

THE INFLUENCE OF PRANAYAMA BREATHING TECHNIQUES, AFTER  
TRAUMATIC BRAIN INJURY ON SELF-PERCEPTION OF HEALTH RELATED  
QUALITY OF LIFE

A Thesis  
by  
LINDSEY NICOLE DENMAN

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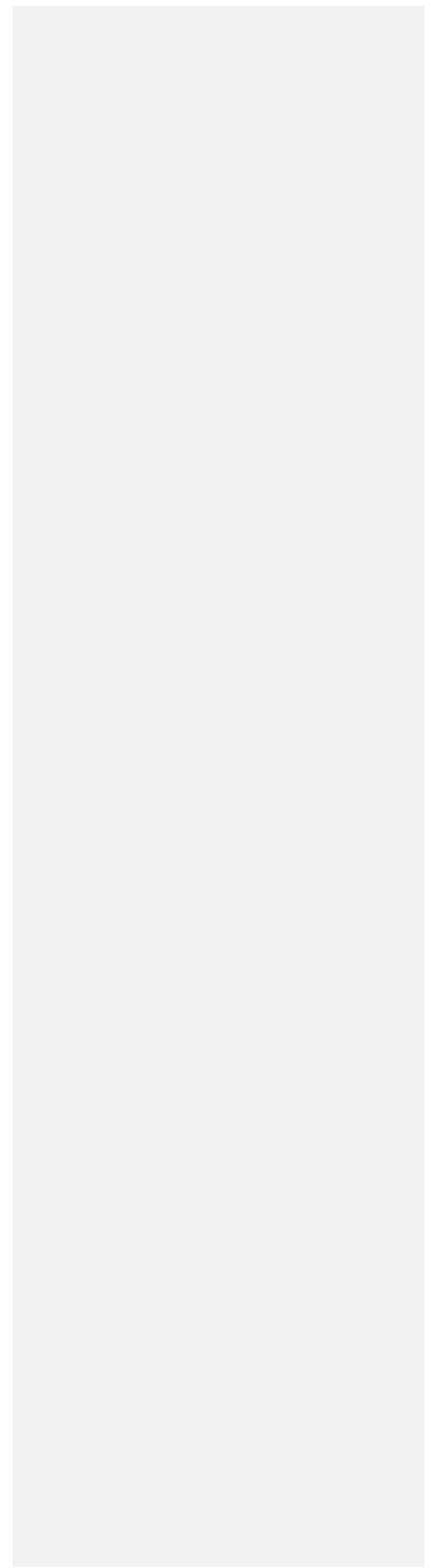
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## **Abstract**

### THE INFLUENCE OF PRANAYAMA BREATHING TECHNIQUES, AFTER TRAUMATIC BRAIN INJURY ON SELF-PERCEPTION OF HEALTH RELATED QUALITY OF LIFE

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This study assumed a case-based approach and examined the influence of pranayama breathing practices on two participant's self-perception of their health-related quality of life (HRQOL) after Traumatic Brain Injury (TBI). Pranayama breathing is a voluntarily regulated yoga breathing technique that is derived from two Sanskrit words: *prana* that means "vital force" or "breath" and *anyama* that means "to prolong." The types of pranayama breathing used for this study were *Ujjay*, *Bhastrika*, and *Nadi Shodhana* (Alternative Nostril Breathing). The Ujjay technique focused on abdominal breathing, including slow deep rhythmic inhalations and then an extended exhalation. Alternative Nostril Breathing was completed by closing the right nostril and inhaling with the left and switching for the exhale, closing the left nostril and exhaling out of the right. Bhastrika was completed by exhaling forcefully through the nose, followed by forceful, deep inhalations at the rate of one second per cycle. Participants practiced the breathing techniques before cognitive therapy, once a week for eight weeks. The pre- and post- data obtained included a

Quality of Life (QOL) scale and an ethnographic interview. The answers of the QOL scale were compared and contrasted to examine any changes in QOL, and the interviews were linguistically analyzed for word choices including transitivity, modality, and appraisal. Both participants reported independently using pranayama breathing practices outside of the study, and participants reported improvements encompassing all of the HRQOL domains. Both participants reported an improvement in respiration. The linguistic analysis of the ethnographic interview indicated increasingly positive participants perspective and attitudes. After practicing pranayama, both subjects discussed their TBI and QOL in a more positive light through use of increasingly positive verbs, modality choices, and appraisal. Finally, both participants indicated feeling as though pranayama breathing resulted in “more awareness.” To conclude, the study indicates that there are marked improvements in all the HRQOL domains, perspective, and attitude when practicing pranayama breathing in conjunction with cognitive therapy

## **Acknowledgments**

I would like to express my sincere gratitude to the Communication Sciences and Disorders Department and the Charles E. and Geneva S. Scott Scottish Rite Communication Disorders Clinic for allowing me to write a thesis. To Dr. Dalton and Dr. Klein of my committee, I am grateful for your support and guidance. Thanks to my friends for helping me keep on keeping on through the stress. Gratitude to Robert James for reminding me to stop and smell the lilies during overwhelming moments and to my mom and dad for believing in me, always. Most of all, I am fully indebted to Dr. Keegan, my chairperson advisor, for her understanding, knowledge, enthusiasm, and encouragement. I appreciate your patience and for always listening to me and giving me your perspective and thoughts. You have pushed me further than I thought I could go.

### **Dedication**

This thesis is dedicated to B.D.P. for providing the random brush with fate. Had our paths never crossed, I may have not found mine. In hindsight, I am grateful. What a long, strange trip it has been.

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## Literature Review

Traumatic Brain Injury (TBI) is an acquired head injury usually caused by an external force. The American Speech-Language-Hearing Association (ASHA, 2010) categorizes TBI into two major types: *Penetrating Injuries*, which are caused by a foreign object that enters the brain, such as a bullet and *Closed Head Injuries*, which result from a blow to the head, common to car accidents. ASHA (2010) also states that between 2.5 and 6.5 million Americans alive today have experienced a TBI; and of that, approximately 5.3 million currently live with some degree of cognitive-linguistic impairment secondary to TBI (Dennis, 2009). Approximately half of the TBI's that occur to the population under age seventy-five are due to transportation accidents, while the leading cause of TBI for ages seventy-five and above are falls, proving occurrences of TBI to be common and of interest to population groups of all ages (Dennis, 2009). The prevalence of TBI survivors is increasing in America as veterans from Afghanistan and Iraq return with such injuries, thus bringing more attention to cause, effects, and treatment. In February of 2009, the VA screened 281,607 Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) veterans. Of these, 56,231 screened positive for TBI symptoms (Dennis, 2009). Recurring TBI among athletes is also a rising issue. Recurring TBI is common within sports with physical contact, for example "some martial arts, and varieties of football including soccer, rugby, American football, and Australian Rules football may exhibit cognitive deficits following head injury incurred in the

sporting arena. Although many sports have modified their rules to reduce the incidence of TBI, such injuries still occur regularly” (Collie, 2001, p. 297).

Among information released for the public education of TBI by ASHA (2014), primary brain damage is defined as the damage that is complete at the time of impact. Skull fractures, lacerations, and hematomas are examples of primary brain damage. Secondary brain damage is the damage that evolves over time after the trauma, for example epilepsy, high blood pressure, or lung changes. The Mayo Clinic (n.d.) describes how TBI may have a myriad of effects that impact the physical, sensory, cognitive and communicative functioning of the individual.

A study by Teasdale and Engberg(2001) examining the dyad of communication and emotion and the effects on individual’s emotions when there is a communication disorder caused by Aphasia, Dementia, or TBI showed a heightened suicide rate and also states that more than 90 percent of people with brain injuries feel isolated and lonely and have a lowered sense of belonging. Therefore, therapy should focus on improving emotional well-being as well as aiding rehabilitation of prior skills.

There is a great influence and effect on an individual’s quality of life (QOL) and well-being after TBI. An individual’s well-being is important in all realms of life, but even more in the realm of one’s health. Broder, Wilson, Genderson, and Sischo (2014) conducted a study examining oral health of individuals with cleft palate and their quality of life. The study examined negative symptoms such as depression as well as positive psychological

characteristics such as resiliency and self-concept. The study revealed that positive psychological characteristics were shown to mediate the negative affect associated with a range of chronic conditions (Broder et al., 2014). The health related quality of life (HRQL) is defined by the Centers for Disease Control and Prevention (CDC; 2013) as a concept that is multi-dimensional with four domains: physical, mental, emotional, and social, and each of these domains influence an individual's functioning. A related concept of HRQL is well-being, which assesses the positive aspects of a person's life, such as positive emotions and life satisfaction. According to the CDC (2013) an individual's well-being is "associated with numerous health, job, family, and economically-related benefits. For example, higher levels of well-being are associated with decreased risk of disease, illness, and injury; better immune functioning; speedier recovery; and increased longevity. Individuals with high levels of well-being are more productive at work and are more likely to contribute to their communities" (p. 1). Hence, methods that promote well-being are a necessary component of healthcare.

