

Sensory Effects of Vocal Phonation in Active Melotherapy

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Abstract: *This paper presents principles, methods of working with vowels and correlated results through the tropisms of vocal phonation in active melotherapy. The subtle aspects of vowels presented by traditional philosophies and the evidence of modern science on vowel phonation are reviewed. Research on vocalic tropisms is described, using an emission method that combines vocalic phonation with relaxation and creative visualization, as well as the methodology for correlating the data. The results confirm the existence of preferentially activated body areas upon emission of each pure vowel, as well as the existence of residual effects, after treatment, concerning mood and attentional state.*

Keywords: *melotherapy; vocals; vocal therapy; receptivity; active and integrative melotherapy;*

Introduction

There is now an impressive experimental body of evidence on the important effects of music therapy². Beyond mentions of music therapy in legendary contexts, in temples, in long forgotten rituals, closer to the tradition that we continue in modern day Europe are the mentions of Aristotle and Plato, then the mentions of the use of music in therapy from the end of the 20th century. 18th and early 19th centuries. The practice had its formal beginnings after World War I, when amateur musicians played for veterans with physical and emotional trauma.

There is still no unanimous opinion on how music therapy works, and, as a result, it is not always accepted in medical practice and is not included in specific forms of social insurance³.

Neuroplasticity is the ability of the brain to make morphological changes throughout life as a result of sensory, motor, reward mechanisms or awareness stimuli. It is now known that neuroplasticity takes place at many levels, from new synapses to entire cortical networks.

The stated aim of music therapy is to stimulate beneficial behavioural changes, and these are presumably due to changes taking place in the brain. Stegemoller states three principles of neuroplasticity that satisfactorily explain the mechanisms of music therapy.

The first principle is related to the circuits created in the brain for reward. Therefore, by associating music with non-musical behavioural elements, therapists can activate this reward circuitry⁴.

A second principle of neuroplasticity is the Hebbian theory, presented in the 1950s by Donald Hebb and summarised by Siegfried Lowel: neurons that transmit pulses together network

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² Stegemöller Elizabeth. 2017, March 1. "Exploring the Mechanism of Music Therapy", *The Scientist Magazine*. Retrieved 20 March, 2023, from <https://www.the-scientist.com/features/exploring-the-mechanisms-of-music-therapy-31936>.

³ Blood A.J. & Zatorre, R.J. 2000. "Intensely pleasurable responses to music correlate with activity in brain regions implicated in reward and emotion," *PNAS*, 98 (20): 11818-23, p. 11820.

⁴ Salimpoor V.N. et al. 2011. "Anatomically distinct dopamine release during anticipation and experience of peak emotion to music", *Nat Neurosci*, 14 (2)): 257-262, p. 260.

together. Research shows that sensory stimuli cause exposed neurons to bind. Rhythm is shown to cause synchronicity in networks of neurons. Thus, by associating music with activities such as movements, vocalizations, breathing, the therapist can stimulate the synchronous emission of neuronal pulses, hence the formation of new cortical networks, towards more stable beneficial changes in subjects.

Conversely, unpleasant noises have negative effects, destroying neuron networks, affecting cognition, memory, by suppressing the formative potential in the hippocampus. This third principle of neuroplasticity can be used by the therapist to alleviate some conditions by reducing environmental noise and good hearing hygiene advice.

Using music, rhythm, as a carrier vector, it is possible to modulate a rhythmic behaviour, even at the vegetative level (breathing, heartbeat), of the frequency of certain brain waves, causing relief of acute, chronic conditions or improving and stimulating natural states and processes in healthy subjects⁵.

Music can be used for children and adults to improve skills related to phonation, speech, expression, even oratory. Dopamine modulation, synchronization of neural activity, and noise reduction stimulate neuroplasticity, if intended to be applied concomitantly, utilizing music's exceptional peculiarity of simultaneously engaging multiple brain areas at different levels of depth and having measurable effects on vegetative functions⁶.

This paper presents principles, methods of working with vowels and correlated results through the tropisms of vocal phonation in active melodotherapy. Research on vocalic tropisms is described, using an emission method that combines vocalic phonation with relaxation and creative visualization, as well as the methodology for correlating the data.

