

Acoustic and Perceived Measurements Certifying Tango as Voice Treatment Method

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Summary: Voice disorders are affecting everyday life in many levels, and their prevalence has been studied extensively in certain and general populations. Notably, several factors have a cohesive influence on voice disorders and voice characteristics. Several studies report that health and environmental and psychological etiologies can serve as risk factors for voice disorders. Many diagnostic protocols, in the literature, evaluate voice and its parameters leading to direct or indirect treatment intervention. This study was designed to examine the effect of tango on adult acoustic voice parameters. Fifty-two adults (26 male and 26 female) were recruited and divided into four subgroups (male dancers, female dancers, male nondancers, and female nondancers). The participants were asked to answer two questionnaires (Voice Handicap Index and Voice Evaluation Form), and their voices were recorded before and after the tango dance session. Moreover, water consumption was investigated. The study's results indicated that the voices' acoustic characteristics were different between tango dancers and the control group. The beneficial results are far from prominent as they prove that tango dance can serve stand-alone as voice therapy without the need for hydration. Also, more research is imperative to be conducted on a longitudinal basis to obtain a more accurate result on the required time for the proposed therapy.

Key Words: Acoustic analysis–Voice characteristics–Tango dance–Indirect therapy–Hydration.

INTRODUCTION

Voice disorders are affecting nearly one-third of the population and they have significant consequences in quality of life.^{1–3} Epidemiologic studies estimated that voice disorder prevalence ranged from 0.65% to 41.6% in general and specific populations^{4–6} as voice can be influenced by different factors.^{1,7,8} Literature reported that health factors,^{4–8} environmental factors,^{2,8–10} emotional factors,^{9,10} hydration factors,^{11,12} aging,^{13,14} and smoking^{14–19} affect voice and its characteristics.^{14–28}

In clinical practice, many people seek a specialist for the assessment of their voice after the presence of unpleasant symptoms during phonation.²⁹ Multidimensional protocols have been established,^{30,31} including laryngeal imaging^{32–36} and aerodynamic^{36–38} and perceptual analyses, along with acoustic evaluation^{39–43} and self-evaluation of symptom frequency and disturbances to daily living.^{44–49}

Traditionally, assessment results are the basis for establishing a treatment program or for evaluating treatment outcomes. Therapeutic plans typically involve the use of (1) direct approaches that focus on manipulating the voice production mechanisms^{50–52} and (2) indirect, holistic approaches that modify the cognitive, behavioral, psychological, and physical environments via patient education and counseling.⁵³

Art therapies, such as dance, music, play, and drama, introduce individuals to an expressive and creative manner of acting.

Expressive therapies share the characteristics of self-expression, active participation, imagination, and mind-body interaction.^{54,55}

The creative arts' ability to heal mental and physical illness has been recognized as a complement to or a replacement of medications.^{56–62} In particular, dance therapy and dances (eg, Argentine Tango) describe the inseparable connection between mind and body, the mental activation, the emotional engagement, and moderate physical exercise.⁶³ As part of the multidimensional and holistic model, Argentine dance is considered as an antistressive, recreative, calming, social, and mood-balancing habit.⁶⁴

The tango as a partnered dance advances the physical contact (embracing) without verbal communication. Even though there are diacritical roles between the two parties, there is a reciprocal empathetic connection retaining the balance as a unit.^{65–67}

The Argentine tango dance has been chosen in the present study because it is very often practiced in nonclinical populations and its characteristics are very similar to those of dance therapy. On the other hand, tango therapy was not selected because it is usually applied in clinical populations.^{67–73} The common characteristics of the prementioned approaches are grounding, mindfulness, and mirroring. Grounding is the condition of being concentrated in the body's reactions, through senses and breathing, without any disturbing thoughts. The previous condition leads to physical, mental, and emotional balance.^{74,75} Furthermore, mindfulness acts similar to grounding but in a wider way of meaning. Mindfulness includes the observation of our senses, movements, thoughts, and emotions, leading to reduction of stress, physical pain, and depression.^{76–78} On the contrary, mirroring triggers mirror neurons causing changes in the heart rate and respiration, via the observation of new postures and dance movements. This mimic procedure gives feedback to the trainee and in turn activates neuron networks relevant to emotion and empathy.^{75–80} Additionally, tango has been correlated to hormonal changes and consequently to stress relief.⁸¹

The primary purpose of the present study was to examine the effect of tango dance on adults. The examination involved

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measurements of their acoustic voice parameters and also self-assessment procedures (filling of questionnaires). An additional factor was examined, which was the consumption of water. The results indicate that only the tango dance has very high positive effects on people with at least 1 year of experience, which makes it the primary method of sustaining or establishing voice in healthier levels.

