# Clinical Case Report Competition

## Utopia Academy

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## Second Place Winner


# Adrienne Parks


## The effects of massage therapy on vocal quality in an amateur singer: a case study


P: 604.873.4467
F: 604.873.6211
research@massagetherapy.bc.ca
massagetherapy.bc.ca

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# Abstract

The purpose of this case study was to investigate whether or not massage therapy could improve the vocal quality of an amateur singer as applied by an entry-level massage therapist with minimal knowledge of vocal technique and theory. No previous research was found which directly assessed the relationship between manual therapy and the singing voice, although manual therapy has been shown to be an effective way to treat muscle tension dysphonia. The subject of the case study was a 54 year old female high school art teacher, who had been singing on an amateur basis in a church choir for 6 years prior to the study. Three assessments were performed by a professional voice teacher. A variety of massage techniques including myofascial release, diaphragmatic breathing, and NMT were performed for 10 sessions of 75 minutes each. Muscle stripping and bowing was performed while the client was actively singing. The subject was instructed to refrain from practicing songs and exercises and from receiving outside voice instruction during the study. No improvements in range or quality were noted, but improvements in breath support, posture, and resting breathing patterns were found. The results were compromised by extenuating circumstances, but it was found that massage therapy could improve the breath support of an amateur singer as applied by an entry-level massage therapist with minimal knowledge of vocal technique and theory. The effectiveness of massage to improve the vocal range and quality of an amateur singer was not supported by this study. Futures studies could benefit from tighter control of subject's use of voice prior to assessment and from looking at massage with professional as well as amateur singers.

***Key Words:*** Singing, massage, breath support, manual therapy, vocal quality, healthy voice

# Introduction

The purpose of this case study was to investigate whether or not massage therapy could improve the vocal quality of an amateur singer as applied by an entry-level massage therapist with minimal knowledge of vocal technique and theory. No previous research was found which directly assessed the relationship between manual therapy and the singing voice, although massage has been anecdotally suggested as a way for singers to maintain a healthy voice (Deeter, 2006).

Studies have shown that less muscle tension is found in singers who have had formal vocal training than in those singers who have had none, indicating that classically trained singers are more efficient than amateur singers (Smith-Vaughn, 2007). An amateur singer was chosen for this study to investigate the maximum effects that massage therapy could have, using a subject with relatively high muscle tension and low muscle awareness.

Manual therapy has been shown to be an effective way to treat muscle tension dysphonia, which is "a functional voice disorder caused by imbalanced laryngeal or perilaryngeal muscle activity that can result in vocal fold hyperadduction, constriction, or bowing" (Claeys, De Bodt, Dhaeseleer, Wuyts, & Van Lierde, 2010, [Abstract]). Studies suggest that manual therapy is most effective for treating functional dysphonia caused primarily by overuse and misuse of the voice and hypertonicity in the muscles of posture and phonation (Clement, De Bodt, De Ley, Van Cauwenberge, and Van Lierde, 2004), (Bless, Ford, Heisey, & Roy, 1997). One study found "significant change in the direction of "normal" vocal function in the majority of patients within one treatment session" (Leeper & Roy, 1993, [Abstract]). Other studies have found success with a more prolonged approach (Clement, De Bodt, De Ley, Van Cauwenberge, and Van Lierde,

2004). Manual Therapy has been shown to improve vocal tract discomfort, as subjectively reported by subjects, as well as to measurably improve qualities such as jitter, shimmer, hoarseness, breathiness, and strain (Clement, De Bodt, De Ley, Van Cauwenberge, and Van Lierde, 2004), (Baken, Epstein, Hirani, Mathieson, Rubin, Wood, 2009).

The structures addressed and techniques used during such studies include kneading of sternocleidomastoid (SCM), bowing, kneading, and compression of the supralaryngeal space, massage to the hyoid bone, kneading and compression of the thyrohyoid space, bowing of the larynx laterally, and manual depression of the thyroid cartilage (Baken, Epstein, Hirani, Mathieson, Rubin, Wood, 2009). This describes the technique suggested by Aronson in his book "Clinical Voice Disorders: An Interdisciplinary Approach, Third Edition" (Epstein, 1991). Additional structures treated in successful studies include trapezius, sternohyoid, geniohyoid, stylohyoid, thyrohyoid, sternohyoid, cricopharyngeus, cricothyroid, globus pharyngeus, and masseter. These additional structures were treated with the intention to eliminate hypertonicity; reduce myofascial pain and discomfort in pharyngeal region; return the hyoid bone to its normal position at approximately the cervical vertebrae (C) C2 – C3 (Magee, 2008); and restore normal posture by decreasing shoulder elevation and eliminating head-forward posture (Clement, De Bodt, De Ley, Van Cauwenberge, and Van Lierde, 2004).

The diaphragm, external, and internal intercostal muscles, along with all accessory breathing muscles were treated during the intervention provided in this study. This included pectoralis (pec.) minor, SCM, and anterior, middle and posterior scalenes (scalenes) (Derrickson & Tortora, 2012). Studies have shown that both SCM and latissimus dorsi assist in respiration during singing, including during very deep or rapid inhalations, when thorax expansion needs to

be maintained throughout a breath, and during the end of exhalation (James, Williams, & Watson, 2012). Additionally, Pettersen and Westgaard suggested that upper trapezius also assists with exhalation by compressing the upper thorax during singing (2004). Therefore, all of these muscles were addressed during the intervention.