1. The meaning and uses of vowels in documented traditions

As a result of modern research, science is coming closer to the most universal idea of human traditions, at the basis of philosophical systems, religions, theos and cosmogonies: vibration (sound) is the creative source of the universe. Sounds in general, but especially the human voice, are perceived on three levels, physical, emotional and conceptual/ideal, the fourth level being the level beyond concept, ideas or form and corresponding to the primordial meaning, the source of Creation. The phonemes of human utterance are carriers of energy, charged with meaning and intention, and this implies full responsibility in their use.

Based on the realities of the measured frequencies, it is possible to relate this to details of the significance of vowels in ancient traditions as well as to established practices of using vocal emissions for therapy. All traditions know how singing, through resonant vibrations in the bones of the face and head, stimulates the pineal gland, with all the effects that modern science knows and measures.

In ancient Egypt, vowels were considered sacred, living reflections of divinity, and therefore were not written down, an element taken up by other later traditions of the Hamito-Semitic languages. In the Corpus Hermeticum, the use of vowel phonemes is mentioned, in their

⁵ Koelsch, S. 2014. "Brain correlates of music-evoked emotions". *Nat Rev Neurosci*, 15(3): 170-80, p. 179.

⁶ Wan, Catherine & Rüber Theodor Y. & Hohmann. Anja & Schlaug, Gottfried. 2010. "The Therapeutic Effects of Singing in Neurological Disorders", *Music Percept.* 27(4): 287-295, pp. 290-292.

own right, in incantations, and with a therapeutic role. Asklepios is said to have written to the king of Ammon "...and we do not use mere words, but sounds charged with power" ⁷.

In Kashmir Shivaism, one of the oldest and most documented revelations in history, the vowels are said to be luminescent, appearing when consciousness relates to itself. Being subject to the laws of duality, like any created thing or phenomenon, they contain within themselves both 'the sun' - the male principle, and 'the moon' - the female principle.

In Hinduism⁸, the entire universe is made up of vibration, called nada - sound. Sounds can be produced by contact - ahata, or pre-existent, as inherent, permanent and immanent manifestation of the Creator in creation, which cannot be produced or reproduced by the creature - anahata. Each being has a specific, unique vibrational imprint, expressed through personal mantra, imprinted by natural conditions at the moment of birth. Revealing this personal sound and chanting it is an intense spiritual practice and considered to be extremely valuable for the spiritual evolution of any person. The knowledge of the ancient traditions has gone so far as to detail levels of vibration and sound as well as visual representations (yantras) for each level of functioning of a human being, which require knowledge of higher mathematics and are confirmed by modern cymatic representations.

Vedanta philosophy details the role and functions of the sixteen vowels, the way they are emitted being a fractal reproduction of cosmogony. The first vowel emitted, which imprints creation is A - anuttara, the supreme sound that contains in a transdimensional point - bindu, the entire creation and creative intent of the Creator. The last emission is H - assimilated to a vowel that concludes the emission, the envelope of creation, called visarga. The entire Sanskrit alphabet - the revealed language - Devanagari, is considered to consist of geometric representations, plane sections through the waveforms of vibrational emissions associated with the respective phonemes.

According to the same philosophy, there is a vowel hierarchy, in which pure vowels are considered A, I, U (anuttara, iccha, unmesa), followed by E, AI, O, AU (representing the Supreme male principle in union with its various active aspects - female principles), followed by the rest of the vowel combinations. Each of these phonemes is the living expression of a form of manifestation of the creator. For example:

- A, represents the vibrating consciousness between two points, whose nature is rest in the reflection of its own nature. Thus, consciousness concentrated in one point receives the impulse towards manifestation and various forms of cognition.
- I, reflects the act of will, dominance.
- U, represents the Expansion of Creation through the manifestation of the Supreme Will.
- E, results from the union of the supreme bliss of A with the supreme manifested will of I and is associated with the subtle space of the heart, the supreme feminine principle, sexuality, fertility, and reproduction.
- O it is associated with the evolution of creation in its stage of decrease, maturation.