This paper is split into the following sections: the next section refers to the materials and methods followed by the research results, then the presentation of the relevant discussion, and finally, the conclusion.

MATERIALS AND METHODS

Participants

Fifty-two adults (22 dancers and 30 nondancers) were recruited. All participants had no former history of any laryngeal or respiratory system disorders 2 weeks before enrollment. Participants who misused their voice or were overexposed to noise, alcohol, or drugs, or had symptoms consistent with gastroesophageal reflux disease, laryngopharyngeal reflux, and diseases of the upper and lower respiratory systems were excluded from the present study. Smokers were considered to be those who smoked at least two cigarettes a day for one consecutive year before the study. Likewise, tango dancers were considered as those individuals with at least two dance sessions per week for 1 year. The participants in the control group were smokers and nonsmokers who never danced.

Data collection

All participants filled in the American Speech Hearing Association's Voice Evaluation Form⁸² and the Greek version of the Voice Handicap Index (VHI).⁸³ The Voice Evaluation Form consists of various domains with the recorded voice history background of each participant. VHI consists of 30 questions, which are summarized to a total score (VHI-T) that was split into three domains: the functional, physical, and emotional. VHI was administered for acquiring the self-awareness level of the participants' voice status. VHI was chosen for the present study because of its high clinical use in daily practice.^{48,84-101}

Voice samples were obtained in a quiet room (<40 dB)¹⁰² under the recommendations of the National Center for Voice and Speech.¹⁰³ The participants practiced several times before recording to obtain optimal measures and were also asked to produce sustained /a/ and /e/ vowel sounds for at least 5 seconds

at a comfortable intensity and pitch. All participants were measured with or without drinking 250 mL of water.¹² Furthermore, the dancers' voice was measured before entering the 1-hour dance session and again 15 minutes after the end of the session. A 15-minute break was allowed for the dancers to control their breath and to allow their heartbeat to drop at normal levels.

Voice analysis was performed with *Praat*,¹⁰⁴ a computer software package for the analysis of speech and voice. The analyzed parameters were the mean F0 (Hz), jitter, shimmer, harmonics-to-noise ratio (HNR or H/N) (dB) and intensity (dB).

Statistical analysis

Normal distributed variables were expressed as the mean (\pm standard deviation [SD]), whereas variables with skewed distribution were expressed as the median (Mdn) (interquartile range). Qualitative variables were expressed as absolute and relative frequencies. The Mann-Whitney test was used for the comparison of continuous variables between the two study groups. The Wilcoxon test was used for the comparison between the pre- and postdancing measurements of the dancers' groups and the pre- and postwater consumptions of all participants. All reported *P* values were two-tailed. Statistical significance was set at $P < 0.05$, and analyses were conducted using *SPSS* statistical software (version 19.0; SPSS, Inc., Armonk, NY).

RESULTS

The sample consisted of 52 participants, of which 22 were dancers (11 male and 11 female). In each group, half of the participants (50.0%) were men. The total sample's mean age was 29.81 years (SD = 9.70 years). The mean age of the male dancers was 34.09 years (SD = 8.05 years), that of the female dancers was 28.91 (SD = 10.28), that of male controls was 30.20 years (SD = 9.98), and that of female controls was 28.3 years (SD = 4.8 years). Also, 57.70% were nondancers and 42.30% were dancers. The two groups were similar regarding the age and sex parameters. **Table 1** presents the participants' scores for VHI-T and its three domains.

The results of the subgroup analysis for men and women are presented in **Tables 2–5**, respectively.

Statistically significant differences for mean pitch (Hz) between the male dancers (predancing) (Mdn = 108.247) and the male nondancers (Mdn = 124.758) during the sustainable phonation of the /a/ sound were calculated ($U = 44.00$, $P = 0.005$). The same differences were computed for shimmer (apq3) (male dancers

TABLE 1.
Means for Dancers (Male and Female) for VHI Total Score and VHI Domains

	Dancers (N = 22)		Nondancers (N = 30)	
	Male (n = 11) Mean (SD)	Female (n = 11) Mean (SD)	Male (n = 15) Mean (SD)	Female (n = 15) Mean (SD)
Total	10.36 (7.01)	13.72 (9.32)	13.86 (5.08)	15.33 (5.08)
Functional	3.09 (2.54)	5.09 (3.21)	4.46 (2.61)	4.60 (2.19)
Physical	4.00 (2.68)	5.18 (3.57)	4.26 (2.89)	5.13 (1.88)
Emotional	4.09 (3.27)	3.27 (3.30)	5.13 (2.89)	5.60 (2.27)

Abbreviations: SD, standard deviation; VHI, Voice Handicap Index.

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