

Research Article

Overtones Singing and Meditation

Riccardo Misto*

Villaggio S. Antonio onlus, Noventa Padovana (Padova), Italy

Abstract

The article analyses the various overtones singing techniques, the physiological and psychic processes connected to this singing modality, and takes into consideration the possibility of using them to achieve that particular state we call “meditation”, a complex mental process involving changes in cognition, sensory perception, affect, hormones and autonomic activity.

Keywords: Meditation; Music therapy; Nitric oxide; Overtones singing; Prefrontal cortex

Introduction

Overtones singing [1], or diphonic singing, are a singing technique, which consists in simultaneously producing two notes (frequencies): one is called fundamental and the second is a so-called overtone or harmonic. In this way particular effects can be obtained which, basically, we can summarize in:

- Feeling of great amazement and wonder in listening
- Possibility of more or less complex musical constructions
- So-called “altered” states of consciousness, with modification of some psychophysical parameters, immediate of which is the so-called “meditative” state

Leaving aside the more strictly religious and mystical aspects, linked to practices used by various cultures, first of all the Tibetan Gyuto and Gyume monks tradition, we will now focus on the acoustic and psychological parameters that underlie the use of this music therapy technique for specifically meditative purposes.

This leads us first of all to analyse the sound in its acoustic vibrational components: any frequency produced (the Hindu use the term “ahata”, audible, and “Anahita”, inaudible) results as the sum of

*Corresponding author: Misto R, Villaggio S. Antonio onlus, Noventa Padovana (Padova), Italy, Tel: +39 3282074908; E-mail: ricmisto@gmail.com

Citation: Misto R (2021) Overtones Singing and Meditation. J Altern Complement Integr Med 7: 209.

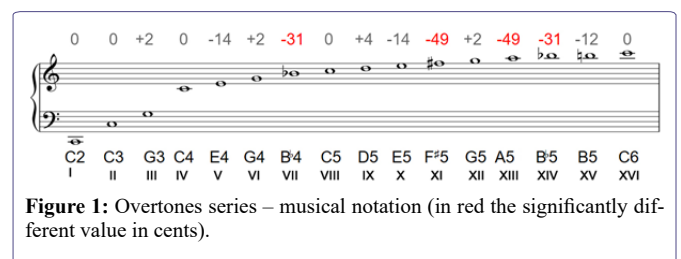
Received: November 24, 2021; **Accepted:** December 01, 2021; **Published:** December 08, 2021

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different frequencies composed of the fundamental sound (the one which is more evident when listening) to which others are superimposed, called overtones, less evident to the ear of the average listener. It is good to clarify that the different constellation of harmonics present in a sound determines its so-called “timbre”, the characteristic colour that allows us to immediately identify the sound of a specific musical instrument. In this way, it was possible to digitally create, in a realistic way, the sounds of the various instruments with modern synthesizers.

Fourier’s theorem says that any sound can be decomposed and re-composed into its components: that is to say that any sound can be decomposed into an infinite number of its harmonics. In essence, it is a question of considering sound as a multidimensional structure where at the base is the fundamental sound, to which infinite levels (overtones) are superimposed. The English term “overtones” is clearer than the definition of “harmonics”, which can generate misconceptions of various kinds. We can therefore consider the overtones as the atomic component of sound. If you analyse the waveform of a sound, you can easily see how this appears quite complex, chaotic, given by the coexistence of countless harmonics. Each sound has its own characteristic timbre (colour), as some harmonics are pre-eminent over others. In the clarinet sound, for example, the odd harmonics are stronger than the others are (looking at the sound spectrum), while the sound of the trumpet or bassoon has a different constellation of harmonics.

At this point, it is useful to analyse the sequence, the so-called progression of the harmonics, starting from a note called Fundamental (F). In the example of figure 1, the key of C has been generically chosen, but the procedure is the same regardless of the starting note (Table 1).



As you can see, the first harmonic (I) coincides with the Fundamental (C), after which the second (II) is still the fundamental but one octave above. The third (III) follows, corresponding to an interval of a fifth (G) and then again the fundamental, one octave above, as a fourth harmonic. Gradually, the successive harmonics follow which, in theory, are infinite, without prejudice to the discriminatory capacity of our hearing organ.

An interesting aspect concerns the actual intonation of the various harmonics, which does not correspond to that established in our equal temperate system, where corrections have been made in order to ensure the efficiency of the musical system. We can therefore already say that in harmonic singing we regain possession of the actual tonal value of the notes, respecting the natural constitution of sound and

Note	C	C	G	C	E	G	Bb	C	D	E	F#	G	A	Bb	B	C
octave		1		2				3								4
N.	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI
overtone																
interval	F	8	5	8	3	5	b7	8	2	3	4+	5	6	b7	7	8

Table 1: Overtones progression.

frequencies. In fact, we say that in Overtones Singing it is impossible to go out of tune, as the harmonic produced is already naturally in tune and its pitch cannot be changed. Some harmonics in particular are different from the musically established pitch: for example, the seventh, eleventh, thirteenth and fourteenth are noticeably waning.