A 2012 National Health Interview Survey (NHIS) asked questions regarding the ability to work and live independently, which were used to examine physical functioning, one of the aforementioned domains. Another survey regarding executive functioning skills is The Barthel Activities of Daily Living (ADL) Index (Mahoney & Barthel, 1965). The ADL Index is comprised of questions with regards to feeding, bathing, grooming, and dressing in relation to the individual's physical functioning abilities. Both the NHIS and The Barthel

ADL index account for the correlation between mobility and HRQL. It is most likely that a TBI includes symptoms affecting physical functioning, which may impact mental functioning, including the individual's cognitive abilities such as attention, memory, and executive function, skills as well as psychomotor functions, emotional functions and more. The inability of an individual to function at his prior level of mental capacity will naturally also influence well-being and inevitably affect the domains of emotional and social functioning. Emotional functioning includes the ability to control emotional reactions, understand emotional expressions, and respond appropriately. Depression, anger, and anxiety are common after TBI (Teasdale & Engberg, 2001) and are all related to emotional functioning. Difficulty understanding and producing language, auditory, verbal, and written, are often present in TBI; and this inability to interact and communicate may negatively affect HRQL, creating emotional distress. It is apparent that the relationship between emotional and social functioning are parallel, and this highlights the suitability of the role of the speech language pathologist of communication disorders specialist for including a focus on well-being in treatment.

Banerjee, Samsi, Petrie, Alvir, Treglia, Schwam, & del Valle (2009) stated there is “an emerging consensus that we need to measure broad patient-related outcomes such as health related quality of life as well as discrete areas of function like cognition and behavior” (p. 15). He also reported a “pattern of depression was observed, showing the more severe the depression, the lower the HRQL reported on both self- and proxy-reports in mild to moderate

dementia” (Banerjee et al., 2009, p. 18). The pattern revealed supports the correlation of psychological characteristics commonly found in TBI, such as depression (Teasdale & Engberg, 2001), which, directly affect an individual’s HRQL. Banerjee et al. (2009) states that “these data suggest that HRQL should be considered a distinct variable which requires measurement in its own right” supporting the growing consensus of the importance of HRQL. Woods, Thorgrimsen, Spector, Royan, & Orrell (2006) suggested “HRQL improvement was associated with reduction in depression and improvement in communication and could be mediated by change in cognition” (p. 220).

Techniques for quality of life intervention include both pharmaceutical and holistic approaches. One of these holistic approaches is yoga. Yoga has become a widespread movement throughout the United States within recent years, and the power of breathing and its effectiveness has become a topic of discussion; however, is still debatable in much of Western medicine, making the need for further research imperative. The average respiration rate for an adult is estimated to be between twelve and sixteen breaths per minute, and it is suspected that HRQL may be influenced by simply manipulating the way we breathe. A study of breath control by Wilson (1942) states there are three ways in which we breathe: “1. The first method of breathing is by raising the upper six ribs. This is generally called ‘chest breathing.’ 2. The second method is that of raising the lower ribs and is appropriately known as ‘rib breathing,’ 3. The third method is by contracting and expanding the abdominal walls, thus raising and lowering the visceral level within the abdominal cavity.”

(p. 340). The third method of breathing is known as “diaphragmatic breathing.” Wilson (1942) also states there is not particularly a “right” way to breathe; instead the importance lies in correctly using one’s breaths.

The idea of the way in which breath is used has been of great importance among Eastern cultures for thousands of years. Within the Eastern culture, beginning “circa 500 BCE from the ancient Indian epic, was the Ramayana” (Burke & Marconett, 2008, p. 67). The Ramayana is one of the great Hindu epics written by the poet Valmiki. It tells the story of a Hindu supreme god and his wife and the King of what seizes current day Sri Lanka. The epic consists of 24,000 verses in seven books in 32-syllable meter style and it is considered an important part of Hindu literature (Larviere, 1998). It is the *Ramayana* that has emphasized the importance of breath and around BCE 200, the *Yoga Sutras of Patanjali* revealed an approach to breathing which is known as the Ashtanga (eight-limbed) yoga (Burke & Marconett, 2008). *Pranayama* is one of the eight limbs that define Ashtanga yoga. Pranayama is a “voluntarily regulated yoga breathing technique” that is derived from two Sanskrit words; *prana* that means “vital force” or “breath” and *anyama* that means, “to prolong.” There are different techniques within pranayama breathing, some involve breathing through one or both nostrils and alternating the depth of breaths, while others involve a period of breath holding, exhaling with a production of a sound, or breathing through the mouth (Burke & Marconett, 2008). Each of the techniques has a different

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Sanskrit name as well as unique purposes and benefits that influence the different domains of HRQL, and overall have a significant influence on well-being.

### **Pranayama and Physical Functioning**

Sengupta (2012) reviewed research supporting the idea that yoga techniques may improve mental and physical health through down-regulation of the Hypothalamus Pituitary Axis (HPA) and the Sympathetic Nervous System (SNS). The HPA directly affects the functions of the thyroid gland, the adrenal gland, and the gonads. Other effects of an increased parasympathetic tone include improved heart functioning and improved respiratory functioning, which may positively impact those with TBI. A study utilizing six weeks of pranayama for individuals with asthma revealed a lower respiratory rate, increased vital capacity, increased forced expiratory volume, increased peak expiratory flow, and prolonged breath holding time, resulting in an overall improved quality of life (Sengupta, 2012). “‘Rib breathing’ is the primary motor element involved in the exhalation required for speech” (Khidr, 2010, p. 4), and what Wilson (1942) refers to as ‘diaphragmatic breathing’ with “no upper chest movement” (Golan, 2013, p. 14) is “normal, functional breathing” (Golan, 2013, p. 14). However, when the upper six ribs are raised, the upper chest begins to move; and ‘chest breathing’ (Wilson, 1942, p. 340) occurs. Upper chest breathing uses the rib and accessory (shoulder& neck area) muscles; and hence the upper chest moves, a symptom of hyperventilation (Golan, 2013). Hyperventilation is an excessive respiratory effort, in other words, it is excessive breathing that may result in muscular fatigue and other associated

difficulties (Golan, 2013). The pranayama breathing practices may benefit the respiratory system by strengthening the muscles that may influence speech production and hence communication.

Pranayama breathing practices were also shown to raise melatonin levels, improving sleep, reducing stress, and decreasing depression rates by 50%, anxiety rates by 30%, and increasing overall well-being by 65% (Sengupta, 2012). The thyroid secretes hormones and influences metabolism, growth and development, and body temperature. For children and adolescents, the hormones secreted are crucial for brain development, making the regulation of the HPA beneficial to the younger TBI population. The adrenal gland is also responsible for the secretion of hormones that control the sympathetic and parasympathetic responses of the body, and the raised levels of melatonin may minimize sleep disorders associated with TBI.

#### **Pranayama and Mental Functioning**

Telles, Singh, and Puthige (2013) studied the effect of *Nadisuddhi Pranayama* and changes in P300. P300 is an event related potential (ERP) or brain response elicited in the use of higher-level cognitive skills (Telles et al., 2013). *Nadisuddhi Pranayama* is alternate-nostril breathing. This technique is completed while seated comfortably and by closing the right nostril and inhaling with the left and switching for the exhale, closing the left nostril and exhaling out of the right. Twenty males practiced *Nadisuddhi Pranayama* for three months in the aforementioned study, and P300 was measured as a means to assess attention



and memory. The results revealed reduced blood pressure, possibly due to reduced task-based stress, and improved ability to attend to and discriminate between auditory stimuli. Reduced blood pressure could result in health benefits for the TBI population that may have blood flow interruptions. Furthermore, reduced cognitive stress and reduced demands on cognition may facilitate improved attention, memory, and decision-making skills.