## Case Study Subject

The subject of the case study, FD, was a 54-year-old female high school art teacher. The subject used her voice for work and often had to raise her voice to get the attention of her students. She reported that often (approximately once a month, for 2-5 days at a time), her voice felt hoarse throughout the school year. She noted that the episodes of hoarseness disappeared when she went on summer holidays. During the intervention, FD was on medication for hypothyroidism, which was well controlled. She also took Trazodone daily to help her sleep through the night. FD suffered from endometriosis throughout her life, and at the time of the study, she was going through menopause. She reported that she had not menstruated for 11 months prior to the start of the study. FD was moderately overweight, and had varicose veins on her left leg. On her initial intake form, she also noted that she was prone to anemia due to a vegetarian diet and that she bruises easily.

FD had endured one major and one minor motor vehicle accident (MVA) during her life. The minor accident took place in June 2011. The subject had not filed a claim for this accident due to the minimal nature of the impact. The major MVA occurred in 1982, for which the subject received extensive physiotherapy for rehabilitation. At the time of the study, the subject noticed pain in the posterior aspect of the neck just inferior to the occipital bone, suggesting muscle dysfunction in the suboccipitals. FD reported that she felt this pain when she had been working at a desk for many hours or when she was under stress. She estimated this pain at a 5/10 on the

pain scale. She estimated that this pain occurred approximately two days a week on average during the school year.

FD had no other complaints to speak of. She did not suffer from headaches or back pain. Upon palpation, it was noted that FD had enlarged submandibular glands bilaterally, as well as an enlarged tongue, which was externally palpable protruding from underneath the mandible by approximately two centimeters.

FD was an amateur singer. During the study, FD sung in a church choir once a week for approximately one hour and attended choir practice once a week for approximately two hours. She had been singing in a choir with this schedule (during the school year with a respite during the summer) for 6 years prior to the study. In addition to this singing time, FD had taken singing lessons every week during the school year for the year prior to the study. She had not been singing in the choir, nor had she taken singing lessons for three months prior to the intervention, which began in September. She agreed not to partake in singing lessons while participating in this study.

## Methodology

### *Assessments*

Three assessments were performed for this study. One assessment took place before the intervention, one during the intervention (after the fourth treatment), and one after the intervention. The assessments were performed by a professional voice teacher, Chelsea Edwardson (CE). CE had a degree in Applied Music from Vancouver Community College with a major in classical voice performance. At the time of the study, she was finishing her Master's degree in Ethnomusicology with a focus on voice at the University of British Columbia. She had

completed additional vocal pedagogy programs and certifications for both popular and classical styles of singing and for speech pathology for singers. She had attended several vocal science conferences focusing on the physiology and acoustics of singing. She had co-founded the Pacific Spirit Children's Choir in North Vancouver, Everybody's Choir in East Vancouver, and at the time of the study, was a part-time conductor for the Vancouver Bach Children's choir. She also ran a private voice studio.

CE began each assessment with a 20 minute vocal warm-up involving the singing of scales using "la," "ee," and "uu" sounds. A vocal exercise called "buzzing" was used, which involved singing of scales through closed lips, where excess air is required to make the lips vibrate to produce sound. melismas were used to assess breath support. "Breath support" in singing is the use and coordination of muscles that contribute to vocal production by creating a consistent air pressure that the vocal folds can utilize to vibrate and produce sound. For the melismas exercise, the subject was asked to sing a continuous pattern of notes without taking a breath in for as long as possible. Each melisma (the pattern of notes) took three seconds to sing. Brief coaching regarding the use of diaphragmatic breathing (DB) was provided by the voice instructor. The subject was also instructed to use gestures to assist her in reaching difficult notes; for example, when reaching for a high note, the subject was instructed to use two hands to make a "teepee" over her head. This was the extent of the vocal coaching the subject received during the study.

The assessment then proceeded with the client singing two songs, in order to assess vocal quality. The songs chosen were "Oh Canada," the Canadian national anthem, with piano accompaniment, and "When Will I Be Loved," by Linda Ronstadt, sung without accompaniment. The songs were sung three times, to give the subject a chance to warm up and become familiar

with the music. The subject was instructed not to practice the songs or vocal exercises outside of the assessment periods. Lyrics were provided for each song.

The client then was tested using another measure of breath support. This exercise involved the subject making a "tssss" sound through her teeth while ensuring that she could feel her breath on a finger held approximately three centimetres from her mouth. This assessment was performed four times in sequence to provide an average breath support time, measured in seconds. Finally, a measure of the subject's vocal range was performed using scales accompanied by piano. The low range was measured using an "ah" sound, whereas the high range was measured using an "uu" sound. The massage student then assessed the subject's breathing patterns at rest by placing her hands on the subject's upper chest anteriorly, abdomen, lateral ribcage, and posterior lower and upper ribcage while instructing the subject to breath normally. Images of the subject were taken from anterior, posterior, and lateral views both while the client was standing at ease and while she was singing to assess postural changes as a result of the intervention. These images were only taken during the initial and final assessment.

***Intervention***

Ten treatments were performed at various intervals from September 15th to November 4th, 2012. The treatments were 75 minutes in length and were performed by a massage therapy student in British Columbia, Canada, in her final term of school. The details of each treatment session can be found in Figure 1. A variety of techniques were used during this study. Descriptions of each technique can be found in Appendix A.