In Taoist philosophy, the cycle of creative processes is reflected holistically and fractally throughout the anatomy, physiology, and mental, psychic processes of the human being. Here,

⁷ Malkowski, Edward F, Dunn, Christopher. 2007. *The Spiritual Technology of Ancient Egypt*. Rochester: Simon and Schuster, p. 180.

⁸ Vinita, Rashinkar. 2019. *Sri Chakra Yantra: Manifest anything with the symbol of everything*. Calcutta:Notion Press, pp. 221-250.

too, we find vocal emissions associated with the processes and organs that govern them, and their emission is practiced for therapeutic purposes with excellent empirically documented results.

2. Importance and functions of phonation in music therapy

Emitted and transmitted Sound manifests and is perceived as a form of energy. The characteristics of mechanical waves are associated with subjective characteristics, linked to human perception: timbre, melodicity, pleasant-unpleasant, harmonious-dissonant, etc. The harmonics of emitted sounds are perceived and distinguished, as a complex that gives a specific note to hearing. Each sound source has its own range of harmonics, according to which it is recognised, appreciated, subjectively associated, or not, in a musical, social, purely experimental context. The human voice is the most complex sounding instrument, both because of the richness of harmonics of the actual phonation and the richness of nuances in pitch, intensity, timbre, intention, expression. Expression through the voice is a basic human function, covering all aspects of existence, spiritual, social, professional, with a fundamental role in the full manifestation of the being. The vocal imprint is unique, unmistakable and is one of the most easily accessible and usable elements of uniqueness of human identity.

The virtues of the human voice in therapy are elementally verified in affective family relationships, in human relationships in general⁹. Emission modulations and nuances have been studied in various art forms, in sales and manipulation techniques, in psychology, pedagogy and have benefited from extensive studies in all these fields¹⁰.

Biological systems respond better to energetic stimuli than to chemical stimuli. In addition to the fact that reaction times are shorter, information transport speeds through tissues are much lower, the effects of exposure to energetic stimuli, of higher, modulable frequencies, are more profound and longer lasting than chemical stimuli.

The human voice is calibrated to the spectrum of auditory, sensory perception in general, as well as to that of tissue receptivity, so that the sound emitted is fully perceived and assimilated across the spectrum at all levels.

Living systems perceive health and harmony as a state of balance and naturally tend towards it. Therefore, the sound expression of physiological functions, be it pulse, heartbeat, articulation, voice, have been carefully correlated with the health states of certain organs, systemically, with emotional states, both for diagnosis and therapy.

The permeability of tissues at certain frequencies is known, with great potential for research on their global effects on anatomical morphologies as well as at the systemic level.

⁹ Dempsey, Rachel. 2001. *A Sense of the Essence - Experiencing the whole self through vocal sound. An examination of contemporary Western voice healing*, thesis on Voice & Healing for an MA in Ethnomusicology. Retrieved March 15, 2023 from from *Queen's University Belfast Web site*, <https://globalharmonies.com/resources/thesis-on-voice-healing/>.

¹⁰ Boyce-Tillman, J. 2006. *Constructing musical healing: The wounds that sing*. London: Jessica Kingsley, pp. 256-280.

2.1. Vocal phonation

Vowels have the particularity that they are emitted without friction between the soft parts of the human phonatory organ. The soft parts of the palate are raised and the tongue and larynx take different shapes and positions, enhanced by the shape of the lips, to form a frictionless airway.

In phonology, 20 vowel types have been identified, including pure vowels as well as diphthongs. These are classified according to the area of emission into front/back vowels, round/irregular, open/closed. Studies¹¹ have shown in MRI images the position of the organs concerned at the time of vowel emission (Figure 1).