Methods

Having made this necessary musicological premise, we come to synthesize the methods that allow producing the various harmonics with the sung voice. It is a question of modifying the structure of our phono-articulatory apparatus in order to enhance those frequencies that are covered by the fundamental. There are several techniques, each of which produces a more or less wide “window” of harmonics. Let’s leave aside the Mongolian “*Xhoomi*” techniques, which significantly stress the vocal cords and which are not recommended for the physiological structure of Westerners, and consider those, so-called European-style, which are safe and do not involve any risk. A particular consideration will then be made to that of the Tibetan monks, called “*Deep voice*” or “*One voice chord*”, which is based on a modification of the *Xhoomi* mode called “*Kargyra*”, in which, however, there are absolutely no stress traits for the vocal cords, as the so-called “false vocal cords” are used. They are essentially four:

- Opening of the glottis
- One cavity
- Two cavities
- Sub-harmonics (Tibetan Deep Voice)

In the first technique, we use the NG phoneme to trigger the harmonic and then the sound is nasalized with the nose to amplify it.

Once the harmonic is activated, we move through the vowels UOAEI, each of which will select a specific harmonic, based on the mathematical sequence of the progression of the harmonics we have talked about. Several warm-up exercises facilitate the concretization of the technique and its effects.

A variant of this modality consists in starting with the sound M (humming) and then transforming it into MOO and then, nasalizing strongly, you always move following the UOAEI sequence to bring out the progression of the harmonics.

In the second technique the entire oral cavity is used with a substantially clean sound, where it will be important to exaggerate the conformation of the mouth and to protrude the jaw a little, keeping the lips soft: we will move from the U (U is pronounced “Y”, between u and i (i.e. pronouncing i but with lips set as for u) and then slowly move towards the I, thus obtaining a wider harmonic window than the glottis technique.

Then, the two-cavity technique consists in dividing the oral cavity by interposing the tongue, which will delicately touch the palate, while with the vowels one always moves from the U towards the I.

Finally, in the Tibetan deep voice technique there is a control of the ventricular folds constantly increasing their function: the singer adducts and relaxes the ventricular folds.

Results

After this brief summary of the technical aspects, let us get to the heart of using Overtones Singing for generically “meditative” purposes, first clarifying what we mean by meditation, a term widely used today but which is not always understood. Let us immediately clarify that the result of meditation presupposes a process, a series of strategies, which then lead to a greater overall awareness, a state of expanded consciousness, as well as favouring mental rest as a result. Let us immediately dispel the misunderstanding of yogic texts (first of all “*Yoga Sutra of Patanjali*”), where we talk about blocking mental activity (nirodha): “this effect, besides being practically impossible, would be very dangerous. In reality, the term nirodha has two meanings, depending on whether it is pronounced with the dental or cerebral d: the latter meaning, which is the correct one, can be translated as “not carried” (nir = reinforcing, odha = carried), and therefore that interval devoid of mental signals between one vritti and the other in the sense that one enters a space, an interval, between one thought wave (“vritti”) and another. It is like a window of emptiness, where, however, the mind is alert and functioning, and where the consciousness filters, giving light to thoughts, allowing the awareness of reality, whether internal or external” [2]. The purpose of yoga, and therefore of meditation, is in fact to increase more and more this space between one thought and the other, where one can get in touch with the true self, the so-called “*Purusha*”, the higher level beyond the contingent and phenomenal world (“*Prakriti*”), connecting with the original source, the divine however one wants to understand it. This leads to greater clarity of view and better understanding of the real world, where one can move with greater awareness.

The greater awareness derives, in technical terms, from one of the most overt effects of the practice of overtones singing, which consists in a slowed perception of the passage of time: this is a psychic effect common to many psychedelic experiences obtainable with the use of particular psychotropic substances, such as LSD, mescaline and other hallucinogenic mushrooms. In this case, we can avoid the dangerous unwanted side effects that these substances can produce. The slowed perception allows you to experience the flow of reality in a new and more conscious way, it is like seeing a scene in slow motion, and in order to understand better many details that otherwise would escape perception. To this psychic effect are added many other changes of important physical and physiological parameters, such as:

- Loading of the cerebral cortex
- Reduction of heart rhythms (by about three beats per minute)
- Reduction of breathing rhythms (decrease in oxygen consumption)
- Decreased brain wave activity (increased alpha waves)
- Reduction of the general rhythms of metabolism

Physiological changes on the fascia (connective tissue of the body), which plays an important role on the brain synapses Strengthening of listening skills, through which the hearing is refined and all the nuances (harmonics) in the various sound sources are perceived more clearly.