**Figure 1**

| Date and Time of Treatment | Techniques Performed During Treatment<br>**All techniques performed bilaterally where applicable unless otherwise specified. |
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| Session # 1<br>Sept. 15, 2012<br>75 min.<br>7:30 - 8:45pm | **Position:** Supine and sidelying<br>**D-MFR:** Working with the subject's breath to increase release of tissue. Cross-hand spreading superficial chest fascia in superior, inferior and lateral directions. Cross-hand release of submamillary fascia. Lateral release of superficial fascia over anterior ribs 6 – 10. Skin rolling over sternum and superior fibres of pectoralis major. Coached DB. Release of platysma, posterior paraspinal muscles of cervical spine (C-s), scalenes, superficial anterior neck fascia, SCM. Sidelying: cross-hand technique spreading fascia over lateral ribs while subject actively reached ipsilateral arm overhead.<br>**I-MFR:** Clavicle.<br>**GTO release:** direct compression with fingertips on anterior aspect of diaphragm.<br>**Passive Stretch:** SCM, scalenes.<br>**Homecare:** Stretching: Superficial anterior neck fascia with manual fixation at manubrium and pec. Minor. Hold each stretch 30 seconds – 1 minute, repeat 2 times daily, continue for 4 weeks. Postural correction: Roll shoulders posterior and inferior and bring chin posterior and inferior, throughout day. |
| Session # 2<br>Sept. 22, 2012<br>75 min.<br>12:30 – 1:45pm | **Position:** Prone and supine<br>**D-MFR:** Bowing erector spinae group (ESG) in the thoracic (T-s) and lumbar (L-s) spine. Spreading/separation posterior aspects of ribs 7 – 12 individually. Cross-hand technique on latissimus dorsi. Extramuscular separation of middle trapezius from rhomboid major and minor (rhomboids). Cross-hand technique on superficial fascia of the chest. Release of platysma, fascia of the scalp via hair pulling. Ear twisting in anterior and posterior directions.<br>**Muscle Stripping:** Posterior neck paraspinals in C-s.<br>**Ischemic Compression:** Right (R.) upper trapezius, suboccipital muscles (subocciputals).<br>**Sacral Traction**<br>**Kneading:** ESG, quadratus lumborum (QL), upper trapezius, rhomboids, and infraspinatus.<br>**Homecare:** Stretching: Scalenes stretch, hold each stretch 30 seconds – 1 minute, repeat 2 times daily, continue for 4 weeks. |
| Session # 3<br>Sept. 30, 2012<br>75 min.<br>12:30 – 1:45pm | **Position:** Prone and supine<br>**D-MFR:** SCM.<br>**Muscle Stripping:** Laminar groove full spine, ESG T-s and L-s, SCM, serratus anterior, serratus posterior inferior.<br>**NMT:** SCM. |

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| | **Kneading:** ESG T-s and L-s, quadratus lumborum (QL), upper trapezius.<br>**Ischemic Compression:** Rhomboids, QL.<br>**Homecare:** Strengthening: Standing exercise. scapular stabilizers strengthening (middle and lower trapezius, rhomboids), two positions, 10 repetitions (reps) each, perform once daily, continue for two weeks. |
| Session # 4<br>Oct. 7, 2012<br>75 min.<br>12:30 – 1:45pm | **Position:** Supine and sidelying<br>**D-MFR:** SCM, bowing pec. minor, serratus ant., subscapularis.<br>**Counterstrain:** Scalenes<br>**NMT:** SCM, pec. major.<br>**Muscle Stripping:** SCM, scalenes, subclavius.<br>**Ischemic Compression:** Subclavius.<br>**Homecare:** Stretching: "Doorway stretch." Pec. major. Two positions to reach upper and lower fibres, hold each position 30 seconds – 1 minute, repeat 2 times daily, continue for 4 weeks. Strengthening: Scapular pushups. Scapular stabilizers strengthening (middle and lower trapezius, rhomboids), 10 reps, perform once daily, continue for two weeks. |
| Assessment # 2<br>Oct. 9, 2012<br>6:00 – 7:00pm | |
| Session # 5<br>Oct. 14, 2012<br>75 min.<br>12:30 – 1:45pm | **Position:** Supine<br>**I-MFR:** Release of horizontal fascial planes including pelvic diaphragm, respiratory diaphragm, thoracic inlet.<br>**D-MFR:** Release of horizontal fascial planes including hyoid, separation of the first cervical vertebrae (C1) from the occiput (C0). Release of digastric, mylohyoid.<br>**Muscle Stripping:** Digastric, mylohyoid, omohyoid.<br>**NMT:** Digastric, sternohyoid, sternothyroid, stylohyoid,<br>**Effleurage and Gentle Kneading:** 10 min. of abdominal massage to assist subject with constipation.<br>**Homecare:** DB. As often as possible throughout day, remember to use the diaphragm to breathe rather than accessory muscles of respiration. |
| Session # 6<br>Oct. 16, 2012<br>75 min.<br>5:15 – 6:30pm | **Position:** Supine<br>**I-MFR:** Release of horizontal fascial planes including pelvic diaphragm, respiratory diaphragm, thoracic inlet.<br>**D-MFR:** Release of horizontal fascial planes including hyoid, separation of C0 – C1. Release of upper trapezius. Lateral bowing and gentle twisting of the larynx in anterior to posterior, and superior to inferior directions.<br>**Ischemic Compression:** Left (L.) SCM.<br>**Muscle Stripping:** Performed while client actively singing scales and adult pop songs (mostly The Beatles and Carole King): digastric, mylohyoid, omohyoid, sternohyoid, |