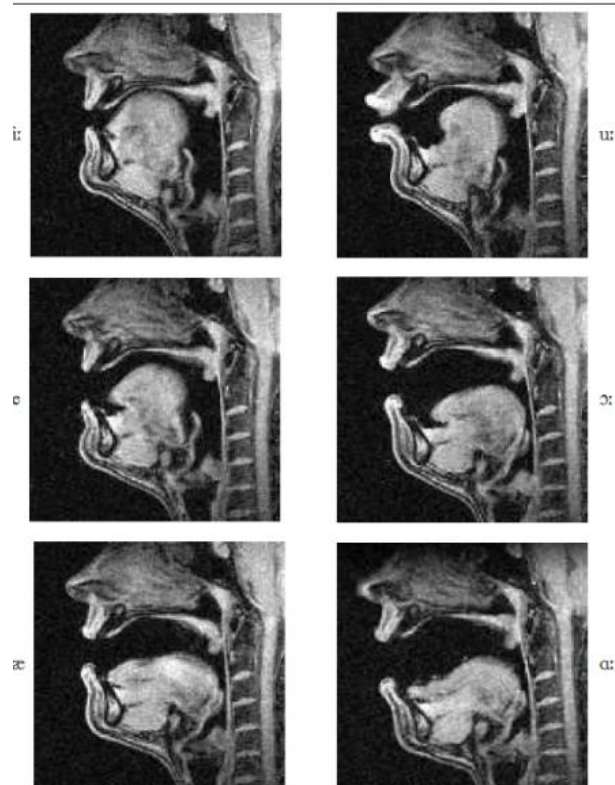


Fig. 1. MRI images of the position of the organs concerned at the time of vocal emission.

¹¹ *Speech, Hearing & Phonetic Sciences, Pals1004 Introduction to Speech Science*. Retrieved December 2, 2019 from UCL Division of Psychology and Language Sciences, from <https://www.phon.ucl.ac.uk/courses/spsci/iss/week5.php>.

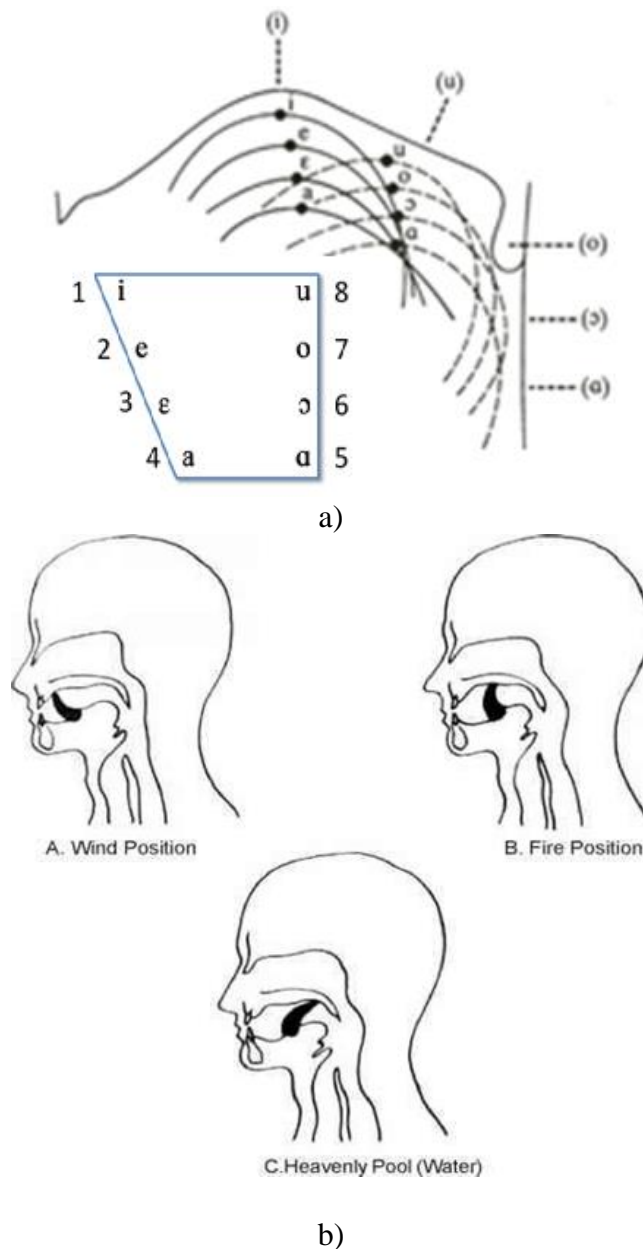


Fig. 2. *Position of the tongue relative to the palate for vowel emission and the vowel-a quadrilateral (UCL Division of Psychology and Language Sciences, 2019) compared with the position of the tongue for dynamizing certain vital processes, in Taoism - b*