Dr. Alfred Tomatis [3] claims that sacred songs were rich in high-frequency harmonics with neurophysiological effects on the human brain, through hearing. One of the main functions of the ear was in fact to stimulate the cerebral cortex and 95% of the total body charge through the reception of sound. Analysing the effects of liturgical chant eventually the doctor realized that the monks, when they sang, seemed to slow their breathing and induce listeners to do the same, generating a common sense of tranquillity.

We must now take into consideration and analyse what are the mechanisms that lead to enter the meditative state, specifically in relation to the overtones singing technique. We assume that it is possible to achieve meditative states using any of the physical senses (in addition to hearing, sight, touch, taste, smell as well as the activity of thought in general). It is therefore essential to start from an experience linked to one of these senses in order to then transcend it and arrive at the state of no-mind, which, we repeat, does not mean blocking the thought, but rather significantly expanding those moments of interval between wave carriers of thought (vritti), which we have called “nirodha”. In the case of Overtones Singing, the strong concentration on the harmonic sound will be important, to hear it, recognize it and therefore “contemplate” it. Contemplation, in fact, is the final stage that follows attention, concentration (prolonged attention) on a specific object (beeja) of the sensory experience. In the diphonic technique, in fact, this attentive focus on the harmonic is extremely important, essential for obtaining good results in bringing the harmonic frequency, to the fore. The first difficulty that the practitioner encounters is precisely that of realizing that he is emitting a harmonic: often the novice practitioner does not realize it, while the listener notices the presence of a second sound. This is because our normal hearing ability is concentrated on the frequency called “fundamental”, which actually contains many harmonics.

This particular attention to the harmonic is the basis of a virtuous mechanism, identified by the Chinese scholar Chen-Gia Tsai in the analysis of the harmonic song of the Tibetan monks (but which is extensible to all other techniques), which concerns in particular the oxide nitric: Chen-Gia Tsai states that “Nonadrenergic and Noncholinergic (NANC) nerves, which cause relaxation of the smooth muscle of the airways, have been described in several species including humans. Nitric oxide appears to be responsible for all NANC response in human central and peripheral airways in vitro. A recent article on meditation highlighted the importance of nitric oxide involvement during meditation. On the basis of these results, a Tibetan harmonic song model can be proposed” [4].

We can describe the basic cycle of Tibetan overtone singing as follows:

- Adduction and distension of the ventricular folds
- Singing with harmonic production
- Mental concentration on the harmonics produced
- This concentration triggers the production of nitric oxide, which leads to a relaxation of the smooth muscle in the supraglottic structure

According to this mechanism, the concentration on the harmonic produces two fundamental effects, closely linked to each other: the improvement of the quality of the harmonic sound, which takes more and more body, volume and clarity on the one hand, and on the other the transcending of normal thinking level, opening the doors to the meditative stage, with all its psychic effects connected.

The meditative process using overtones singing technique, therefore, is based on specific mechanisms that exploit the activation of the prefrontal cortex and the cingulate gyrus, which is a structure of the limbic system. The prefrontal cortex occupies the most rostral part of the frontal lobes and constitutes a large area that connects to the motor, perceptual and limbic areas of the brain: it plays a fundamental role in cognitive processes and in the regulation of behavior [5]. Thanks to the connections with different cortical areas, it is the neuroanatomical substrate of executive functions: planning, implementation and conclusion of behaviours directed to a purpose through coordinated and strategic actions, integration and synthesis of information, organization [6]. The cingulate gyrus is a part of the human brain located in the two cerebral hemispheres. This structure, together with the Para hippocampal gyrus, forms the limbic cortex of the limbic system of the brain. It is divided into three zones: an anterior (ACR) located in the prefrontal and orbit frontal region, a Posterior (PCR) and a Retrosplenial (RSR). Newberg and Iversen [7] (2003) have proposed the possibility of a neurophysiological network underlying meditative states.

Conclusion

We can affirm, on the basis of the considerations made, and on the experience of many practitioners of this technique, that overtones singing, with its various and differentiated styles, constitutes a functional platform to induce in the person who is singing, significant modifications of the normal physical and psychic parameters, such as to generate that particular state that we generally define “meditative” (a complex mental process involving changes in cognition, sensory perception, affect, hormones, and autonomic activity) [8,9]. For these effects, it will not be necessary to resort to complex singing techniques, as it is sufficient to produce a fundamental note and from this to select, with the technique you prefer, one harmonic from the sequence that arises mathematically from the natural progression of the overtones, concentrating the attention and the ear to “contemplate” it. For other purposes - for example to work selectively on specific physical and energetic centres - it will be necessary to produce an appropriate harmonic that will be more suitable for producing the desired effects. However, this is a topic beyond the more general purposes of this article.

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