

The Reception of Overtone Singing by Uninformed Listeners

Marie-Cécile Barras¹ and Anne-Marie Gouiffès²

¹ University of Bordeaux (IUFM d'Aquitaine, Bordeaux IV and Department of Music, Bordeaux III)

² Jeannine Manuel Bilingual School, Paris and OMF, University of Paris IV-Sorbonne

Background in acoustics and psychoacoustics. Overtone singing is a vocal technique by which a single source produces two melodic pitches simultaneously. When an unprepared listener hears a recording of overtone singing, the first question is usually: "How was the sound produced?" The level of auditory education may play a role in the perception of this phenomenon.

Background in cultural studies. A study of a cultural initiation includes subjective aspects of reception. Listeners are presented with an unknown vocal technique from a popular culture. The majority of listeners will experience it as a real cultural confrontation with an unknown world of sound. The initial phase of acculturation is therefore the most salient.

Aims. Our objective is to determine how the listener reacts to an unknown musical phenomenon, in both its perceptive and cultural dimensions.

Main contribution. The present study concerns the listener's reception of overtone singing. The musical corpus includes styles of singing as diverse as those found in Tuva and Mongolia, in South Africa (Xhosa women), or among the Dani people of Irian Jaya in the Indonesian territory of New Guinea. Psychoacoustic tests were given to 338 adolescents (10–15 years old).

Implications. In order to understand the mechanism 'from the inside', all the listeners, who have undergone the tests, then try overtone singing. Our study opens the door to a transformation in the way one listens. It encourages an openness to other artistic and cultural dimensions through a real education of the ear.

Keywords: Overtone singing, ethnomusicology, pitch perception, psychoacoustics, reception, cultural studies

Introduction

The present study concerns the listener's reception of overtone singing, a vocal technique by which a single source produces two melodic pitches simultaneously. One of the pitches is the generally stable fundamental, which serves as a sort of drone; the other results from the shifting emphasis of different harmonics. This shifting emphasis has a melodic intent. The various harmonics are obtained through a modification (by pronouncing the vowels) of the singer's resonators (the pharyngo-buccal cavity acts as a resonator of variable volume) and a particular use of the breath with a forceful contraction of the abdominal and neck muscles. This is characteristic for traditional techniques of overtone singing. In a different way, the ethnomusicologist Trần Quang Hai thinks that the singer's nose can be used as a natural shutter in order to filter undesirable frequencies with no more additional efforts than while speaking (Zemp, 1989; Zemp & Trần, 1991), but this experimental possibility should not be confused with the guttural overtone singing (or 'throat singing' as Mongols and Tuvans call it).

This vocal technique which is very original has been observed, recorded and studied in depth for about thirty years by ethnomusicologists and acousticians (Léothaud, 1989). A short sequence of analysis presented in an interactive process can be found at: <http://www.mae.u-paris10.fr/crem-cnrs/Animations/diphonique/hai1.html>, or at the website of the 'Musée de l'Homme' of Paris: <http://www.ethnomus.org>¹ (click 'Enter', choose 'Réalisations Multimedia', 'Les clefs d'écoute', 'Le chant diphonique'). The analysis of the frequencies can be visualized immediately as the singer physically emits overtone singing thanks to a special computer programme (e.g. 'sygyt software', <http://www.sygyt.com>², Maass & Saus, 2003) which draws sonagrams (or spectrograms), thus illustrating the acoustic specificity of the sound.

Though this vocal technique is now well known by specialists (Walcott, 1974; Trần, 1975, 2002) and also used in contemporary music, overtone singing is still unknown to the general public. The first listening experiment that we did in music classes triggered varied and surprising reactions. This music raised issues linked both to perception and cultural background. Therefore we felt that overtone singing was a good basis to explore the psychoacoustic experience and the cultural initiation that it entails.

So the main question was: "How does an uninformed listener react to an unknown musical phenomenon?" – in perceptive and cultural dimensions.