Extreme positions of the phonatory soft parts were identified, as well as a vowel emission space, represented by the vowel quadrilateral (Figure 2), made up of the extreme points of the tongue position at vowel emission. These can be correlated with the position of the tongue for the dynamisation of certain vital processes, in Taoism (A-Air-Lungs, control processes, B-Fire-Heart, Pericardium, Small Intestine, C-Water-Kidney, Bladder).

2.2 Vocal frequencies

Spectral analysis of speech signals involves generating sounds and filtering them independently of the vocal tract, acting as a resonator tube. In vowel emission, the sound is produced by the vocal cord and filtered by the vocal tract, which is specifically formed for the emission of that vowel, from the larynx to the lips. The pitch and timbre of the vowel changes by changing the source, and the phonetic quality of the vowel changes by changing the filter, i.e. the shape of the phonatory tube. Figure 3 shows three different vowel spectra produced from the same laryngeal emission. The frequency response of the vocal tract contains peaks and troughs of amplitude. The spectral peaks occur due to the preferential frequencies of vibration of this tube, called resonance or formants. Measurement of these formants allows us to know the response frequencies of the phonatory tube to speech emission, as shown in table 1.

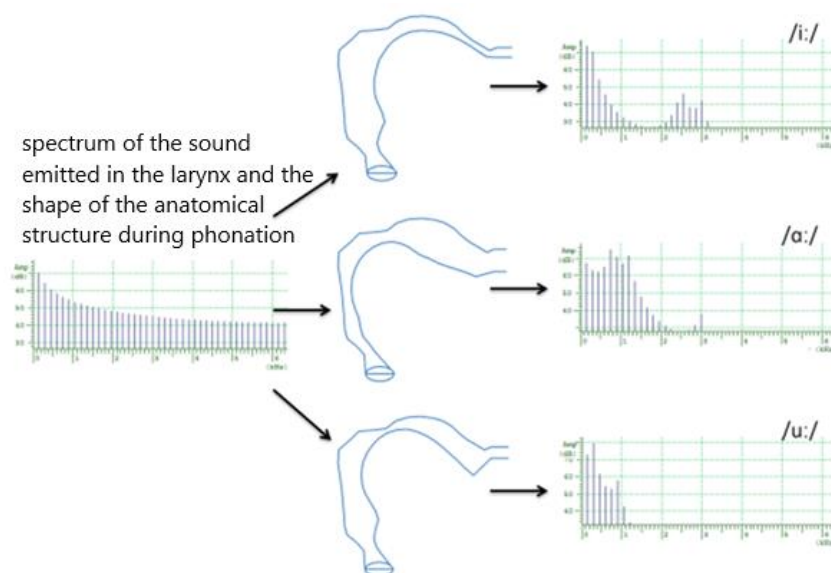


Fig. 3. *Different vowel spectra produced from the same laryngeal emission*¹¹

These measured frequencies were reflected in the acoustic surveys carried out with the cymascope. This device works on the principle of highlighting stationary Chladny curves, points of minimum amplitude at the elastic vibration of a plate (or flat fluid films, at rest), specific to vibration frequencies, induced in the plate with a mechanical vibrator, connected to a pulse generator, precisely controlled electronically.

Figures 4 and 5 show images of the plane projections of the waves generated in the vocal emissions of the human voice¹² and instrumental sounds.

¹² *The Science of Phonology*. Retrieved November 2, 2019, from https://www.cymascope.com/cyma_research/phonology.html.