Subramanian et al. (2014) compared effects of slow and fast pranayama techniques on cognitive functions. Eighty-four healthy volunteers were recruited for the study and were divided into three groups. One practiced the fast pranayama's of *Kapalabhati* (alternating short, explosive exhales and slightly longer, passive inhales), *Bhastrika* (bellows breath), and *Kukknya* (fast exhale); the other practiced the slow pranayama's of *Nadishondhana* (alternative nostril), *Pranava* (meditation while chanting a syllable “/ooum/” (OM) repeatedly, in unison with the breath), and *Savitri* (slow, rhythmic, deep breathing); and the last group was a control group that received no pranayama intervention. The intervention was twelve weeks long for thirty-five minutes a day, and a perceived stress scale, reaction time (RT), and cognitive parameters were recorded. The Cognitive Functions Test Battery was used to collect cognitive parameters and consisted of Letter Cancellation Test (LCT), Trail Making Test A (TTA), Trail Making Test B (TTB), Forward digit span (FDS), and Reverse Digit Span (RDS). The results indicated a significant reduction in perceived stress and improvement in the following cognitive domains: attention, visuo-motor speed, and memory retention capacity. This improvement was present in both fast and slow breathing groups;

hence, results indicate that both slow and fast pranayama are beneficial for stress reduction and improvement of cognitive functions. Fast pranayama also had additional effects on the sensory-motor performances such as a faster visual and auditory RT (Subramanian et al., 2014). Interestingly, the improvement of visual RT within the fast pranayama group may indicate improving physical motor skills difficulties, as well as the evident improvements in the mental functioning domain of HRQL, which therefore enhances well-being.

### **Pranayama and Emotional Functioning**

A study examining seven individuals with a score of 11 or more on the Hamilton Depression Rating Scale involved practicing of different yoga asana, yoga positions which practice the art of being still, along with pranayama techniques such as: *Suryanuloma-Viloma* (Right nostril breathing), *Ujjay* (the ocean breath), *Bhastrika* (bellows breath), and *Pranava japa* (OM chanting). At the end of the study, all seven of the participants lowered their depression scores (Thirhalli et al., 2013). Furthermore, Telles, Singh, Joshi, and Balkrishna (2010) reviewed the effects of pranayama breathing on Bihar flood survivors experiencing PTSD. The study consisted of 22 participants, who were divided into a control group and a ‘yoga group.’ For one week, the participants practiced four different pranayama techniques: *Kapalabhati*, *Anulom-vilom*, *Brahmari*, and *Udgheet*. *Kapalabhati* is a high frequency yoga cleansing breath, *Anulom-vilom* is alternative nostril breathing, *Brahmari* is exhalation while making a humming sound similar to a bumblebee, and *Udgheet* is exhalation while chanting a syllable “/oom/” (OM). The effects of the high frequency breathing, *Kapalabhati*,

indicated an increase in the SNS activity. Contrasting, alternative nostril breathing, *Anulom-vilom*, showed a decrease in SNS activity. This is not surprising as variety of research indicates that pranayama practices are proven to be a successful for improving autonomic functioning (Thirhalli et al., 2013). The SNS is part of the Autonomic Nervous System (ANS), which controls involuntary functions, and the SNS is known best for the “fight or flight” response of the adrenal glands. The decrease in sympathetic activity should prove beneficial in reducing the anxiety common among individuals with brain injury. The attention difficulties common to TBI may be addressed with the decrease in sympathetic activity. This decrease may facilitate reduced stress and potentially more motivation for therapy participation.

Turankar et al. (2013) reviewed the effects of slow breathing on cardiovascular and pulmonary functions as well as galvanic skin resistance in twenty-two healthy volunteers, who were divided into two groups: a control group and a pranayama group. In this eight-day study, the control group performed regular rhythmic breathing while in a sitting position and the pranayama group practiced *Anuloma-Viloma* with *Kumbhak* (alternative nostril breathing with breath holding). Participant’s demonstrated increased parasympathetic tone, decreased sympathetic activity, improved heart and respiratory functions, decreased stress and strain on the body, and improved physical and mental health. The Parasympathetic Nervous System (PNS) is also part of the ANS and is known for “rest and digest.” An improved parasympathetic tone would aid sleep disorders in TBI. Furthermore, in cancer patients, an

improvement of psychological health was noted (DiStasio, 2008). DiStasio (2008) stated, “participants were assessed before and after the intervention regarding health behavior variables, quality of life, mood, stress, and cancer-related cytokine production. The results showed decreased stress and improvement in quality of life, sleep, and other health behaviors such as exercise and caffeine consumption in participants” (p. 126). Hence, overall, research indicates that pranayama enhances mental health, exposing the potential to improve the emotional functioning domain of HRQL and well-being.

### **Pranayama and Social Functioning**

Since HRQL is multidimensional (CDC, 2013), it makes sense and is apparent the aforementioned domains overlap, meaning difficulties in even one domain influence the other domains simultaneously. Social functioning is a culmination of the physical, mental, and emotional domains. Physical aspects such as speech difficulties or motor difficulties are common to TBI. The ability to speak is dependent on the respiratory system. The ability to understand and express thoughts requires cognitive skills such as attention, memory, and decision-making. Emotional distress, depression, anger, and anxiety (Teasdale & Engberg, 2001) are also common in TBI. Emotional distress can influence motivation both in social functioning, as in the amount, effectiveness, and quality of daily social interactions, and in therapy, being less motivated due to distraction and difficulty and/or lowered sense of belonging and self-confidence. Pranayama breathing practices could be useful in influencing the different domains associated with social functioning and HRQL. The physical

improvements of pranayama such as the improvement in respiratory functioning (Sengupta, 2012) and improved physical motor skills (Subramanian et al., 2014) may address speech difficulties common to TBI. The increase of melatonin and activation of the SNS (Burke & Marconett, 2008; Sengupta, 2012) may address sleep disorders common to TBI as well as reduce cognitive demands and improve attention, memory, and decision-making that in turn facilitate successful communication. The SNS also influences depression, anxiety, and anger, by lowering stress. Lowered stress may allow the individual to be more motivated to participate in therapy and increase the attention and memory skills necessary for successful social communication (Subramanian et al., 2014).

### **Pranayama and Quality of Life**

Dhruva, Miaskowski, Abrams, Acree, Cooper, Goodman, & Hecht (2012) completed a study of cancer patients undergoing chemotherapy and the effects of pranayama breathing on the patient's quality of life. In this study, twenty-three patients were divided into two groups and both practiced pranayama techniques; group one practiced over two consecutive chemotherapy cycles, while group two only practiced during one cycle. The pranayama techniques used were *Breath observation*, in which participants focused on their natural breath, *Ujjay*, which focuses on abdominal breathing, slow deep rhythmic inhalations and an exhalation and then an extended exhalation, *Kapalabhati*, in which the individual inhales gently, retains briefly, and exhales forcefully, and *Nadi Shodhana*, which is alternative nostril breathing. Fatigue was measured with the Piper Fatigue Scale; sleep disturbances were

measured using the General Sleep Disturbance Scale; anxiety and depression were measured using the Hospital Anxiety and Depression Scale; stress was measured using the Perceived Stress Scale; and the Short Form 12-item Survey (SF-12) version one was used to measure QOL. There were no statistical differences between the two groups; however, the results indicated a statistically significant improvement in sleep disturbances and anxiety within the participants that increased the amount of yoga practice. With overlapping domains defining HRQL, improvements in all four make pranayama techniques a beneficial alternative method to improve HRQL and overall well-being in all neurogenic disorders associated with TBI. The evidence of pranayama techniques cultivating positive therapeutic effects is overwhelming. This immense potential to improve the HRQL and well-being, which is the ultimate goal of therapy, via breath control, furthers the “pressing need for studies of quality of life in large, representative samples of people” (Banerjee et al., 2009, p. 21).

In conclusion, Pranayama breathing practices have proven to positively enhance common symptoms of TBI in many different ways. The down-regulation of the Hypothalamus Pituitary Axis (HPA) and the Sympathetic Nervous System (SNS) promote improved quality of life, while raised levels of melatonin minimize sleep disorders associated with TBI. *Nadisuddhi* can be used to improve attention and memory while reducing blood pressure. Both slow and fast pranayama can be beneficial for stress reduction and improvement of cognitive functions (Subramanian et al., 2014). Interestingly, the improvement of visual reaction time within the fast pranayama group may also support

improving the physical motor skill difficulties. Pranayama practices are proven to be a successful treatment for anxiety disorders (Panjwani, Gupta, Singh, Selvamurthy, & Rai,1995). Overall, Pranayama breathing practices cultivate and increase well-being that affects quality of life that is typically altered by TBI. With the rising prevalence of individuals with TBI, this research should provide information to future clinicians working with this population as to whether breathing practices as part of the therapy regime benefit health related QOL. As previously stated, TBI survivors are a growing population, therefore, continuing research for innovative and effective therapy techniques is valuable and essential.

The purpose of this study was to examine these therapeutic benefits of pranayama breathing techniques on HRQL and well-being of the TBI population. Hence, the question of this research is “How do pranayama breathing techniques, in conjunction with group therapy, influence an individual’s perspective of **their** health-related quality of life after TBI?”