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| | sternothyroid, thyrohyoid.<br><br>**GTO Release:** Sternohyoid, sternothyroid.<br><br>**Compressions of Diaphragm:** In anterior to posterior and lateral to medial directions. Compressions were performed to relax the diaphragm on exhale and to strengthen the diaphragm and external intercostals muscles on inhale. Five repetitions on inhale, five repetitions on exhale in each direction.<br><br>**Effleurage and Gentle Kneading:** 10 min. of abdominal massage to assist subject with constipation.<br><br>**Homecare:** DB. As often as possible throughout day, remember to use the diaphragm to breathe rather than accessory muscles of respiration. |
| Session # 7<br>Oct. 21, 2012<br>75 min.<br>12:30-1:45pm | **Position:** Supine<br><br>**D-MFR:** Release of superficial anterior neck fascia, platysma, fascia of the scalp, hyoid bone. Ear twisting in anterior and posterior directions. Ear pulling in an inferior and posterior direction as well as a superior and posterior direction. Lateral bowing and gentle twisting of the larynx in anterior to posterior, and superior to inferior directions.<br><br>**Muscle Stripping:** SCM, temporalis, masseter, posterior neck paraspinals.<br><br>**Ischemic Compression:** Medial pterygoid and lateral pterygoid, both treated externally and intraorally. Root of the tongue, treated intraorally.<br><br>**Homecare:** SCM. Hold 30 seconds – 1 minute, repeat 2 times daily, continue for 4 weeks. |
| Session # 8<br>Oct. 28, 2012<br>75 min.<br>12:30-1:45pm | **Position:** Supine<br><br>**I-MFR:** Release of horizontal fascial planes including pelvic diaphragm, respiratory diaphragm, thoracic inlet.<br><br>**D-MFR:** Release of horizontal fascial planes including hyoid, separation of C0 – C1. Bowing of trachea. Lateral bowing and gentle twisting of the larynx in anterior to posterior, and superior to inferior directions.<br><br>**Muscle Stripping:** SCM, longus colli belly and attachments C3 – C7. The following performed while client actively singing scales and adult pop songs: mylohyoid, sternohyoid, sternothyroid, thyrohyoid, SCM, anterior scalene.<br><br>**NMT:** SCM.<br><br>**Homecare:** DB. As often as possible throughout day, remember to use the diaphragm to breathe rather than accessory muscles of respiration. |
| Session # 9<br>Nov. 4, 2012<br>75 min.<br>12:30-1:45pm | **Position:** Supine<br><br>**D-MFR:** Release of superficial anterior neck fascia, SCM. Bowing of trachea. Lateral bowing and gentle twisting of the larynx in anterior to posterior, and superior to inferior directions. Working with subject's breath to increase diaphragm release, pulled ribs 5 – 7 laterally, held each side for > 1 minute. Cross-hand release of anterior ribs, increasing angle of costal margin.<br><br>**D-MFR:** While client actively singing scales and adult pop songs: trachea. |

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| | **Muscle Stripping, Kneading, and Ischemic Compression:** While client actively singing scales and adult pop songs. Sternohyiod, sternothyroid, thyrohyoid, SCM, anterior scalene.<br>**Homecare:** DB, with emphasis on relaxing diaphragm completely on exhale. |
| Session # 10<br>Nov. 6, 2012<br>75 min.<br>5:45 – 7:00pm | **Position:** Supine<br>**D-MFR:** Release of superficial anterior neck fascia, SCM. Bowing of trachea. Working with subject's breath to increase release of diaphragm, pulled ribs 5 – 7 laterally, held each side for > 1 minute. Cross-hand release of anterior ribs, increasing angle of costal margin. Ear twisting in anterior and posterior directions. Intraoral release of palatine aponeurosis. Intranasal release of fascia in posterior aspect of the external naris.<br>**Ischemic Compression:** Medial pterygoid and lateral pterygoid, both treated externally and intraorally. Root of the tongue, treated intraorally.<br>**Kneading:** Masseter, temporalis.<br>**D-MFR:** While client actively singing scales and adult pop songs. Trachea.<br>**Muscle Stripping, Kneading, and Ischemic Compression:** While client actively singing scales and adult pop songs. Sternohyiod, sternothyroid, thyrohyoid, SCM, anterior scalene.<br>**Rib Springing:** ribs 5 – 10, ribs 2 – 4.<br>**Homecare:** DB, with emphasis on relaxing diaphragm completely on exhale. |

# Results

The results of the three assessments can be seen in Figure 2. No improvement in range or quality was noted, but improvements in breath support, posture, and resting breathing patterns were found.

In Figure 2, a range value such as "C3" means that the subject was able to reach a "C" note in the third octave. "Workable range" was defined as the highest and lowest notes the singing instructor would feel comfortable assigning the subject to sing for a performance. "Total range" was defined as the highest and lowest notes the subject was able to reach, but which was not pleasant-sounding or performance-quality. The first value listed in a range, e.g. "C3" of the range C3 – A6, is the low note and the second value is the high note. Melismas are defined as a

pattern of notes played on the piano which take three seconds to perform. Image 1 shows the notes and octaves on a piano.