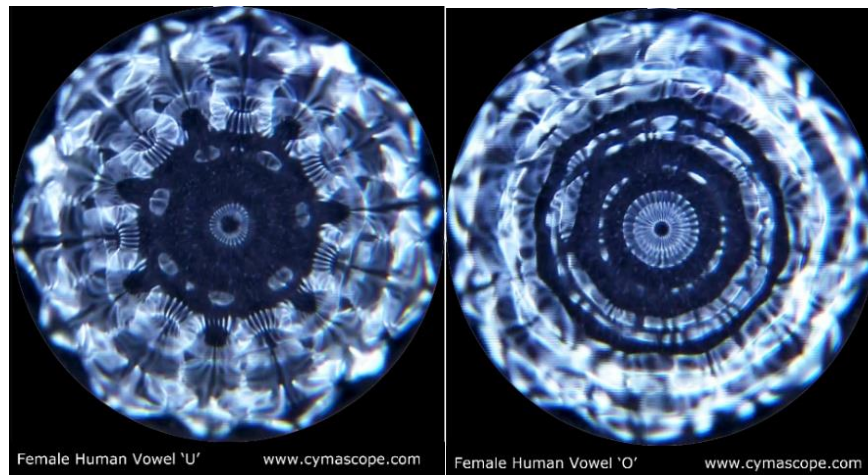


Fig. 4 Waveforms on flat water film and professional cymascope¹²

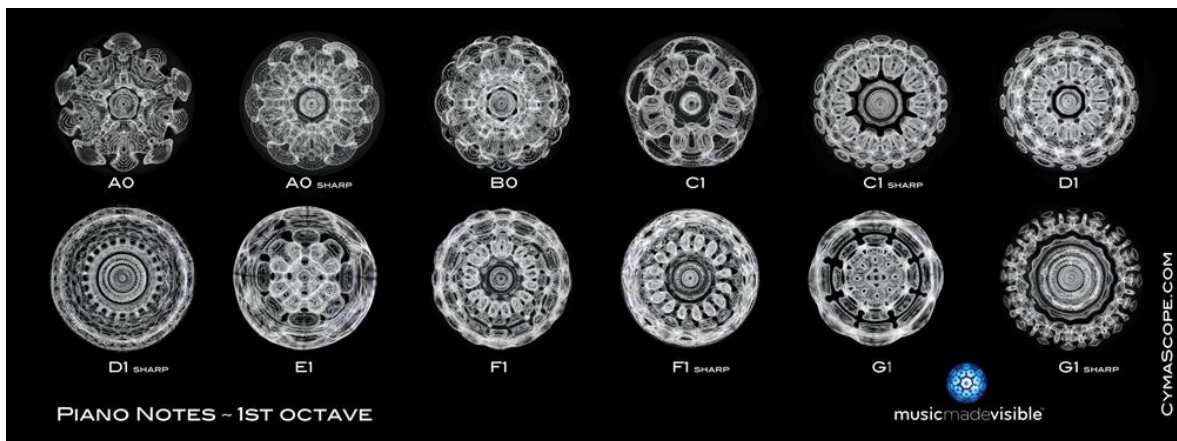


Fig. 5. Notes played on a classical piano, snapshots taken from HD video recording¹²

2.3 Current state of research on vocal phonation

One of the earliest researches on the effects of phonation and intonation is due to Maranto¹³ (1993). In vocal melodotherapy, phonation and chanting have been used to stimulate connection with the deeper aspects of the being. Austin¹⁴ observed that chanting induces an altered state of consciousness and mediates the connection between the personal and collective unconscious with the conscious mind, with effects of eliminating emotional stress and waste. MacIntosh¹⁵ (2003) has used chanting in stabilizing survivors of physical abuse, with a focus on

¹³ Maranto, C. 1993. „Applications of music in medicine”. In *Music therapy in health and education*, edited by Heal M. & Wigram T. London: Jessica, Kingsley, pp. 160-165.

¹⁴ Austin, D. 2009. *The theory and practice of vocal psychotherapy: Songs of the self*. Philadelphia: Jessica Kingsley, pp. 187-224.

¹⁵ MacIntosh, H. 2003. "Sounds of healing: Music in group work with survivors of sexual abuse." *The Arts in Psychotherapy*, 30 (1), p. 20.

sound awareness with the help of corruption, with very good results in regaining self-awareness, self-esteem, and expressiveness. The effects are stronger and stabilise more quickly in group therapy.

Intonation and vocal delivery reduce tension, focus attention and enter a state of naturalness and flow, resulting in relaxation, an increased state of comfort and well-being, and self-awareness.