Method

Musical corpus

The existence of overtone singing is now acknowledged in places beyond Mount Altai, in Central Asia, among the following populations: Mongolian, Tuva, Khakash, Altaian, and among the Bashkirs (West of the Urals). What is less well known is that certain Xhosa women from South Africa perform overtone singing in extremely low vocal registers and that a recording (by John Levy, 1967, cited in Zemp & Trân, 1991, and in Trân, 2002) of a singer also shows that overtone singing existed in Rajasthan. The Dani people of Irian Jaya in the Indonesian territory of New Guinea practise a unique kind of triphonic singing that has yet to be fully researched.

We wanted to let the students listen to several techniques in order to explore the diversity present in different continents and allow them to discover this phenomenon in other new places. Thus the musical corpus includes styles of singing as diverse as those found in Tuva and Mongolia (Desjacques, 1993), in South Africa (with women's voices singing in the lower register), or among the Dani people of Irian Jaya.

The performance is executed by a sole vocalist, and not by a vocal ensemble which produces a harmonic from the fusion of several voices, as observed in the polyphonic singing of Sardinia (Lortat-Jacob, 1998) or with the deep bass voices of the monks of the Gyütö monastery in Tibet, in exile in India (Trân, 1999).

Students listened to four extracts that were each less than one minute long:

- **EX1 (= Extract 1), 0'57, Mongolia, *xhöömij*** (Maison des Cultures du monde, 1989, N°6: 'Khuren khalgaatai delguur').

The *Khoomei* (or *xhöömij* or *xöömii...* – transliterated in different ways by different authors), from a Mongolian word that means 'throat' or 'pharynx', is generally translated as 'throat-singing'³ and is the name of a particular soft-sounding style (with clear harmonics) as well as the general term for throat-singing. The fundamental pitch in the *khoomei* style is higher (in a baritone register) than that of *kargiraa* (see EX3).

- **EX2 (= Extract 2), 0'34, New Guinea, Dani people** (Petrequin, 2001, N°18–19–20: 'Lolo-Lou, Habema').

The Extract 2 (Dani people) is an ethnological document and not an 'ethnomusicological' record. It is important to note that this extract was an exception to the rule, because the singer was producing a triphonic sound.

- **EX3 (= Extract 3), 0'56, Tuva, 'Dag kargyraa'** (Zemp, 1996, N°37: Russie-Kyzyl, République de Tuva).

Kargiraa style, from an onomatopoeic word that means in Tuvan 'to wheeze', 'to speak in a hoarse or husky voice' (Alekseev, Kirgiz & Levin, 1990) is characterized by an extremely low fundamental pitch (frequency between 55 Hertz [Hz]–65 Hz).

- **EX4 (= Extract 4), 0'52, South Africa, Xhosa woman** (Ngqoko, Lumko district) (Zemp, 1996, N°36-a: *Nondel' ekhaya* ['Married at home']; in the style *umngqokolo ngomqangi* by Nowayilethi Mbizweni).

Umngqokolo (overtone singing in South Africa) *ngomqangi* style is 'inspired by the buzzing of a beetle held in front of the mouth [of the performer], with selection of harmonics in the buccal cavity' (Trân, in Zemp, 1996).

This heterogeneous musical corpus could make the identification of this phenomenon more complicated for the listeners (because of the stylistic diversity of the pieces), but we wanted to offer a pedagogical and cultural mind opener that was as wide as possible in our test.

Note that overtone singing is traditionally performed by men. The ethnomusicologist Trân Quang Hai thinks⁴ this tradition is based on acoustical principles (Zemp & Trân, 1991). One has to produce a fundamental tone within the range of about 150 Hz (or about 200 Hz at most) to perceive harmonics up to the 13th harmonic (a vibration of about 2000 Hz, or about 2600 Hz), but a 150 Hz emission is not within the usual register of women's voices. For instance, in the test, the Tuvan melody in 'Kargiraa technique' (EX3) uses harmonics number 8, 9, 10 and 12.

The Xhosa woman in South Africa (when using the lower register of her voice; EX4), is an exception, and all the pupils thought this was a man's voice in this extract.

Psychoacoustic test: subjects, listening experiment and questionnaire

Psychoacoustic tests were given to a broad public (adolescents and young adults between the ages of 10 and 30, with hypothesis of standard hearing). The results in this paper are based on the answers of 338 adolescents between the ages of 10 and 15. These adolescents belong to an international school "École Active Bilingue Jeannine Manuel" offering bilingual education in French and English (about 75% students use at least two languages at home and practice bilingualism daily). The audience included all students from 14 classes taught by Anne-Marie Gouiffès.