**Figure 2**

| Assessment | Findings |
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| Assessment # 1<br>Sept. 9, 2012<br>10:00 - 11:00am<br>60 min. | **Workable Range:** C3 – A6<br>**Total Range:** A3 – C6<br>**Melismas "ah" sound:** 4 (for a total singing time of 12 seconds)<br>**Melismas "uu" sound:** 5 (for a total singing time of 15 seconds)<br>**Breath Support using "Tssss":** 16.9, 18.8, 20.6, 18.3 (average of 18.65 sec.)<br>**Quality Assessment by CE:** The subject's useable range sounded strained. The subject was unable to relax certain muscles (including the diaphragm), which stopped her airflow from being efficient. Her throat muscles were also very over-used and over-developed due to straining and lack of muscle strength.<br>**Subject Breathing Pattern at Rest:** The subject was found to have an apical breathing pattern, which is "an inefficient breathing pattern, where the client mainly uses the upper chest, or apex of the lungs, to breathe; the lateral ribs move slightly; and the abdomen hardly moves at all" (Ludwig and Rattray, 2002, p. 34). |
| Assessment # 2<br>Oct. 9, 2012<br>6:00 – 7:00pm<br>60 min. | **Workable Range:** B3 – B(flat)6<br>**Total Range:** B2 – C6<br>**Melismas "ah" sound:** 6 (for a total singing time of 18 seconds)<br>**Melismas "uu" sound:** 8 (for a total singing time of 24 seconds)<br>**Breath Support using "Tssss":** 17.18, 19.0, 22.14, 22.02 (average of 20.09 sec.)<br>**Quality Assessment by CE:** The vocal folds sounded swollen, and the subject's technique seemed to be just as tight as at the first assessment. However, her breath management had made some significant improvements and she was able to utilize airflow more efficiently. Throat muscles were still overworking and diaphragm wasn't relaxing completely. More movement in the diaphragm was noted.<br>**Subject Breathing Pattern at Rest:** The subject's chest moved before the abdomen. The abdomen did move moderately. The subject was unable to expand her ribs laterally even with coaching. |
| Assessment # 3<br>Nov. 7, 2012<br>6:00 – 7:00pm<br>60 min. | **Workable Range:** C3 – A6<br>**Total Range:** F(sharp)2 – C6<br>**Melismas "ah" sound:** 11.5 (for a total singing time of 34.5 seconds)<br>**Melismas "uu" sound:** 12 (for a total singing time of 36 seconds)<br>**Breath Support using "Tssss":** 36.68, 29.4, 32.0, 33.24 (average of 32.83 sec.)<br>**Quality Assessment by CE:** Swollen sounding vocal cords were noted. Despite this, there was more ease with breath management and the subject's ability to utilize air |

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| | effectively had increased significantly. The subject's throat muscles had softened at rest, but she was not able to change her muscle coordination when asked to sing. There was some increased ease in her singing of the Linda Ronstadt song.<br><br>**Subject Breathing Pattern at Rest:** The abdomen moved before the chest, indicating a shift to diaphragmatic breathing. The subject was still unable to expand her ribs laterally even with coaching. |

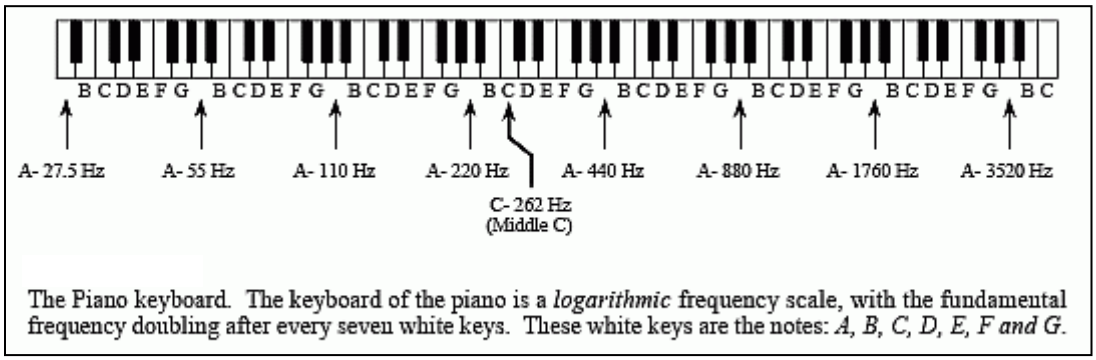


**Image 1:** (Smith, 2011)

The following postural changes were noted from the first to the final assessment: decreased head-forward posture, decreased anterior rotation of the shoulders, decreased hyperlordosis of L-s and better control and awareness of abdominal musculature. These changes can be seen in Images 2 and 3.

**Image 2:** Resting Posture at Assessment 1

**Image 3:** Resting Posture at Assessment 3

## Discussion

No improvement in vocal range could be found as a result of this intervention. The results of the study, however, were hindered by the extenuating circumstances. The day prior to Assessment # 2, the subject had lost her dog and spent 30 minutes yelling in the woods to get it back. This left her vocal cords swollen and her voice noticeably hoarse during the assessment. The day prior to Assessment # 3, the subject got only three hours of sleep and drank a bottle of wine. The singing instructor noted that these two factors, lack of sleep and consumption of alcohol, can affect the voice the day after, contributing more negative effects than a cold or flu. The singing instructor suspects that the range may have been improved by massage, but it was impossible to assess this given the condition of the subject's voice. The range did broaden in the lower ranges during the final assessment, but this is not desirable because it was due to swelling of the vocal cords. Future studies would benefit from controlling such variables more tightly to assess the true effects of massage on the singing voice. The full analysis and discussion from the voice instructor can be found in Appendix B.