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## **Methods**

### **Participants**

This study examined two, English speaking adults who have experienced a TBI more than one year previous to the study in order to eliminate the possible influence of post acute spontaneous recovery. Spontaneous recovery would make it difficult to discriminate results that may be attributed to the therapy provided. The research took place over a two-month period, and breathing techniques were in conjunction with a two-hour group therapy session for speech-language and cognitive skills that took place once per week. This group treatment approach for individuals with a TBI promotes natural communication, is client-centered, and aims to facilitate positive identity formation. The inclusion criteria for participants included a diagnosis of a traumatic brain injury, and they were recruited from the group of individuals that were receiving the Speech-Language-Pathology group services at the Charles E. and Geneva S. Scott Scottish Rite Communication Disorders Clinic. The two participants included a 52-year-old female and a 60-year-old male who have been assigned pseudonyms to keep their information private. Participant 1, Kara (pseudonym) experienced a TBI in 2012 while stopping during a snowstorm to check on an individual she witnessed flipping his car. When an intoxicated driver in another car, hit the first car involved in the wreck, making the car spin and land on Kara. This broke all the bones in her face and jaw, hand, and shoulder, and she received lacerations and acquired a brain injury. Participant 2, Scott (pseudonym) experienced what is believed to be a seizure in 2009 due to previous injuries to



his spine. During the seizure, Scott fell down a staircase head first and received the following injuries: a cracked skull from right to left side, a cracked right eye socket in five places, a fractured cheek bone down to the jaw, a broken collar bone, a cracked shoulder, a separated rotator cuff, four broken ribs, and bleeding throughout the brain. At the time of this study the outwardly evident fractures and breaks of both participants had healed, but both continued to experience deficits related to the brain injury.

### **Data Collection**

Before beginning the study, the participants were provided with a consent form to be signed by themselves. The consent form informed the individuals of what the study is about and what they will be asked to do, while also discussing the risks and benefits associated with the study, and the confidentiality of their information. Lastly, it informed the individual that taking part in the study was voluntary; they did not have to participate and were free to withdraw from the study at any time. To establish a baseline and a better understanding of the individuals, the formal, standardized Assessment of Language-Related Functional Activities (ALFA) was administered pre treatment (Baines, Martin & McMartin Heeringa, 1999). The ALFA assesses functional activities for persons 16 years and older and took about 45 minutes to complete. It consists of 10 subtests, each of which assess a different functional activity: Telling Time, Counting Money, Addressing an Envelope, Solving Daily Math Problems, Writing a Check/Balancing a Checkbook, Understanding Medicine Labels, Using a Calendar, Reading Instructions, Using the Telephone, and Writing a Phone Message

(Baines, Martin & McMartin Heeringa, 1999). The ALFA scores indicate areas which may require different levels of assistance. The ALFA consists of Activities of Daily Living (ADL) type tasks, and the individual's scores will indicate the functional areas impacted by each individual's TBI, identifying areas directly influencing the different domains of HRQOL. The other data, consisting of a quality-of-life scale and interview, was collected pre- and post- study. Since "the objectives of qualitative research is to review and compare both pre- and post- data to describe and understand the mundane" (Damico, Simmons-Mackie, Oelschlaeher, Elman, & Armstrong, 1999, pg. 654), and to examine the everyday activities and routines and actions of individuals as they go about their daily lives, this study assumed a case-based qualitative design. The qualitative measures included a quality of life scale, which was developed by the author based on current available scales but adapted for the methods being utilized in this study, as well as an ethnographic interview (see Appendix A), which was audio recorded and transcribed before analysis.

The strengths of utilizing qualitative research for the purposes of this study relate to the flexibility to adjust both data collection and analysis to fit the needs of the research allowing "the variables that make up social phenomena to be accounted for" (Damico, et al., 1999, pg. 656) allowed the breathing practices to be modified if needed. The qualitative design, "allows the researcher to collect descriptive data most often using words or pictures rather than numbers" (Damico et al., 1999, pg. 656). The ethnographic interview was chosen, as it is a method of qualitative data collection that allows the researcher to describe

and understand the perspective of the individual (Damico et al., 1999). This data was transcribed and linguistically analyzed for verb choices and elements of appraisal that provided insight into the individuals attitudes and perspectives. Furthermore, qualitative research is “designed to orient to a more focused description than a broader one” (Damico et al., 1999, pg. 656) and focuses “on the process of accomplishing social action rather than the product of social action as the outcome of the analysis” (Damico et al., 1999, pg. 657). Since this study utilized only two participants, the focused aspect of *how* things happen is equally as important as *what* happens and was accounted for by using a qualitative analysis of the ethnographic interviews and quality of life scales.

### **Data Analysis**

The data was examined to identify the participant’s self-perception as measured by the ethnographic interviews and QOL scale. The answers from pre- and post- QOL scales were compared and contrasted to examine any changes in QOL. Salient and relevant descriptive information was obtained from the interview data in order to add to the information obtained in the QOL scales. The ethnographic interview is different from a traditional interview in the way the interviewer approaches it; instead of the interviewer knowing what information they are out to get, in an ethnographic interview, the interviewer approaches with idea of letting the individual being interviewed set the agenda. The interview was more like “a series of friendly conversations in which the clinician slowly introduces open-ended questions to assist the client or family member in sharing their

experiences” (Westby, Burda, & Mehta, 2003 p. 1). First the interviewer explained the reason for the interview and the types of questions that were to be asked. Descriptive and structural questions were used. Descriptive questions were broad and general, allowing the clients to describe their experiences, their daily activities, and objects and people in their lives. Structural questions were used to explore responses to descriptive questions and to understand how the client organizes knowledge (Westby et al., 2003). In order to better understand the client’s feelings and perspectives, the researcher asked open-ended questions and asked for examples in order to elicit longer, more descriptive responses. The researcher also used the strategy of restating and summarizing what the client had said in order to avoid any miscommunication and give the client a chance to make corrections if needed. The use of multiple questions, leading questions, and why questions were avoided so as not to exhaust, skew, or offend the client. Then, the ethnographic interviews were linguistically analyzed for verb choices, modality, and elements of appraisal that convey attitudes towards quality of life. The transitivity of verbs was examined (Halliday & Matthiessen, 2004) with a specific focus on mental verbs. These are verbs that express information about the individuals mental state (e.g. know, believe, remember). Additionally words that express modality and indicate inclination, probability, obligation or potential (Halliday & Matthiessen, 2004) were examined within the context where they occur. These word choices allow the researcher to examine the uncertainty, wants, needs and self-perceived potential of the individual. Use of appraisal conveys how speakers construe particular authorial identities

for themselves (Martin & White, 2005; Pankovskyi, 2013). This allowed the researcher a better understanding of the individuals perception of their social role, which secondary to the social component of HRQOL is a significant aspect of quality of life. The framework of appraisal is comprised of engagement, attitude, and graduation (Martin & White, 2005). Engagement involves “identifying the particular dialogic positioning associated with given meanings” (p. 97). Engagement includes referencing and non-referencing to other viewpoints. For example, non-reference to a viewpoint would be something like “there are four seasons” and a reference to other viewpoints would be “according to climatologists, there are four seasons.” Attitude is “concerned with our feelings, including emotional reactions, judgments of behavior and evaluation of things” (p. 35). Analysis of attitude includes aspects of affect, which are emotional statements and responses; judgment, appraisal of behaviors; and appreciation, which describes likes and dislikes. Lastly, graduation deals with “grading phenomena whereby feelings are amplified and categories blurred” (p. 35). Graduation includes analysis of words having positive or negative meaning, such as wonderful or rotten; repetition and synonym use in building intensity, such as “terrible,” “awful;” intensifiers such as “little,” “very,” or “always.” Analysis of appraisal further identifies the individual’s perspective by indicating positive and negative associations, reflecting the individual’s attitude and perspective as well as experiences. For the purposes of this research, the author focused on attitude, examining the affect, appreciation and

judgment, as this was expected to provide the most information on the participant's emotional status, opinions and perceptions.

### **Treatment Plan**

The two individuals practiced pranayama breathing practices at the beginning of each therapy session. The types of pranayama breathing used for this study were:

*Ujjay*, this technique focuses on abdominal breathing, including slow deep rhythmic inhalations and then an extended exhalation.

*Nadi Shodhana (alternative nostril breathing)*, this technique is completed while seated comfortably and by closing the right nostril and inhaling with the left and switching for the exhale, closing the left nostril and exhaling out of the right.

*Bhastrika (bellows breath)*, this technique is completed by relaxing the shoulders and taking a few deep, full breathes from the abdomen. First, the participants will start exhaling forcefully through the nose, followed by forceful, deep inhalations at the rate of one second per cycle. The breathing is entirely from the diaphragm with head, neck, shoulders, and chest relatively still while the belly moves in and out.