The test took fifty minutes (including setting up and instructions) which stands for a full weekly music lesson. The group of adolescents listened together to the four extracts in the music class. No communication between them and no visible expression were required (but this was impossible for them – see 'Results / Student's reactions').



Figure 1. Ages with the distribution of girls and boys.

An open questionnaire was distributed at the beginning of the session, followed by more precise questions that lead to investigations of the structure of the sound. Listeners were asked four questions (one different question for each extract). It is important to notice that they did not have the questionnaire in advance, but read the questions one by one, while the test was going on (the students were only allowed three minutes to write down their answers).

The questions are the following (EX1= Extract 1, EX2= Extract 2, etc.):

- **EX1** – What are you hearing?
- **EX2** – What are you listening to? Try to explain more. Try to describe the sound.
- **EX3** – In addition to what you have heard, try to say what you have felt and try to explain this feeling.
- **EX4** – What was your personal feeling? Try to explain the reasons why and give us as many details as you can. Try to guess how the sound could be made.

Results

When unprepared listeners hear a recording of overtone singing, one of their first questions is usually: “How was this sound produced?” After a closer listening, they may try to decipher the nature of the sound (the level of auditory education may play a role in the perception of this phenomenon).

Student’s reactions

Children of this age are still spontaneous enough to physically manifest what they are feeling through body language. When they finally understand that it was produced by a human voice, many adolescents — contrary to older audiences — are tempted to reproduce the sound themselves, much like they did when first learning to speak. So, reactions were varied: perplexity, laughter, miming, curiosity, pleasure, rejection, enthusiasm, fear...⁵

Written answers

Responses for each extract in the open questionnaire and comments about the sound, allowed several listening channels to be distinguished. The categories of the origin of the sound in the Figure 2 are extracted from the free comments. The distribution of the types of answers shows: source(s) of the sound(s) determined; voice(s) and/or instrument(s) or labelled sound (without voice); perception of the source(s) undetermined (see Figure 2).

In the channel noted ‘undetermined source of sound’, most of the answers specified that they were unable to determine the source. So the remaining question was: “How was this sound produced?”

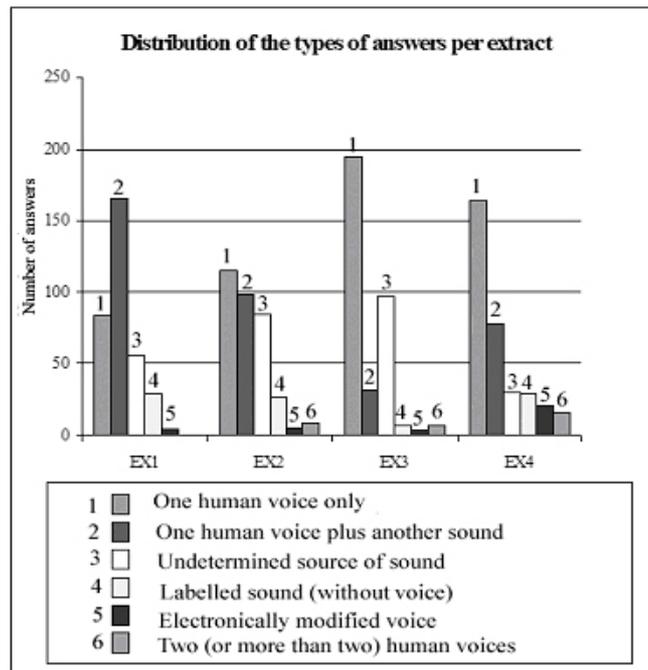


Figure 2. Distribution of the types of answers per extract.

It was, at times, difficult to differentiate between reactions to musical characteristics and those related to specific vocal techniques; however, we noticed that the negative reactions (like *'it gives me a headache'*) seemed to be related to the feeling of the obtrusive and awkward presence of the singer's body (*'It's like somebody with a sore throat, and we feel it ourself'* – EX3, Justine, 13 years old), while positive reactions were the expression of musical appreciation (like *'It was beautiful, the way he sings'* – EX3, Joséphine, 13 years old). This point should be confirmed by data.

