their parameters. We devised two kinds of computer programs: One for the analysis of pitch at the basis of two different algorithms (Hess, 1983) which has been published (Stadler Elmer & Elmer, 2000), and one for visualizing the data. Our cooperation aimed at devising and applying a method that allows analysing, describing, and representing performed melodic productions with a new quality: Categorical perception, working well with musical experts, is eliminated. Acoustic analyses and detailed descriptions of produced melodies show the organisation of pitch and time in a new and culture-free quality.

Methods. We always study a person's singing as a process and not as a single or unique event. The microgenetic method – including analysis of the social interactions - focuses a person's consecutive song inventions or reproductions. The analysis concerns pitch, timing, syllables, quality of sung pitch (stable, beginning or ending glissando, unstable pitch etc.), phrasing (by breath), joint singing, help by researcher, comments by the singer, and pauses within the song. The songs analysed were acquired or invented within a quasi-experimental setting in order to have common grounds to compare.

Results and conclusion. Microgenetic analyses yielded by this new method reveal the strategies in terms of stable and variable patterns a person uses to make songs. It is demonstrated by a case study with a six-years-old boy how grows up in his Turkish family and attends a Swiss-German kindergarten. Due to this method, it is obvious that singing and its development should be viewed as a transient act of meaning making in the sense of applying a cultural tool. The case of bi-cultural backgrounds challenges both, the methodological as well as the theoretical approaches.

Seahore (1938) demonstrated a constant and gross deviation of performed melodies from the original musical score. The conventional musical score leaves the singer or instrumentalist great latitude for interpretation. Our hearing is limited in focusing on pitch and time accuracy, since musical situations are complex, tone movements are rapid and blurred. Studies on pitch perception (e.g. Siegel & Siegel, 1977) show that our auditory perception unreflectively uses pitch categories to structure experience even in cases such categories do not exist. This phenomenon, called "categorical perception", paradoxically prevents both, a so called "objective perception" of sounds and the experience of chaotic and unstructured sounds. Categorical perception, resulting from the past, prepares for the structuring of future experiences (Valsiner, 2000). Hence, the psychic dynamic works economical or conservative: It uses previous patterns to structure new precision or so called objectivity. Usually, our auditory perception functions very well to identify, understand, and even enjoy performed melodies despite the fact that the pitches and the timing deviate from the written score. Pitch, intensity, timbre, and the timing are first of all a matter of an overall interpretation and not of accuracy. A perfect match between the musical score and the interpretation is possible with computer sounds. However, such interpretations appear boring and sterile. Musical scores are messages and instructions from composers, which leave freedom to interpreters. But how can we describe what is actually performed?

So far, performed melodies were analysed either by mere listening combined with approximated notation, by expert ratings with respect to certain criteria (e.g. accuracy), or by transformation into midi format. These methods are neither culture free nor satisfying.

In many domains of music psychology, ethnomusicology, and developmental psychology, we need reliable descriptions of performed melodies, because reliable and valid descriptions are the basis for any theories that address musical behaviour, change, and development over time.

Analysing performed melodies

The method we designed was been described earlier (Stadler Elmer & Elmer, 2000), and the internet address for downloading the two programs give as well detailed instructions: http://mmatools.sourceforge.net/. Therefore, the main steps are only briefly described, and emphasis is put on illustrating results given by this method. For a structural analysis of performed melodies, pitch and its timing are generally considered more important than intensity and timbre.

Pitch analysis. There are various ways to analyse pitch. For instance, praat (Boersma & Weenink, 2007) is a very powerful computer program for analysing speech and related parameters including pitch. Our pitch analyzer is specialized on analyzing melodies, and it is less powerful and less complicated than praat. We devised two kinds of computer experiences at the expense of perceptual programs: One for the analysis of pitch at the basis of two different algorithms (Hess, 1983) which has been published (Stadler Elmer & Elmer, 2000). Figure 1 shows this program at work. The second program provides a detailed graphic notation of acoustic parameters at the basis of a data structure resulting from the acoustic analysis. We used this program since the beginning, but only recently, in 2006, it was improved and made easier for the public.

