

Effect of Spinal Manipulative Therapy on the Singing Voice

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Summary: Objective. This study investigated the effect of spinal manipulative therapy (SMT) on the singing voice of male individuals.

Study Design. Randomized, controlled, case-crossover trial.

Methods. Twenty-nine subjects were selected among male members of the Heralds of the Gospel. This association was chosen because it is a group of persons with similar singing activities. Participants were randomly assigned to two groups: (A) chiropractic SMT procedure and (B) nontherapeutic transcutaneous electrical nerve stimulation (TENS) procedure. Recordings of the singing voice of each participant were taken immediately before and after the procedures. After a 14-day period, procedures were switched between groups: participants who underwent SMT on the first day were subjected to TENS and vice versa. Recordings were subjected to perceptual audio and acoustic evaluations. The same recording segment of each participant was selected. Perceptual audio evaluation was performed by a specialist panel (SP). Recordings of each participant were randomly presented thus making the SP blind to intervention type and recording session (before/after intervention). Recordings compiled in a randomized order were also subjected to acoustic evaluation.

Results. No differences in the quality of the singing on perceptual audio evaluation were observed between TENS and SMT.

Conclusions. No differences in the quality of the singing voice of asymptomatic male singers were observed on perceptual audio evaluation or acoustic evaluation after a single spinal manipulative intervention of the thoracic and cervical spine.

Key Words: Singing voice—Chiropractic—Spinal manipulative therapy.

INTRODUCTION

The singing voice is the result of the interaction between the source of the sound (the vocal folds) and the transformation of the sound that occurs in the resonance cavities (the region above the glottis, also known as filter). The intensity of the sound, tone, musical genre, and the interpretative style of each singer are determined by adjustments made to this system, which includes the vocal tract, sound source, and filter.¹

Muscle tension and postural changes directly relate to voice quality. Increased muscle tone around the neck, torso, shoulders, and thorax may compromise the quality of the singing voice.²⁻⁵ The compromise of voice quality can be partially explained by the action of laryngeal mechanoreceptors, which trigger reflex adaptations in the vocal cords when stimulated by minute changes in body position.² Thus, a good posture and appropriate muscle tone are required for producing a voice of good quality, whereas excessive muscle tension during singing, especially around the neck, is detrimental to voice quality.⁶

Voice quality may be influenced by several postural aspects.⁷ The position of the head relative to the torso may alter the diameter of the pharyngeal cavity.⁸ The position of the head and cervical spine has been associated with specific voice types. Johnson and Skinner⁹ observed that singers tend to project their heads forward during singing, thus changing the position of the hyoid bone and increasing the pharyngeal space in the region of the third cervical vertebra (C3). Thus, maneuvers that facilitate those postures may improve the emission of sound.

Several techniques such as stretching and strengthening exercises have been developed to modify and improve posture.² These techniques may be time consuming and costly and require appropriate physical space and materials. Chiropractic therapy, a relatively simple therapeutic method, may be an adequate alternative for improving posture and normalizing muscle tone before using the singing voice professionally.

Chiropractic is a health care specialty that uses spinal manipulative techniques to reduce pain and motion restriction. Spinal manipulation is a low-amplitude high-velocity manual procedure aimed at vertebral segments with restricted motion whose main purpose is to restitute normal joint mobility. Spinal manipulation has been shown to increase range of motion and reduce muscle tension in the lumbar and cervical spine and pain sensitivity in previously painful areas.¹² When performed by qualified professionals, manipulative procedures are simple, fast, and efficient.^{9,10}

There is strong evidence of the efficacy of spinal manipulative therapy (SMT) for spinal pain.^{13,14} Physiological mechanisms that mediate this activity may include changes to

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the inflow of sensory information to the nervous system such as stimulation of muscle spindle afferents and Golgi tendon organs, increased central pain threshold, and changes in neural output to visceral and muscular organs.¹⁵ Chiropractic manipulation may also result in normalization of nociceptive and synesthetic reflex pathways, sympathetic activity, and muscle tone. Several studies have reported an immediate change in pain threshold, range of motion, and muscle tone after spinal manipulation.^{9,10,16} These findings show that SMT has a positive effect on posture and muscle tension and suggest that it may improve voice quality.