The participants practiced all three Pranayama breathing practices seated comfortably. They closed their eyes and relaxed their shoulders taking a few natural breaths to center and ground themselves, clearing their mind and bringing their attention to following their breaths. First, the individuals practiced Bhastirka breathing practices for 10 circulations. Bhastrika breathing was chosen due to the results on the perceived stress scale, showing it to lower

stress levels as well as the improvement in the following cognitive domains: attention, visuo-motor speed, and memory retention capacity (Subramanian et al., 2014). Stress and cognitive function problems are common to TBI. Bhastirka was chosen as the first practice for two reasons: (a) it is a faster and more forceful breathing practice, so it is easy to bring attention to the breaths and (b) the reduction in stress will hopefully relieve preliminary anxiety or stress caused by initial nervousness.

Second, the individuals practiced Ujjay breathing for 10 circulations. Since depression is common to TBI, it seemed appropriate to include Ujjay breathing due to the results of the Thirhalli et al. (2013) study, which showed an improvement of scores on the Hamilton Depression Rating Scale. Ujjay was chosen as the second practice because unlike the previous practice (Bhastrika), Ujjay is a slow pranayama, bringing more attention to the breathe due to the extended exhalation. After awakening the senses with the fast Bhastrika, Ujjay will set a rhythmic tone to the breathing, furthering grounding and centering of the individual and cultivating a strong awareness of their breath, keeping the individual's attention. Third, Alternative Nostril Breathing was practiced for a total of 7 full circulations through each nostril, for a total of 14 circulations. This breathing practice reduces blood pressure and improves ability to attend to and discriminate between auditory stimuli (Telles et al., 2013). Alternative nostril breathing also significantly reduces stress and improves attention, visuo-motor speed, and memory retention capacity (Subramanian et al., 2014). Alternative Nostril Breathing also showed a decrease in SNS activity, a successful means of

improving autonomic functioning (Thirhalli et al., 2013). This was chosen as the last practice because the reduced blood pressure also reduces cognitive stress, which is beneficial in facilitation of improved attention, memory, and decision-making skills, thus allowing the individual to focus on the therapy to follow. The decrease in sympathetic activity should prove beneficial in reducing the anxiety as well as the attention difficulties common to TBI. Since Alternative Nostril breathing appears to be the most beneficial for the problems common to TBI, it had the most potential to provide motivation and hopefully participation. The breathing practices took approximately 4 minutes to complete at each session.



## **Results and Discussion**

### **Participants**

Two participants completed the ALFA, quality of life scale, and ethnographic interview. Due to extenuating circumstances and weather-related issues, each participant completed a different number of sessions. Kara participated in eight sessions in conjunction with cognitive therapy. Scott completed four sessions of pranayama breathing practices but only two in conjunction with cognitive therapy. Scott was undergoing sleep Apnea studies and was no longer able to come to therapy due to a change in his medication. However, Scott was very interested in the study and requested that he continue to participate in the research and practice the pranayama breathing.

### **Participant 1**

Kara's ALFA scores resulted in an Independent Functioning Rating (IFR) of one on nine out of 10 subtests and an IFR of two on the telling time subtest. An IFR of one indicates "high probability of independent functioning on this task" and an IFR of two is "indication of need for some level of assistance on this task, needs further exploration" (Baines, Martin & McMartin Heeringa, 1999, p. 21). Kara reported noticing that recently she had been having trouble with time telling and described mixing up the hands of the clock. Hence, her score on this Time Telling (TT) task confirmed Kara's reported difficulties.

**Table 1.** ALFA Record of Scores for Kara

Subtest	1 TT	2 CM	3 AE	4 MP	5 WC	6 UM	7 UC	8 RI	9 UT	10 WM
No. Correct	6	9	10	10	10	10	10	8	5	15
% Correct	60	90	100	100	100	100	100	80	100	75
IFR	2	1	1	1	1	1	1	1	1	1
Time	1:32	3:19	1:21	1:56						

*\*1=high probability of independent functioning on this task; 2= indication of need for some level of assistance on this task, needs further exploration; 3= high probability that the patient is not able to function independently on this task. Note TT= Telling Time; CM= Counting Money; AE= Addressing an Envelope; MP= Solving Daily Math Problems; WC= Writing a Check and Balancing a Checkbook; UM= Understanding Medicine Labels; UC= Using a Calendar; RI= Reading Instructions; UT= Using a Telephone; WM=Writing a Phone Message*

Telling time requires visuo-motor skills and the Alternative Nostril breathing may have a positive impact on Kara's visuo-motor skills. Subramanian et al. (2014) reported that Bhastrika affects perceived stress and lowered stress levels in addition to improvements of attention, memory capacity, and visuo-motor skills. Hence, this initial assessment indicates that there was potential for the breathing tasks to advance Kara's functional abilities especially in the tasks involving visuo-motor skills, such as telling time.

**Table 2.** Pre- and Post- therapy changes on QOL scale for Kara

HRQOL Domain	Changes Reported on QOL Scale:	Pre-therapy	Post-therapy
<b>Emotional</b>	<b>Experience a depressed mood</b>	<b>Sometimes</b>	<b>Rarely</b>
<b>Emotional</b>	<b>Experience frequent, persistent and intense feelings of generalized nervousness, tenseness, or worry</b>	<b>Sometimes</b>	<b>Rarely</b>
<b>Emotional</b>	<b>Experience frequent anger or irritability in response to minor slights, vengeful behavior</b>	<b>Sometimes</b>	<b>Rarely</b>
<b>Emotional</b>	<b>Experience frequent, intense feelings of guilt or shame; or</b>	<b>Sometimes</b>	<b>Rarely</b>

	<b>feeling that one is a burden to others</b>		
Emotional	Willingness to try new things; ability to tolerate normal disorder; taking reasonable risk	Good	Moderate
Emotional	Trust in others	Good	Moderate
Emotional	Self-Confidence	Good	Moderate
<b>Mental</b>	<b>Difficulty reading, doing math, or writing</b>	<b>Sometimes</b>	<b>Rarely</b>
Mental	Difficulty concentrating and focusing on task; attention easily diverted	Sometimes	Always
Mental	Difficulty learning new things; forgetting to take medications; forgetting to keep appointments	Sometimes	Often
Mental	Experience slowed thinking, speaking, or moving; decreased spontaneous movements	Never	Rarely
Mental	Ability to feel pleasure or take interest in things; motivation to do expected task	Good	Moderate
Mental	Experience confusion	Never	Sometimes
Mental	Concentration	Moderate	Poor
Physical	Experience shortness of breath	Often	Sometimes
Physical	Experience headaches	Often	Always
<b>Physical</b>	<b>Difficulty with physical Mobility (e.g., walking stairs, lifting, carrying, holding)</b>	<b>Always</b>	<b>Sometimes</b>
<b>Physical</b>	<b>Experience physical pain or discomfort</b>	<b>Always</b>	<b>Sometimes</b>
Physical	Feel tired or having little energy	Often	Sometimes
Social	Assertiveness	Very Good	Good
Social	Interest in social contacts and activities	Good	Moderate
Social	Expression of emotions	Very Good	Good
Social	Experience disorganized (circumstantial, irrelevant, illogical, derailed or incoherent) speech writing	Rarely	Sometimes

Physical, Mental & Social	Functioning in life	Moderate	Poor
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\* The improvements are noted in bold

In both the pre- and post- therapy ethnographic interviews Kara speaks of her experience being a “process” and states that she is currently in a stage of “acceptance.” She was always very interested and willing to participate in the breathing practices, revealing Kara to be an active participant in her “process.” This indicates her motivation. Throughout both interviews she used the phrase “I’m trying” multiple times. Kara reported awareness of her difficulties and sought improvement. Having a positive outlook, Kara was very accepting of the things that could not be changed and described her self to be “dealing” with them. She never speaks as though she is a victim; instead she speaks of “moving on with life” and having “more awareness of her limitations and how to either accept them or deal with them” indicating an internal locus of control, meaning she felt accountable for her healing and well-being. Overall, Kara reported improvements of seven of the 25 reported difficulties from the pre-therapy QOL scale and 11 items were reported the same on pre- and post- QOL scales, indicating no improvement or decline. The remaining seven items indicated declines and encompassed both the physical and emotional domains, with the majority of declines falling in the emotional domain. These declines may be due to Kara’s state of “acceptance,” as she is more aware of her feelings as she begins to process and accept the difficulties and changes due to her TBI. When completing the post-therapy QOL scale and ethnographic interview Kara was recovering from the flu. Kara also stated she felt

as though she was experiencing allergy problems and appeared more stressed than she had been during previous sessions, as she requested not to participate in the breathing practices due to her health and reported she had a migraine. When given the post-therapy QOL scale, Kara laughed and said, “this isn’t the best day to fill this out,” referring to her health issues. On the post-therapy QOL scale, Kara reported improvements in some areas, but she also reported a number of declines as well. Interestingly, during the final interview, she stated that she feels as though the pranayama breathing practices “help me a lot actually.” She reported that she preferred the Ujjay breathing, as she felt it was the most effective technique for her. Kara reported independently practicing Ujjay breathing outside of the session times, particularly when she feels anxious and has migraines. Overall, Kara’s post-therapy QOL scale and ethnographic interview are contradictory, and this might be due to her illness at the time of the final meeting.