The breath support and postural improvement findings do suggest that massage can have a beneficial influence on the singing voice. The breath support measure using the "tssss" exercise improved from an average of 18.65 to an average of 32.83 seconds, which is an improvement of 14.18 seconds on average from the beginning to the end of the intervention. Additionally, the subject's ability to sing the melismas went from 15 seconds on one breath to 36 seconds on one breath, which is more than double. This is a very impressive improvement and suggests that massage can greatly improve an amateur singer's ability to use their diaphragm and other muscles of respiration efficiently. The singing instructor suggested that a professional singer could benefit even more than an amateur from massage because the proper coordination and awareness of muscles is already engrained. CE suggested that the muscles could be aided by the

process of massage to remain healthy so that the professional singer can sing more frequently and with greater ease without risk of straining their voice. At the moment, however, this hypothesis is unsupported. Massage and the professional voice was not addressed in this study. Future studies could look at comparisons between amateur and professional singers, as well as sample from a larger and wider population, including males, young singers, and singers of different musical styles.

During this study, the subject was instructed not to practice the techniques or songs or to receive any additional singing instruction other than what was given in her choir practices and during the assessments. This was done to assess the pure effect of manual manipulation, stretching, and diaphragmatic breathing on the singing voice. Some vocal improvements are motor skills which require practice and coaching to be learned, for example the ability to expand the ribcage laterally. Such skills could not be affected by manual manipulation alone, and were therefore not seen to improve as a result of this study. Future studies could look at a combination of vocal coaching with massage, as opposed to vocal coaching or massage alone, to see the benefits of massage for the dedicated voice student.

The subject anecdotally reported that she was able to hold a note longer than any other singer in her choir. She also reported that she did not experience hoarseness or loss of voice at all during the course of the intervention. Normally, she suspects she would have lost her voice at least twice during this time period due to the nature of her work. This anecdotal finding is consistent with the previous research cited regarding massage for muscle tension dysphonia.

The major change in breath support measures occurred from the second to the third assessment. An improvement of only 1.44 seconds was seen from Assessment # 1 to Assessment # 2 whereas an improvement of 12.74 seconds was seen from Assessment # 2 to Assessment # 3.

Given this, it can be assumed that the massage techniques used during sessions # 5 – 10 were more effective than the techniques used in sessions # 1 – 4. Therefore, massage therapists reading this study are encouraged to follow the procedures used in sessions # 5 – 10 as a guide for treating singers.

Because there were no previous studies on this subject, a variety of massage techniques were used to see if massage therapy could be used to improve the singing voice. Future studies may want to look at specific techniques in more detail to see which techniques are effective and which are irrelevant.

## *Conclusion*

It was found that massage therapy could improve the breath support and posture of an amateur singer as applied by an entry-level massage therapist with minimal knowledge of vocal technique and theory. The effectiveness of massage to improve the vocal range and quality of an amateur singer was not supported by this study.

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# Appendix A: Description of Techniques

| Technique | Description and Effects |
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| Diaphragmatic Breathing (DB)<br>(No oil used) | Description: The therapist places one hand on the subject's stomach, superior to the belly button and slightly overlapping the costal margin. The client is then instructed to "breathe up into my hands." This is repeated for three breaths. The therapist then places two hands on the subject's lower lateral ribcage and instructs the subject to "breathe out into my hands." Guest can be instructed to breath with diaphragm as learned in this method as homecare.<br>Effects: "Diaphragmatic breathing increases relaxation, lymphatic flow and efficiency of gas exchange, and facilitates stretching techniques; it also decreases pain and stress" (Ludwig & Rattray, 2000, p. 35). |
| Golgi Tendon Organ Release (GTO release)<br>(No oil used) | Description: "Direct compression [is] placed on the tendon near the junction with the muscle… The therapist uses reinforced thumbs or fingers, holding for a minimum of 30 seconds or until the muscle relaxes. The tendon may also be bowed into an "s" or "c" shape The rate is slow and the pressure is moderate to deep." (Ludwig & Rattray, 2000, p. 38).<br>Effects: "Golgi tendon organ release reduces muscle tone and spasm" (Ludwig & Rattray, 2000, p. 38). |
| Ischemic Compression<br>(No oil used) | Description: "An ischemic compression is a static compression applied by the therapist's thumbs, fingertips or olecranon to the trigger point [or hypertoned muscle]. The pressure used is sufficient to temporarily cause local ischemia in the tissue that is compressed, while staying within the client's pain tolerance. The length of time the compression is held varies from seven seconds to one minute," until a release is felt (Ludwig & Rattray, 2000, p. 40).<br>Effects: "The reactive hyperemia that follows the release of pressure may help to flush metabolites from the tissue" (Ludwig & Rattray, 2000, p. 40). |
| Neuromuscular Therapy (NMT)<br>(can be done with or without oil) | Description: The therapist thoroughly treats the tendon at the origin and/or the attachment (depending on accessibility) of the muscle using either reinforced finger or thumb kneading. The therapist performs eight strokes cross-fibre in a lateral direction, eight strokes cross-fibre in a medial direction, and then eight strokes with-fibre in a superior direction, and eight strokes with-fibre in an inferior direction. All these strokes are performed at moderate to deep pressure according to the client's pain tolerance. The therapist does not slide over the skin but does engage the tendon at the same location for all strokes. The rate is approximately one stroke per second. As performed in this study, this origin and insertion technique is combined with muscle stripping, a petrissage technique described elsewhere in this table.<br>Effects: "The origin and insertion technique reduces muscle tone and spasm" (Ludwig & Rattray, 2000, p. 39). |
| Muscle Stripping (MS)<br>(can be done with or without oil) | Description: "The thumb, elbow, ulnar border of the hand, or fingertips are used. With moderate to deep pressure, the contours of muscles are followed often from the distal to proximal muscle insertion. The pressure is applied along the fibre direction" (Ludwig & Rattray, 2000, p. 24).In this study, the muscle was either compressed into the underlying tissues and then drag was applied, or the muscle was lifted between the fingers and thumb and a stripping motion was applied.<br>Effects: Increase in local circulation, loosening of muscle fibre and connective tissue adhesions (Ludwig & Rattray, 2000) |
| Indirect Myofascial Release<br>(I-MFR)<br>(No oil used) | Description: "The therapist applies pressure sufficient to contact the layer of fascia being treated; this pressure may be very light or moderately heavy. The therapist moves the tissue in the "direction of ease", or the direction the fascia will move most easily. This is usually opposite the direction of the restriction. The slack in the fascia is taken up. The fascia is then held in this position as the tissue attempts to return to its original position, which is palpated as a subtle sense of movement in the tissue. As the tissue stops resisting the therapist's pressure, further slack will develop. This slack is taken up again, holding without pushing, until new slack develops. This is repeated through several cycles, until a tissue release is felt. The direction of the perceived tissue motion may change but the therapist should not allow the tissue to return to |