Snow et al.¹⁶ explored the experiences and effects of vocal phonation. Results indicated the emergence of an increased state of attention and awareness with the initiation of phonation, and the essential descriptors were 'meditative, calm, relaxed'. Strong emotional associations were also observed, such as subjective experience of the induced vibrations, in terms of mood and emotional state.

3. Exploring localised effects of vocal phonation

3.1. Study objectives

The main objective was to collect information on the existence and location of physical level effects obtained from vocal phonation, which are detectable from alternate sensations from other experiences. Current research has focused on descriptors of emotional, psychic state experiences and existing information about tropisms in vocal utterance is found only in ancient traditions, in old traditions. Therefore, this study aims to collect sensory impressions related to the stimulation of specific, localized body areas and after-effects of vocal emission practice, described non-specifically¹⁷.

The study was based on the application of an emission technique that combines relaxation, creative visualization with actual emission, followed by exploratory awareness of immediate effects, group data collection and correlation.

3.2. Method

The sample was composed of 15 subjects (10 women and 5 men), aged 40-55 years, without relevant musical experience, all with higher education, coming from and living in urban areas. Participants were informed that the purpose of the experiment was to collect descriptive information on the location and effects of controlled vocal emission.

The experiment lasted 2 months, with two sessions of vocalic emissions of two vowels a and i, each lasting 15 minutes. The practice was done in a group, in a space with good sound insulation, after a practice of dynamic stretching and moderate physical exercises, which fully interested the physical structure.

The working technique involved the following:

¹⁶ Snow, Shelley & Bernardi, Nicoletò & Sabet-Kassouf, Nilufar & Moran, Daniel & Lehmann, Alexandre. 2018. "Exploring the Experience and Effects of Vocal Toning". *Journal of Music Therapy*. 55 (3), 1093.

¹⁷ Peterson Gordon E., Barney Harold L. 1952. "Control Methods Used in a Study of the Vowels", *The Journal of the Acoustical Society of America* 24(1): 175-182, p. 180.

Seating the subjects in a circle in a comfortable posture, sitting or seated, freely chosen, but keeping the spine straight, with the segments aligned. After 2 minutes of relaxation at will, with free breathing, and eyes closed, participants are asked to mentalize, visualize the vowel, in the spontaneous form associated by each, for 1 minute.

Keeping the eyes closed, the vowel emission was cycled: inhalation, slight retention of the vowel on full, with mentalization of the vowel, emission of the vowel on exhalation, in the duration, timbre, pitch and volume chosen by the vowel, comfortably. After a brief awareness in the "vacuum" phase of voice retention, resume inhalation, full retention with mentalization and vocal emission.

After 10 min of controlled emission, 2 minutes of awareness of the effects followed, in the same posture, with eyes closed.

After the slow, open-eyed return, participants were asked to complete the questionnaires provided as a research tool.

3.3. Research tools

A questionnaire and an interview were used as research tools to collect descriptors of location in the body, the nature of perceptions and their intensity, as well as the structured interview. For the localization item, a human silhouette was provided with the following horizontally delineated areas: head (head-eye, eye- upper lip, mouth-chin), neck-shoulders, chest-diaphragm, diaphragm-abdomen, groin area, thigh-knee, calves, ankles-foot, hands. Subjects were asked to mark, by circling, as precisely as possible, the location of the perceived effects after practicing the vowel work technique. The interview also sought to capture the effects stabilised by systematic, daily practice in the personal space, but the testimonies were few in number (2), for practice lasting a week or 10 days.

Each area was assigned a numerical reference to indicate the intensity of perception. There were a total of 8 sessions of work with each vowel (A, I) per month. A total of 120 response sheets were collected for each vowel. The item on the nature of the effects was given the following options for multiple choice: vibration, throbbing, tingling, warm feeling, cold feeling, shivering, diffuse. The intensity item was measured with a Lickert scale on 6 levels of perception, from indistinct to maximum intensity. A trivalent descriptor comfort/ neutral/ discomfort has been associated with it.