#### *Physical Changes*

On the final QOL scale, Kara reported that she experienced headaches more often than reported on the pre-therapy QOL scale. This could be due to her recent sickness and current allergy problems, as migraines are common to allergies. In contrast, Kara reported overall improvements in her headaches during the final ethnographic interview. Kara’s final QOL scale indicated improvements in the following: (a) feeling tired or having little energy, (b) shortness of breath, (c) physical mobility, and (d) pain or discomfort. The reduced fatigue at the end of the study may result from the increased melatonin that results from

pranayama practices (DiStasio 2008; Sengupta, 2012; Turankar et al., 2013). The increase of melatonin results in an improved circadian rhythm, better sleep, and hence less fatigue. The improvements in physical mobility difficulties and experience of less pain and/or discomfort after practicing pranayama breathing may result from improved regulation of the Hypothalamus Pituitary Axis (HPA) and its influence on hormone regulation (Sengupta, 2012). Kara also noted feeling short of breath less often and improvements of respiratory functioning may be directly related to pranayama breathing. Sengupta (2012) reported that after practicing pranayama breathing practices, individuals demonstrated a lower respiratory rate, increased vital capacity, increased forced expiratory volume, increased peak expiratory flow, and prolonged breath holding time. Physical improvements may also be due to changes in the way in which Kara breathes. As previously mentioned by Khidr (2010), Golan (2013), and Wilson (1942), there are three types of breathing: “rib breathing,” “diaphragmatic breathing,” and “chest breathing.” Upper chest breathing uses the rib and accessory muscles, moving the upper chest and is a symptom of hyperventilation, which requires significant effort and may result in muscular fatigue, pain or discomfort (Golan, 2013). Pranayama breathing influences the respiratory system by strengthening the muscles, which could have an effect on the way in which an individual breathes. It is possible pranayama breathing, and its focus on using the diaphragm, could account for Kara’s respiratory improvements.

### *Mental Changes*

On the final QOL scale, Kara indicated experiencing more difficulty in the following: (a) difficulty learning new things, forgetting to take medications, forgetting to keep appointments, (b) being disorganized, (c) difficulties with slowed thinking, speaking, or moving, (d) experiencing more confusions, (e) difficulties feeling pleasure or taking interest in things, and (f) poor concentration. This may be due to the heightened awareness of her difficulties. An improvement in physical health was noted on the final QOL scale. The improvement in Kara's physical health may allow her to focus on mental issues, which may have made Kara become more aware of her cognitive difficulties. Kara reported improvements after completing pranayama breathing practices with reading, doing math, and/or writing. Reading, math, and writing all require visuo-motor skills. Subramanian et al. (2014) noted an increase in these skills with both fast and slow pranayama breathing groups. This may explain Kara's reported improvement within the cognitive domain.

### *Emotional Changes*

On the final QOL scale, Kara indicated a decline in the following: (a) trust in others, (b) willingness to try new things and taking reasonable risks, (c) self-confidence, and (d) expression of emotions. While coming to terms with her current level of functioning and taking responsibility for the "process" of recovery, Kara may be becoming more aware of her emotions. She also reported some emotional improvements, stating she "rarely" experienced: (a) frequent anger or irritability, (b) depression, (c) persistent and intense

feelings of generalized nervousness, tenseness, or worry, and (d) intense feelings of guilt or shame. It seems logical that raising awareness could potentially contribute to emotional distress, as the person is more aware of their difficulties. However, Telles (2010) reported improved scores on the Hamilton Depression Rating Scale in participants practicing pranayama breathing practices that included Ujjay and Bhastrika. It is possible the heightened awareness caused by the pranayama breathing may have contributed the decrease in depression. A variety of research indicates pranayama breathing practices are successful for improving autonomic functioning (Thirhalli et al., 2013). Since the SNS is part of the ANS, the decrease in sympathetic activity should benefit in reducing anxiety. Since anger and guilt are common to stress and anxiety, the reduction of stress and anxiety could improve feelings of anger and guilt.

#### *Social Changes*

On the final QOL scale, Kara reported a decline in both her interest in social contacts and activities and assertiveness, since completing the initial scale. However, during the ethnographic interview, Kara states “I have avoided a lot of situations that cause anxiety and that can be a bad thing ‘cause you become closed off somewhat, but it can also be a good thing because I’m happy and, ya’ know, I’m working it out.” This indicates Kara’s social interests are declining, and she is avoiding situations. Although reducing social interactions is not a positive change; Kara views it as a positive choice because avoiding situations that bring her anxiety makes her happy and gives her time to work things out. This change in



social interactions is an intentional move by Kara to focus on her emotional health. This aligns with Kara's description of her "acceptance" phase, and it makes sense that she would find more happiness in enjoying less frequent but more meaningful social interactions. Therefore, for her, this is a positive experience in order to improve her emotional health.

#### *Overall Quality of Life*

On the pre- and post-therapy QOL scale, Kara indicated she "often" felt happy with life. Kara reported a decline in her overall functioning in life, noting it to be "poor." However, during the final ethnographic interview, Kara stated, "I can only see improvements over long periods of time." Perhaps Kara does not feel enough time has passed since practicing pranayama breathing to indicate any changes in her overall functioning.

#### **Linguistic Analysis**

##### *Transitivity analysis*

During the pre-therapy ethnographic interview, Kara's use of mental verbs was most prevalent when speaking about how she felt in social situations. Kara stated, "...people looked at me to make it happen; my family and my friends, and when I couldn't do that I was embarrassed. I didn't *know* my self. I didn't *know* my identity. I mean, who am I if I can't do that?" Kara's use of the phrase "didn't know," indicates her uncertainty with her own mental state when, previously, before her accident, she was certain about who she was.

During the post-therapy interview when speaking about how she felt about the changes in her life after practicing pranayama breathing, Kara stated, "I *feel* better." This

indicates that she is less uncertain with her mental state, representing a more positive perspective. That is not surprising since Kara related that she is in a phase of “acceptance.” Kara reported that pranayama breathing heightened her “awareness.” Awareness is important to acceptance and improvement, as is a state of knowing. An increased awareness may improve an individual’s perception, as they have a clear picture of their thoughts and emotions. The Self-Awareness Theory by Duval and Wicklund (1973) states, “at a given moment, people can focus attention on the self or on the external environment. Focusing on the self enables self-evaluation. When self-focused, people compare the self with standards of correctness that specify how the self ought to think, feel, and behave. The process of comparing the self with standards allows people to change their behavior and to experience pride and dissatisfaction with the self. Self-awareness is thus a major mechanism of self-control” (p. 18).

*Modality analysis: Expression of obligation*

Kara did not express obligation during the pre-therapy interview and did so infrequently during the post-therapy interview. When Kara was asked how she felt after completing the breathing practices, she stated that she believed it helped her and went on to say, “It’s hard for me to pull myself away and stop. It’s a discipline; *I have to* really work on. I like the slow one (Ujjay).” The statement implies she feels as though she must put a lot of effort into taking the time to practice pranayama breathing, and this highlights her obligation to practice this on her own. This was not a requirement of the study and hence is a self-

determined obligation. In this respect, she is continuing her trend of maintaining control of her life and she sees pranayama as a part of that, as it has already proven helpful in decreasing her headaches and anxiety.

*Modality analysis: Expression of probability*

The pre- and post-therapy ethnographic interviews included no expressions of probability. Although Kara never spoke of what she “would” have previously done. In the post-therapy interview she did speak about future plans with certainty, indicating again that she feels in control of her life.

*Modality analysis: Expression of potential*

In the pre-therapy ethnographic interview, Kara indicated potential by stating “I couldn’t” and “I can’t.” When speaking about her experience going out to eat, she ends the statement with “*I couldn’t* do it.” Kara was asked to further describe the changes in her memory and she responded by describing a situation in which she saw someone she recognized, but she could not remember his name or how she knew him. She stated, “...*I can’t* put it together.” Both “I can’t” and “I couldn’t” represent negative potential, indicating a feeling that she is no longer able to do things she previously could. Kara described these feelings in an interesting analogy, she said “...it’s like it’s a puzzle, my brain feels like a puzzle and some of the pieces are missing and I keep thinking, gosh, if I find those pieces and plug them back in I’m going to be okay, but I think those pieces are gone and I’ll have to

make do.” The fact that the “pieces are gone” serves to highlight Kara’s awareness that she does not have the potential to be the person she once was.