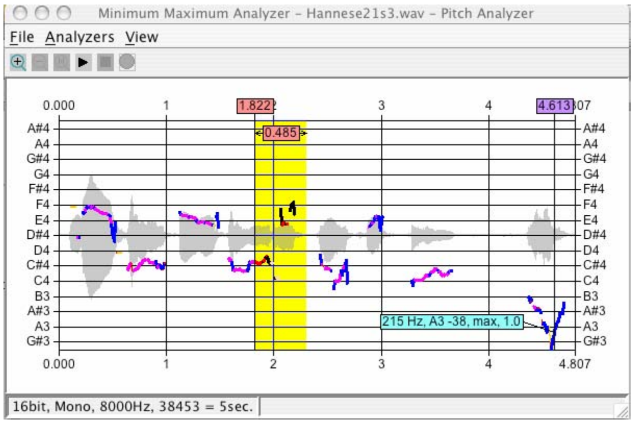

Figure 1. Our Pitch analyzer. Acoustic analyses on pitch (Hz and cents) and time are given. For instructions see: http://mmatools.sourceforge.net/.

Notational system. Conventional music scores suggest that a melody consists of a sequence of single notes consisting each of a stable pitch with well defined distances. But sung or instrumentally produced melodies usually deviate from such notation, and furthermore, they hardly ever show as stable pitch categories of our tonal system that could be quantified. Rather, the pitch patterns are influenced by the accompanying syllable and by the previous and the subsequent sound. Yet, our categorical perception creates stable pitch categories that are not present as such in the signal. Hence, the conventional music notation is not adequate to describe performed melodies. We need a more detailed notation system that represents the measured acoustic parameters (pitch and time).

Table 1 shows the symbols we invented to reduce the information given by the acoustical analysis and to represent graphically. Figure 2 shows the result of applying the new methodology, the analysis of a song sung by a six years old boy. The data structure that allows producing this figure with the program “notation viewer” is given in Table 2. Again, instructions on making such a structure at the basis of the pitch analyzer (pitch, time, syllables, phrases etc.) are given at http://mmatools.sourceforge.net/.

Code	Symbol	Description
1	•	Stable pitch
2	•/ •\	Stable pitch, ending with upward or downward glissando
3	/• \•	Stable pitch, starting with upward or downward glissando
4	/ \	Unstable pitch, but clear upward or downward glissando
5	I	Unstable pitch with glissandi in any direction and/or unidentifiable, fuzzy pitches within context of singing (prolonged vowel)
6	W	Pitch of a spoken syllable
7	X	Estimation on the basis of disturbed signales
8	H	Syllable sung by the researcher
+10	○	Joint singing

Table 1. Symbols used to denote measures and additional features in the figures.

Hannes, event 37, Solo 13, 5.1 secs
1
9
1 19.0 19.0 3.13 Flie-
1 15.3 15.3 3.75 gen
3 16.8 19.1 4.35 lie-
1 15.3 15.3 4.99 gen
2 16.8 16.0 5.58 das
3 12.4 13.2 6.15 du
1 17.1 17.1 6.70 Ka-
1 12.5 12.5 7.28 sten-
4 11.0 08.3 7.76 mann
8.20
End

Table 2. Example of the data structure yielding Figure 2. The symbols shown in Table 1 are encoded.

Examples

The following examples give insights into a larger study on how children from migrated families adapt to the dominating language and music culture in the kindergarten (Stadler Elmer & Engelberger, 2007). Hannes, growing up in a turkish family, learned a new song. Only two of his soli are presented here. They illustrate the new method and how it is useful in bi-cultural contexts.