A previous study has shown the effect of spinal manipulation and voice quality, in which a 46-year-old man with a main complaint of spasmodic dysphonia had voice quality improved after 2 weeks of treatment with manipulation of the atlantoaxial segment of the upper cervical spine.¹⁷ Additionally, Waddell¹⁸ reported the case of a 25-year-old female patient who presented with dysfunction in the first and fifth cervical vertebrae after a car accident whose singing voice significantly improved after 10 sessions of SMT.

This study investigated the effect of SMT on the singing voice of 29 selected individuals among male members of the Heralds of the Gospel (HG), which is an international association of the faithful of Pontifical Right.

METHODS

The study was approved by the ethics and research committee of Cruzeiro do Sul University, São Paulo, Brazil. All procedures were fully explained to the candidates, and selected subjects were enrolled after signing an informed consent form.

Participant selection

Twenty-nine subjects were selected among male members of the HG, which is an international association of the faithful of Pontifical Right. This association uses instrumental music and singing in their evangelizing mission. Members live together in the same housing communities, where they share daily activities such as wake up and sleep time, work, physical activities, meals, and religious ceremonies that include collective singing. Smoking and alcohol use are not allowed in HG communities.

The HG were chosen for this study because they are a homogeneous group, in which all members share the same routine, including vocal health habits, and are dedicated to chanting regularly. The sample included members of the association who practiced singing on a daily basis and reported no respiratory diseases such as obstructive or restrictive pulmonary diseases or temporary conditions such as influenza or common cold on the day of data collection. Candidates were selected by the association's administrative staff based on their availability on the day of data collection.

Procedures

Participants were randomly assigned to two groups using the *Randomization* software (<http://www.randomization.com>). This program randomly assigns a given number of individuals

to a predetermined number of groups. The criterion used for group assignment was to allocate an equal number of individuals to each group. To achieve this, participants were divided into four-person segments, with two participants from each segment being randomly assigned to each group. A schematic flowchart of the procedures is shown in [Figure 1](#).

A sample of the singing voice from each participant was individually recorded in a quiet room using a Behringer Super Cardioid XM2800S microphone connected to an Acer 12.1WXGA LCD laptop computer, with 2 GB DDR2, 250 GB hard drive, and an Intel Core 2 duo T7300 processor with an onboard sound card. Recording was performed using the *Acoustica Mixcraft* software (Acoustica, Oakhurst, California).

During the recording session, participants were instructed to remain standing with their arms lowered and comfortably relaxed and maintain a distance of 10 cm between their mouth and the microphone, which was measured with a ruler attached to the microphone. All participants sang a 1-minute segment familiar to them of a Gregorian version of the "Hail Mary" prayer.

After the first recording session, participants were assigned to either of the following groups: SMT, addressing segments of the cervical, thoracic, and costovertebral articulations or nontherapeutic intervention with low-intensity transcutaneous electrical nerve stimulation (TENS). Procedures for each group were as follows.

Spinal manipulative therapy. Procedures were performed by a professional chiropractor and no previous knowledge about the participants. Physical examination consisted of manual palpation of the thoracic and costovertebral joints with the participant lying on an appropriate table in the prone position and of the cervical region in the supine position. Segments with joint dysfunction were identified based on findings of tenderness and/or restricted motion to palpation. Next, SMT consisting of low-amplitude high-velocity maneuvers directed specifically at affected segments was performed. A single session was performed, and procedures were timed and did not exceed 10 min.

Therapeutic transcutaneous electrical nerve stimulation. Procedures were performed by a physical therapist and no previous knowledge about the participants. Transcutaneous electrodes were placed on the right and left paravertebral regions of the thoracic and cervical spine of participants while they were lying in the prone position. Electrodes were connected to a TENS equipment (Tensvif 993 four; Quark Medical Products) set to a 4 Hz frequency and 40 milliseconds wavelength. The low-intensity electrical current produced corresponds to a 20% sensory level. Analgesic effects from TENS treatment have been reported for 100 Hz and 50 milliseconds current,¹⁹ but no therapeutic effects have been reported with low-intensity currents such as the one used in this study. The low current used provided a placebo effect, but nevertheless could be sensed by participants, and therefore had a greater chance of being perceived as a real treatment. A single session was performed, and procedures were timed and did not exceed 10 minutes.

After procedures were completed, participants were immediately referred to a second recording session identical to the first one described previously.

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