In post-therapy interview Kara also used words indicating potential in order to describe her current state of mind. She stated “...I’m, ya’ know, *kinda* working it out.” This statement references her future potential and is increasingly positive when compared to such statements in the initial interview. It indicates Kara’s motivation and self-confidence in her recovery. Although the word “kinda” adds uncertainty, it is still representative of positive potential and her ability to potentially look forward to improvements.

*Appraisal analysis: Affect*

The pre-therapy interview contained elements of negative affect, such as: “angry,” “rage,” “disappointment,” “sadness,” “horrible,” and “denial.” The use of negative appraisal indicates Kara’s overall feelings towards her TBI and the changes she has experienced to be predominantly negative. Kara used no positive appraisal in the pre-therapy interview.

The linguistic analysis of the post-therapy ethnographic interview identified a significant change in the affect expressed as Kara used many elements of positive affect. For example, Kara’s described her quality of life at the present moment, as: “good” using words such as “rebirth” and “lucky” to indicate her positive attitude. Further, when asked how she feels after practicing pranayama breathing, she replied, “I’m happy.” That statement of positive affect provides significant support for the use of pranayama breathing practices.

*Appraisal analysis: Appreciation*

In the pre-therapy ethnographic interview, Kara described how her life changed by stating she “was severely depressed, which was a *horrible* thing to experience.” The use of “horrible” portrays negative appreciation and indicates that she has a negative opinion of her quality of life after TBI.

The post-therapy interview included many elements of appreciation. For example, when Kara was asked how she felt after completing the breathing techniques, she reported, “...I *like* the slow one,” referring to the Ujjay technique. She reported Ujjay breathing to be the most beneficial when she felt anxious and/or experienced headaches. These elements of positive appreciation reveal a positive perspective on Pranayama breathing.

*Appraisal analysis: Judgment*

The pre-therapy ethnographic interview contained one utterance that included judgment. Kara stated, “...I was kinda the life of the party and some people are like, what’s her problem, why is she being like that?” That indicates that Kara feels that others have noticed the change after the TBI but rather than attribute these to TBI related difficulties others are misperceiving or misunderstanding her. The post-therapy ethnographic interview contained no descriptions of judgment. This could mean that Kara seems to be more comfortable with her new ‘self’ and less concerned with the judgments of others or herself.

### *Summary*

Over the course of the study, Kara reported declines and improvements on the QOL scale. Some of Kara's reported declines on the final QOL scale are contradictory to information reported during her final ethnographic interview. The improvements noted on the final QOL scale were found in three domains: (a) physical, (b) mental, and (c) emotional. Within the physical domain, Kara reported improvements in her energy levels, stating she felt tired less often. She reported less difficulty with physical mobility and physical pain and discomfort. Lastly, Kara felt improvements in her respiratory system, reporting she felt short of breath less often. Continued use of pranayama breathing may also positively impact her emotional difficulties. The reduction of depression and anxiety may positively influence other emotional elements such as self-confidence. Since HRQOL is multidimensional, any improvement in one domain may influence other domains, meaning social difficulties may improve as progress occurs in the other domains.

The interview data also revealed a change over time, with the final interview containing much more positive verbs, less negative uncertainty, and more elements of positive appraisal. Kara reported that pranayama breathing heightened her "awareness," indicating enhanced introspection. She also states feeling "lucky" and "better" and this highlights Kara's positive attitude after practicing pranayama breathing.

## Participant 2

Scott's ALFA scores resulted in an IFR of one, on eight out of 10 subtests and an IFR of two on the writing a check and balancing a checkbook and understanding medicine labels subtests. As previously outlined an IFR of one indicates "high probability of independent functioning on this task" and an IFR of two is an "indication of need for some level of assistance on this task, needs further exploration" (Baines, Martin & McMartin Heeringa, 1999). Although Scott's scores indicate independent functioning with Telling Time (TT), Counting Money (CM), and Addressing an Envelope (AE), the time it took to complete those tasks is longer than the norms. According to Baines, Martin & McMartin Heeringa (1999), Scott's completion time on the: (a) TT subtest indicated a time five Standard Deviations (SD) below the norms, (b) CM subtest time indicated a time two SD below norms, and (c) AE subtest one SD below the norms (p. 22). This indicates a processing delay.

**Table 3.** ALFA Record of Scores for Scott

Subtest	1 TT	2 CM	3 AE	4 MP	5 WC	6 UM	7 UC	8 RI	9 UT	10 WM
No. Correct	8	10	10	10	6	7	10	9	5/5	16
% Correct	80	100	100	100	60	70	100	90	100	80
IFR	1	1	1	1	2	2	1	1	1	1
Time	5:35	7:11	3:27	3:42						

*\*1=high probability of independent functioning on this task; 2= indication of need for some level of assistance on this task, needs further exploration; 3= high probability that the patient is not able to function independently on this task. Note TT= Telling Time; CM= Counting Money; AE= Addressing an Envelope; MP= Solving Daily Math Problems; WC= Writing a Check and Balancing a Checkbook; UM= Understanding Medicine Labels; UC= Using a Calendar; RI= Reading Instructions; UT= Using a Telephone; WM=Writing a Phone Message*

Scott's results on the ALFA indicate that he may indeed benefit functionally from the breathing practices utilized in this study. The Alternative Nostril Breathing and Bhastrika pranayama breathing practices may reduce cognitive stress and subsequently improve the visuo-motor speed (Subramanian et al., 2014) associated with telling time and improved attention and memory (Thirhalli et al., 2013) needed for task such as counting money and solving math problems. In addition, memory retention capacity improvements (Subramanian et al., 2014) may benefit tasks such as counting money and addressing an envelope. Scott's score of two on writing a check and understanding medicine labels indicate a need for assistance and both these tasks require memory retention, attention, and visuo-motor skills. These increased cognitive demands may result in increased stress during the completion of these tasks. Subramanian et al. (2014) reported that Bhastrika affected perceived stress on the perceived stress scale. This reduction in stress levels, along with improvements in attention, memory capacity, and visuo-motor skills will possibly advance Scott's functional abilities across all tasks and specifically in the tasks requiring assistance. The improvements reported by Scott in the post-therapy ethnographic interview may be an indicator of these advancing functional abilities.



**Table 4.** Pre- and Post- therapy changes on QOL scale for Scott

HRQOL Domain:	Changes Reported on QOL Scale:	Pre-therapy	Post-therapy
<b>Emotional</b>	<b>Expression of Emotions</b>	<b>Poor</b>	<b>Good</b>
Emotional	General well-being	Good	Moderate
Mental	Confusion	Sometimes	Often
<b>Mental</b>	<b>Impaired Judgment, planning or problem solving; lack of creativity or abstract thinking</b>	<b>Rarely</b>	<b>Never</b>
Mental	Concentration	Good	Moderate
<b>Mental</b>	<b>Difficulty learning new things; forgetting to take medications; forgetting to keep appointments</b>	<b>Sometimes</b>	<b>Rarely</b>
<b>Physical</b>	<b>Shortness of breath</b>	<b>Often</b>	<b>Sometimes</b>
Physical	Appetite	Moderate	Very Poor
<b>Physical</b>	<b>Difficulty Sleeping</b>	<b>Always</b>	<b>Often</b>
Physical	Overall Physical Health	Moderate	Very Poor
Social	Disorganized (circumstantial, irrelevant, illogical, derailed or incoherent) speech or writing	Never	Rarely
<b>Social</b>	<b>Over-Talkative or Racing Speech</b>	<b>Sometimes</b>	<b>Rarely</b>

\* The improvements are noted in bold

Four weeks into the study, Scott was diagnosed with sleep apnea. Although he was not able to continue to attend group therapy, he wished to continue the study utilizing pranayama breathing practices, indicating motivation to participate. Scott had reported sleeping difficulties in the pre-therapy QOL scale, suggesting that the apnea was present during that time, and he reported that his sleep was less impaired in the final QOL scale,

indicating that his sleep difficulties were less of a problem at the end of the study. However, during the final interview, Scott emphasized his sleep disruptions reporting how they negatively affect his functioning and result in confusion, reduced appetite, disorganized (circumstantial, irrelevant, illogical, derailed or incoherent) speech or writing, concentration difficulties, and reduced overall well-being and physical health. This contradicts the improvements reported on the QOL scale, as Scott indicated six of the 12 reported difficulties from the pre-therapy QOL scale as improved. The contradictory information may suggest that perhaps the diagnosis of sleep apnea increased Scott's perception of the problem, and so while the problem was likely present on initial interview, he was more aware and inclined to discuss it during the final interview. On the final interview it appears that the label of the diagnosis means that Scott now attributes all his difficulties to his sleep apnea. The positive change in Scott's QOL scale may be attributed to the treatment for sleep apnea during the study. Scott reported during the final interview that he now uses a sleep apnea machine throughout the night, which he did not use at the time of the pre-therapy QOL scale. Interestingly, although he indicated that his sleeping had improved, he also reported that he was "not using the apnea machine as he was supposed to." If he were to use this machine as he was trained to, there may be significant improvements in his QOL as related to sleep. Pranayama breathing could help Scott's sleep apnea, as apnea is a form of disordered breathing and reports of improved respiration after using pranayama breathing was noted by Sengupta (2012).