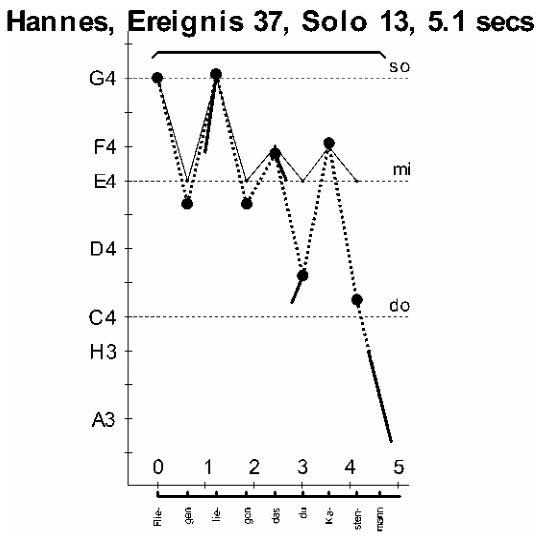

Figure 3. Hannes, during a song learning process, produced this song as his 13th solo. Before this event, there happened 36 events concerning this particular song, such as song presentation by the experimenter and the child’s previous 12 soli. Note in the figure, that the model song is depicted as a thin line for a comparison. But in the case of Hannes, the model is always incompletely depicted because the boy sang abbreviated songs. Here, his solo version ended after the model’s first phrase.

While analyzing many of his solos, we identified his recurrent patterns and strategies in building up a new song. As the figure shows, he accepts the beginning part of the melody, but not the words, he leaves out the middle part of the song, and he ends by accepting the words, but not the melody. His gradual building up melody and lyrics is systematically analysed. Figure 3 exemplifies another strategy: Here and in other soli, he wanted to end the song with a low pitch. For reaching this, it happened that he had to add a syllable or to manipulate the lyrics and the melody in order to end on a low pitch.

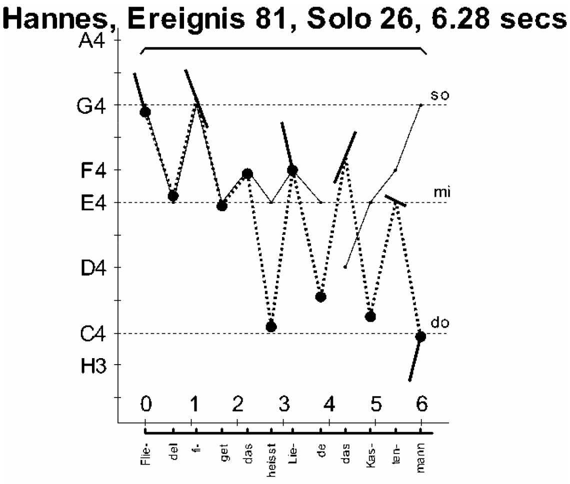

Figure 4. This solo version shows again his strategy of accepting the melody in the beginning, and of accepting the final words of the lyrics. The middle part of the song has more elements compared to previous soli. He fills the middle part by repeating up and down as a melodic pattern and by adding German-like syllables or proper words, but without coherent meaning.

Compared to other children learning this particular song (Stadler Elmer, 2002), Hannes was very slow in accepting the lyrics and melodic patterns. Although Hannes shows considerable difficulties – compared to children growing up in one culture - with adapting to his second language and to another kind of musical style, this solo version shows something interesting which is not visible: In the middle of the song he changes the meter while keeping a regular beat. Yet, this change from trochaic to jambus is not visible in the figures, because the focus here is the configuration of the beginning and ending pitches, syllables, and their timing. Poetic meter such as trochaic and jambus depends on the language and lyrics, and it is a mixture of duration, of falling or rising intensity, and of falling or rising pitch. Yet, meter, its pulse and accents, is both, a musical and a poetic means to structure time. In balcanic music, changes in meter are characteristic, but are seldom in the occidental music culture. The discovery of how this Turkish boy uses patterns of his first culture to adapt to a second culture was only possible by the microgenetic approach and the culture-free access to acoustic parameters. Although this Turkish boy has difficulties in adapting to the language and music, he uses previously learned singing structures from his other culture to build up a new song in the context of the other culture. Apart from structural aspects of this boy's behavioural organization, we were impressed by his patience and his interest in the task.

Conclusions

Because this methods deconstructs songs singing or melodic performances into a simultaneous configuration of relevant parameters (pitch, time, syllables), the complexity of the description is ensured. It allows assessing behavioural organization and its change over time. Moreover, because this method emphasizes acoustic measures as basic and almost culture-free elements, descriptions of performed melodies allow going beyond a particular musical or tonal system. For understanding universal developmental mechanisms and how they manifest in various cultural settings, it is important to have research tools that assure to gain some common descriptive grounds. The study of children with bi-cultural backgrounds is very challenging, because the researcher needs knowledge of the two cultures. The children develop strategies for handling their dual half cultures, in the context of singing, with respect to language and music.

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