4. Data analysis and results

The analysis was done by conventional treatment of the information provided by questionnaire and interview. By the nature of the experiment, the subjective component was not targeted in the questionnaire. Due to the context, the interview was of short duration, with concrete, unelaborated information, averaging 2.5 minutes. The identification of the categories mentioned during the interview was made based on the notes taken during the interview and led to several response structures: comfort note on group practice, sensory experiences (systematized in Table 2), specific states of consciousness (meditative, self-awareness, attention, focus), affective response related to the issue itself (positive, negative, mixed reactions). Sensory effects were also mentioned, related to awareness of the breathing act, calming of chest tension and deepening of inspiration, calming of breathlessness in general.

4.1. Observations on the effects of group practice

These relate primarily to the adjustment of broadcasting rates and duration. After the first 2-3 emissions, the retention times on full and on empty were spontaneously adjusted by the participants so that the emission period and duration were the same for the whole group simultaneously. At interview, it emerged that each participant felt the need to generate and amplify a unified sound field, perceived as powerful and beneficial. A second observation concerns the spontaneous harmonization of the emission intervals, with the prevalence of octaves and fourths, after the first 3-5 emissions in the group. No personalised explanation for this phenomenon was received through the interview, with the vast majority of participants unaware that they had altered pitch. The reference was, each time, a low, male voice, emitted loudly, with intensity, prevalent in the group.

4.2 The locations of the vocal effects

| Location | A | | | | | | I | | | | | |
|-------------------------|---|---|----|---|----|-----|---|---|---|---|----|-----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 |
| <i>Intensity level</i> | | | | | | | | | | | | |
| upper forehead and head | | | | | 28 | 92 | | | | | 53 | 86 |
| Eyes and Eyebrows | | 2 | | | 15 | 18 | | | | | 63 | 75 |
| mouth-chin | | | | | 34 | 17 | | | | | 11 | 51 |
| neck-shoulders | | | | | 23 | 113 | | | | | 42 | 39 |
| chest-diaphragm | | | | 3 | 12 | 105 | | | | | | 109 |
| diaphragm-abdomen | | | 10 | | | 3 | | | | | 12 | |
| groin-perineum area | 2 | | | | | | | | | | | |
| palms | | | | | 1 | | | | | | | |

Table 1. *Incidence of responses to localisations of vocalic effects*

The locations of the vocal effects are displayed in Table 1. The frequency of reports in the head and chest area was significantly higher than in other areas of the body, with a maximum intensity on the chest and upper head area. Without exception, the effects were judged to be comfortable each time.

The two subjects noted a good mental tone, a state of relaxation, a capacity for detachment, mental clarity, for several hours after the practice and a good dynamisation of the head area for vowel A, respectively the central chest area and the top of the head for I. Comparing the results with the traditionally mentioned areas, there is a good overlap for the vowel A, and an accentuation of the effects on the central chest area, in addition to the traditionally mentioned top of the head for the vowel I.

5. Conclusions

The study provided empirically systematized data on the sensory effects and specific locations of controlled vowel emission. The experiment proposed the collection and empirical

analysis of the results obtained based on short-term, one-off group practice. Data were collected immediately after the practice and categories were identified based on brief interviews.

There were predominantly localized sensory effects, with high intensity, in the head and chest area, and the overall rating was comfort and positive mood. Compared to traditional mentions, these effects partially overlap the energetically activated areas in the explanation of Vendanta and Taoist philosophies.

With regard to the actual experience of voice output, it was characterized as rather neutral, with no notable emotional involvement. This can be correlated with the state of centeredness reported in the explanation of those who practiced for a longer time. The study did not correlate the nature of sensory effects with other categories, but, analysis of the data revealed diffuse, non-specific energization of the specified areas.

5.1 Limitations of the present study and research directions

This type of research can be developed in a broader way, for each type of vowel, with an experimental design aiming at a broader dynamics of practice, both in duration and frequency, under conditions of comfort for the subjects. Also, great attention should be paid to how research tools aim to eliminate subjective, momentary factors in the correct assessment of sensory effects.

A comprehensive study of the effects of vocal emission can be used with good precision in active music therapy, both for physical and specific, subtle effects.

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