The answers were so interesting that other studies should be made related to the vocabulary of specific notions that we had not foreseen (sense of the Sacred, exoticism, feeling of strangeness, emotions, presence of the body, etc).

One example of answers concerning 'Exoticism'

As a way to locate some unknown music (in a foreign country, from a civilization, a cultural practice, a ritual or a ceremony...) or as an expression of 'aesthetics of diversity'

About 25% pupils spontaneously felt the need to locate this 'sound' in a country, or identify it as originating from some civilization, some cultural practice, some ritual or ceremony, etc. (we noticed that this need grew in proportion to the age of the students from 11 to 15). Identification was often erroneous. Only one student referred to Mongolia for Extract 1 (correctly) but he also referred to Mongolia for Extract 4 (South Africa, in fact). We can see that around 12% referred to Africa correctly for the Ex4, and only 1% for the other extracts.

But, initially, getting a right or wrong answers was not a problem. These answers were interesting because they allowed us to realize how the students figured out the representation or the image of the 'Difference', the 'Distance'.

The 'furthest away' in space is an *'alien'*, or an *'unidentified flying object'*. The 'furthest away' in time is a man *'imitating a Prehistoric man'*. Lea, 14 years old, wrote: *'It is as if I was in a cavern during the Prehistoric Age, before man could speak'*. One pupil imagined *'Asian monks in Antiquity'*; such an image summarizes a single definition of the distant space-time and spiritual spheres. The answers cover a map throughout the globe, with a preference for Africa, Asia and Australia (imagined like a continent peopled with Aborigines only). We can assume that Europe and America (except for the Indians!) and, in fact, generally Western cultures are not quoted (or exceptionally in a different way: use of technology with electronically altered voices). In their view, this is not exoticism (all of these adolescents are not from Europe, but they would refer to Western culture). Yet, *'a far-away place where technology has yet to arrive'* (Aude, 14 years old), can be exotic...

All of these answers (a significant number of them from youngsters aged 14–15) lay the foundation of 'the aesthetics of the diversity' concept, according to the words used by Victor Segalen in his essay, *Essai sur l'exotisme* (1999).

We can suppose that the adolescents' need to locate and culturally identify four minutes of music (an unknown musical phenomenon) may have to do with their growing individuality and conscience. These adolescents can assert their identity by applying diversity to the Antipodes, the natural wilderness of a country, a temple in a forest, tribal dances or rituals... The singer could be a Shaman, an Indian or an African witch-doctor... They can hear *'the national anthem of the jungle'*, but they honestly confess imagining things: *'At the end, I interpreted it as a song sung for African celebrations, even though I knew it was not so'*. With *'A human voice which does not come from our cultures'* (Jianne, 13 years old), which *'transports [...] out of class'* (Julia, 14 years old), one leaves the secular world. Perhaps, because of the weirdness of the sonority, this voice was often associated to sacred customs. As a religion, Buddhism was frequently quoted (due, maybe, to what the Western world has learned of Buddhism and its mystery).

We found other answers without any connection to a particular religion, but very profound and tainted with mysticism: *'I felt enveloped by the sound; it struck down deep into my bones; it dissolved all the little noises in the background and became the ONLY sound. It was so loud and overwhelming that I seemed to become a lonely rock shaken by that moan. It was like a call to God that pierced the sky and shattered the trivial things that surrounding me. It was everything in the world while it played....'* (Emma, 12 years old).

Background

At the end of the test, students were asked personal questions because we wanted to know which kind of connection could be established between their way of hearing and their personal background.

The questions relating to the background are the following:

- Do you play an instrument? If yes, which one and for how long?
- What is your mother tongue? Are there any other languages spoken at home (except French)?
- Have you ever lived abroad or spent significant amounts of time abroad on holiday (out of France)?
- Have you heard this kind of music before? Give us some details.
- What are your musical tastes?

The data about the background are still under analysis; however, a brief outlook can be provided. For example, we noticed that several students mentioned the 'didgeridoo' as an instrument that could accompany the singer, or in which the singer could sing while blowing through it. The second point is most interesting even if it is not factual: it shows that listeners have perceived — consciously or not — the existence of harmonics.