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| | the original position. The pressure is light to moderate and the rate is slow" (Ludwig & Rattray, 2000, p. 50).<br>Effects: "Indirect fascial techniques increase the excursion and flexibility of fascia by moving it in the direction of ease, usually opposite to the restriction" (Ludwig & Rattray, 2000, p. 50). |
| Direct Myofascial Release<br>(D-MFR)<br>(No oil used) | Description: The therapist "take[s] the fascia towards the restriction or adhesion. This engages the soft tissue barrier. The tissue is then carefully taken beyond the barrier, which breaks down the bonds between the connective tissue fibres *(Greenman, 1989; Lewit, 1993)*... The pressure is moderate to deep and the speed is slow" (Ludwig & Rattray, 2000, p. 47). The therapist can either use two hands or fingers (palmar contact), applying force to the tissue in opposite directions or use only one contact point and move the tissue against its own resistance only.<br>Effects: " Direct fascial techniques increase the excursion and flexibility of fascia by moving it towards, then beyond, the restriction" (Ludwig & Rattray, 2000, p. 48). |
| Skin Rolling<br>(No oil used) | Description: "The thumbs are placed on the skin next to each other while the fingers grasp the skin forming a line. The fingers are pulled towards the thumbs, raising the skin between them from the underlying layer. The thumbs are slowly pushed away from the therapist over the skin, engaging the tissue. At the same time, the fingertips are "walking" over the skin, gathering it up ahead of the thumbs and maintaining the raised roll of skin as the thumbs push forward. The rate is slow and the technique is performed in long sweeps" (Ludwig & Rattray, 2000, p. 47).<br>Effects: " Direct fascial techniques increase the excursion and flexibility of fascia by moving it towards, then beyond, the restriction" (Ludwig & Rattray, 2000, p. 48). |
| Rocking<br>(No oil used) | Description: "The therapist moves the client's body part in a rhythmic manner and then allows it to return to its original position. The rocking motion is continued, allowing the adjacent joints to move. The rate is variable, from gentle to vigorous." (Ludwig & Rattray, 2000, p. 53).<br><br>Effect: "The increased sensory input from proprioceptors reflexively reduces muscle tone *(Hertling, Kessler, 1990)*. Rocking also helps mobilize the joint capsule. It increases the succussive action present at a moving joint which helps to move synovial fluid necessary for joint nutrition" (Ludwig & Rattray, 2000, p. 53). |
| Rib Springing<br>(No oil used) | Description: "The therapist carefully compresses the client's rib cage with her hands during exhalation of a deep breath. The therapist then takes up the slack in the tissue, compressing it to a soft-tissue end feel only. This compression is maintained while the therapist instructs the client to inhale against the pressure of the compression. As the client's inhalation is about half completed, the therapist quickly and smoothly releases the compressive force. The client will often have an audible intake of breath, indicating a correct application of the technique." (Ludwig & Rattray, 2000, p. 55 - 56).<br><br>Effects: "increase[s] tissue and joint mobility" (Ludwig & Rattray, 2000, p. 56). |
| Counterstrain<br>(Pin & Stretch)<br>(No oil used) | Description: "The therapist compresses the tender point while the client is placed in a position that moves the joint or limb *away* from the pain, shortens the muscle and almost completely reduces the pain *(Neumann,* 1989). The compression and position are maintained for 90 seconds. After that the client slowly returns to a neutral posture and is reassessed (Ludwig & Rattray, 2000, p. 61).<br><br>Effects: "The counterstrain technique reduces pain, muscle spasm and hypertonicity of muscles surrounding a joint" (Ludwig & Rattray, 2000, p. 61). |
| Kneading | Description: "Using the thumb, fingertips, palmar surface, or ulnar border of the hand or forearm, the therapist performs short, rhythmical, unidirectional or circular movements. The pressure peaks in the middle of the technique. Kneading can also be applied by alternating the circles. When deeper pressure is needed, the therapist can us one hand or thumb to perform the technique and the other hand for reinforcement and support" (Ludwig & Rattray, 2000, p. 25).<br><br>Effects: Increase in local circulation, loosening of muscle fibre and connective tissue adhesions (Ludwig & Rattray, 2000). |