- **EX1** – Shalla-Marie, 13 years old:
'A kind of highpitched voice. Vibrating. And we can hear the breaths he (or she) is taking. It sounds like he is moving his mouth a lot to make the sound. It is a peculiar sound, very peculiar and it sounds like the kind of music the aborigines in Australia listen to and make.'

- **EX1** – Bastien, 13, lived in Australia for 3 ½ years:
'This sounds like the didgeridoo, the instrument of the Australian natives.'

- **EX1** – Hilary, 11, Australian pupil:
'I hear a man's voice imitating the sound of a didgeridoo. Maybe a recorder.'

That is why we had to verify if those students had had special musical experience when they lived or stayed abroad, or if they had specific knowledge linked to their family origins. All the Australian pupils (or those who had had a long stay in Australia) said the sound was reminiscent of the Aboriginal instrument.

Implications

In order to understand the mechanism 'from the inside', all the students of the 14 classes of the bilingual school "École Active Bilingue Jeannine Manuel" who have undergone the tests, tried overtone singing (in the line of Zemp & Trân, 1989, 1997; Trân & Souvet, 2004; Trân, 2005). Two weeks after the experiment, more than three hundred pupils were taught the basics of the technique of overtone singing by Anne-Marie Gouiffès as she was taught herself by Trân Quang Hai in 2004.

Reactions were various: girls were generally shy and inhibited, but when they tried the results were often excellent. Almost all the boys considered this vocal experience as a challenge and were very excited to perform.

Practising

We conducted our investigation in a bilingual school where multiculturalism was a reality. In such an environment, signs of rejection or refusal on a cultural basis — if they existed — were less obvious, less overt. One would not reject music because it is strange (or 'alien') but resistance is based on the assumption that it is some 'noise', some 'sound' that takes you aback, or is boring or unpleasant.

Practising the basics of overtone singing is a good way of discovering 'alterity' — or 'otherness' — because the feeling of voicing and listening implies a complete change of habit. At the same time students discover new physical sensations and listen to their own voices in a way they never did before. It sometimes reveals a new personality, and the students who succeeded in overtone singing were admired by their friends. Besides, we soon noticed that some students, usually shy when it came

to singing, were very happy to practice overtone singing. Probably, these students had wished to learn overtone singing as it is sung in Mongolia or Tuva.

Despite broken voice, all the boys in the forms were willing to try and were interested in the performance of others. ‘Sense of failure’ posed no problem. One student asked whether written scores of overtone singing existed; this led to a discussion about oral and written tradition... The matter was different with the girls. They were interested in the description of the phenomenon but the majority of them refused to try overtone singing.⁶ It may have to do with the fear that this way of singing, which causes funny faces and transforms voices, might alter their own image.

Conclusion

After investigating a musical corpus and vocal technique little known to the general public, we intended to bring a musicological contribution to the work of acousticians, ethnomusicologists, and, obviously, musicians who practice overtone singing (Zemp & Trân, 1989, 1997; Pegg, 2001).

This study proposed to examine overtone singing through the unique perspective of listeners’ reception. The majority of listeners (a middle school audience) experienced it as a real cultural confrontation with an unknown world of sound. The initial phase of acculturation is therefore the most salient.

This type of research requires an interdisciplinary approach (musicology; ethnomusicology; acoustics and its musical subdisciplines, and psychoacoustics; the psychology of perception; sociology and cultural studies). After having conducted this experiment, we are able to conclude that the discovery of overtone singing opened the door to a transformation in the way one listens. It encourages opening up to other artistic and cultural dimensions through a real education of the ear.

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¹ Official website of the UMR laboratory of the CNRS 7186 (Centre National de la Recherche Scientifique, France).

² Created by Bodo Maass and Wolfgang Saus in 2003, this website 'can be used as a spectrum analyzer and a visual feedback tool as well as an interactive visualization of music theory'.

³ See the website www.khoomei.com. Created by Steve Sklar (USA), for Tuvan throat singing or *Khoomei*.

⁴ As he told us in a work session.

⁵ The reactions were recorded on video and presented at the 3rd Conference on Interdisciplinary Musicology (CIM07), held in Tallinn, Estonia, 15–19 August 2007, on the theme of singing.

⁶ On the video documentary presented at CIM07, some girls can be seen trying overtone singing but these instances were the only ones.