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| Effleurage | Description: "effleurage is applied using the hand, with fingers together. The fingertips maybe used when applying effleurage to a small area such as the neck when the client is supine… The surface of the hand, fingers or forearm should closely conform to the contours of the client's tissue or limb being touched. The pressure is applied broadly and generally, through the entire surface of the structure used… Effleurage is applied smoothly, using a light to moderate depth…Effleurage is classically a long stroke, covering the length of the client's limb or thorax. The direction of effleurage is centripetal or towards the heart; therefore, while the therapist maintains contact on the return stroke, no pressure is used *(Wood, Becker, 1981)*" (Ludwig & Rattray, 2000, p. 22).<br><br>Effects: "The effects vary depending on the depth, rate and rhythm of the technique; effleurage tends to have a more reflexive effect on circulation if less pressure is used and a more mechanical effect if deeper pressure is used. Repetitive and sweeping, effleurage is used to increase local venous and lymphatic return, to increase local circulation or to reduce edema" (Ludwig & Rattray, 2000, p. 22). |

# Appendix B: Vocal Assessment Report and Summary

Written by Chelsea Edwardson

**Session #1:** On the first assessment with FD, it was evident that there was a lot of tension blocking her from singing in a healthy and open way. Her useable range sounded strained and although her breathing techniques were functioning, her inability to relax certain muscles (including the diaphragm) was stopping her airflow from being efficient. Her throat muscles were also very "over-used" and "over-developed" due to straining and lack of support. This particularly showed in the lower jaw and tongue areas. I explained certain muscle functions in singing to both FD and the massage student, and advised of certain muscle areas that may lessen tension in the wrong areas when trying to produce an open sound (increasing range). I also encouraged FD to use her own physical gestures to help "reach" higher notes. Overall, FD's technique was very constrained and "tight" because of muscle overuse in the wrong areas, which she was doing to try and "control" the voice.

**Session #2:** FD's second assessment was a bit inhibited by her experience the day before where she needed to call her dog for several hours in which she apparently hurt her voice. The vocal folds sounded swollen, and her technique seemed to be just as tight as the first assessment. However, her breath management had made some significant improvements and she was able to utilize airflow in a more efficient way than the first assessment. I reminded her of some of the muscle function and we worked a lot on breath management, testing perhaps more extensively than the first session. Throat muscles were still overworking and diaphragm wasn't relaxing completely, although, more movement range in the diaphragm area was noticeable.

**Session #3:** FD made the vocal assessment a little bit difficult at the end because she stayed up for a lot of the night drinking with a friend: two factors that can really affect the voice the day

after, contributing more negative effects than a cold/flu. Her range didn't improve, mostly because of her swollen sounding cords (due to the alcohol and lack of sleep) but despite this, there was more ease with breath management and her ability to utilize air effectively had increased significantly. She also expressed an ease with her singing which was noted by her choral conductor/director (who even pointed out her breath management to the whole group as an excellent example). Her throat muscles had softened a bit, but because of her "muscle-memory" while singing (and without coaching), she was not able to change her muscle coordination when asked to sing. Old habits remained and range did not improve much. However, there was a more open sound. I was frankly disappointed to have not had a situation conducive to measuring results because I believe that the sound quality may have actually improved if it hadn't been for the drinking and staying up late. I did hear some ease in her singing of the Linda Ronstadt song she chose, however, it would be difficult to make assumptions about quality without having a more controlled set of variables during this experiment.

**Summary:** Through this case study, FD did make some general improvements, which I feel were absolutely aided by the massage work. However, without instruction and coaching, the muscle work alone would only take her so far in extending range. The most noticeable area of improvement was breath management, and I believe that was a combination of muscle relaxation and muscle awareness: how these muscles work in relationship to vocal production. Without the understanding of vocal and bodily function in its relationship to the voice, it would be difficult to find stable and consistent results.

**Extended thought for discussion:** It would be interesting to compare levels of singers, for example, working with an experienced singer to see how they responded to the work. They may be able to utilize the massage benefits more because the coordination and awareness of muscles (and muscle usage) is already there. Also a more controlled set of variables would have aided in the effectiveness of this study (making sure that subject is not drinking or yelling for the dog the night before the assessment).

Through my own experience through scientific voice studies, I haven't seen much (if any) scholarly writing on the relationship between vocal production and specific massage benefits. I think we could use a lot more study on this since the body is the instrument itself, and the relaxation of the right muscles is absolutely part of the ability to form the motor skills needed. But in order to utilize the work done in massage therapy to aid the "instrument", the right coaching is needed to develop the motor skills.