### *Physical Changes*

After practicing pranayama breathing, Scott stated that he felt short of breath less often, indicating that pranayama techniques may have resulted in an improvement in respiratory functioning. This is not surprising as Sengupta (2012) found that after practicing pranayama breathing practices for six weeks, individuals with asthma revealed a lower respiratory rate, increased vital capacity, increased forced expiratory volume, increased peak expiratory flow, and prolonged breath holding time. Research conducted by Sengupta (2012), Turankar et al. (2013), and DiStasio (2008) indicated improvements in sleep when utilizing pranayama breathing techniques due to the increase of melatonin, possibly contributing to the changes in Scott's perception of his sleep difficulties. Scott reported experiencing more difficulties with appetite and overall physical health in the post-therapy QOL scale perceiving both as "very poor." He stated in the interview that he believed the decline in appetite and physical health was due to the recent diagnosis and experiences related to the sleep apnea.

### *Mental Changes*

Scott reported less difficulty with judgments, planning or problem solving, creativity, and abstract thinking after completing pranayama breathing practices. It is possible Bhastrika and Alternative Nostril Breathing may be accountable for the reported improvements. Subramanian et al. (2014) reported improvements in stress level, motor speed, attention, and memory after practicing Bhastrika breathing. The reduction of stress

may also account for the improvements, as Thirthalli et al. (2013) reported a decrease in SNS activity and lowered blood pressure reduced cognitive stress and facilitated improved decision-making skills after practicing Alternative Nostril breathing.

#### *Emotional Changes*

Scott reported experiencing less difficulty with his expression of emotions on the post-therapy QOL scale. Ujjay breathing practices may explain the changes in expression of emotions as reduced depression, as indicated by improved scores on the Hamilton Depression Rating Scale have been reported after Ujjay breathing (Thirthalli et al., 2013). Lastly, Scott's improvement in expression of emotions being could be due the impact of the SNS on depression, anxiety, and anger, by lowering stress. Pranayama breathing affects the down-regulation of the Hypothalamus Pituitary Axis (HPA), which controls hormone production and regulation, and has a role in maintaining homeostasis, and so reduces effects of stress. Reduced stress may allow the individual to be more motivated to participate in therapy and increase the attention and memory skills necessary for successful social communication (Subramanian et al., 2014).

#### *Social Changes*

When completing the final QOL scale, Scott commented he believed the increase of difficulties with disorganized (circumstantial, irrelevant, illogical, derailed or incoherent) speech or writing was due to the recent diagnosis and experiences related to the sleep apnea. Scott reported less severe difficulties with over talkative or racing speech and learning new

things. Scott's perception of his social abilities seemed to improve after participating in the Pranayama breathing exercises. Scott reported positive improvements within the social domain by indicating that the difficulties he previously experienced of being over-talkative or using racing speech was now less severe. As aforementioned, since HRQL is multidimensional (CDC, 2013) it is evident the domains overlap and influence the other domains concurrently. Since social functioning is a culmination of the physical, mental, and emotional domains, the reduced severity of difficulties of being over-talkative or using racing speech may well stem from a combination of changes. For instance, improvements in respiratory functioning as noted by Sengupta (2012) and cognitive skills (Telles, Singh, and Puthige, 2013) may account for the social changes. Perhaps the perceived changes in expressing emotions account for social changes since emotional distress can influence motivation and self-confidence. Finally, the increase of melatonin and activation of the SNS (Burke & Marconett, 2008; Sengupta, 2012) may address sleep disorders common to TBI as well as reduce cognitive demands and improve attention, memory, and decision-making that in turn facilitate successful communication. Lowered stress may allow the individual to be more motivated to participate in therapy and increase the attention and memory skills necessary for successful social communication (Subramanian et al., 2014). Most sensibly, the social changes are an amalgamation of the variations of reported differences and changes after participating in pranayama breathing across all the domains of HRQL.

### *Overall Quality Of Life*

On the final QOL scale, Scott reported that he believed the increased difficulties to be due to the recent diagnosis and experiences related to the sleep apnea. Overall, the post-therapy QOL scale indicated an improved perspective within the emotional, mental, and social domains. Scott indicated to feel as though pranayama breathing practices to provide more personal insight which, would account for improvements within the aforementioned domains.

### **Linguistic Analysis**

Throughout the interview Scott mentioned having multiple educational degrees, emphasizing the importance he places on education. He also frequently worked to bring the conversation round to a discussion of his anger towards Appalachian State University (ASU) and the way they treated him after his accident. It seems as though in both interviews there is a pattern of first highlighting his educational background and identifying himself as a scholar and then discussing his feelings towards ASU. His multiple degrees and education serve as validation to himself, as though he needs people to understand that he is educated, therefore, what he has to say is valid. Then he emphasizes his validated anger at the unfair treatment he has experienced. This is interesting because when validating himself and speaking about his education he portrays an internal locus of control, where he is in charge and accountable for those successes, yet when speaking about his experiences with his previous employer there is

a shift to an external locus of control where he is the victim and so not responsible for the unfortunate events.

#### *Transitivity analysis*

During the pre-therapy ethnographic interview, very few utterances contained mental verbs. For example, when speaking about his accident Scott stated that “I came to and didn’t have a clue what happened to me, I was strapped down and I didn’t *recognize* anyone; it was hell.” The inability to “recognize” family and friends indicates a negative experience. Later, Scott states that he “...could not accept. I did not *realize*. I don’t *know* what the word for it is actually, that I had suffered a TBI and it’s only been in the last six months that I’ve kind of awoken and went; I’ve had a TBI.” The negated mental verbs of “realize” and “know” here emphasize his negative feelings towards the event of the TBI. Most interesting, when describing what happened to him he stated, “I went down 20 stairs head first, we *think*.” The interesting part of the statement is the tag ending which includes the mental verb “think.” The fact that the subject of this clause is “we” implies uncertainty not only on his part but also of those around him (family, friends, and medical professionals), stressing the confusion that surrounded the event.

The majority of the utterances during the post-interview included mental verbs, for example, when discussing the pranayama breathing practices he stated “I *feel* like it puts my thoughts, my inner voice, on a different dimension; in fact, that probably what I am *seeking* without *thinking* about it aloud.” The use of “I feel” and “I am seeking” and “thinking”

portray mental elements. This reveals Scott to feel pranayama breathing to fulfill what he seeks when trying to process his emotions and thoughts. He continues to use “I feel” throughout the interview as he discusses the breathing. “It seems, *feels* like it gives me greater insight over other people. I mean, I *feel* like it has segregated me and I have an ability that many people don’t.” This indicates that Scott believed he feels different from others. His perspective of feeling segregated is due to “having an ability that many people don’t.” This indicates that he believes pranayama breathing provides him with a positive tool, giving him greater insight than others.

*Modality: Expression of obligation*

When Scott was asked about how he felt about the changes in his life since the first interview he answered “I don’t think it’s good, it’s not my—ya know, I need to, one thing I need—something to do. I mean I read, I write; got another paper I am kicking around, but I need something to do. I need engagement, I do.” The repetitive use of “I need” indicates the feeling of obligation and Scott’s need to belong. This is contradictory to Scott’s earlier statements where he reported that he believes he is different from others and possesses an ability that many do not (i.e. the pranayama breathing tool). He describes pranayama breathing puts “his thoughts on a different dimension” and it appears that he plans to use this very tool that he believes sets him apart from everyone else, in order to “fit in” and “belong”. Perhaps the “greater insight” provided by pranayama breathing will provide the clarity Scott seeks and help to cultivate a sense of belonging.



*Modality analysis: Expression of probability*

During the pre-therapy ethnographic interview, expressions of probability were most prevalent when speaking about his experience post-injury with ASU. When asked to describe any positive or negative aspects of his injury and what it meant to him he responded, “There is not one day, one day, that I don’t dwell on it. And by dwell on it, I mean spend a concentrated amount of time, now some days it may be 10-15 minutes and other days it may be all day it’s on the back of my mind. I blame a lot of that in how they treated me. If *they’d* follow ADA laws, I *would* have had a system. I *would* have had accommodations. I would have, I *would* have, I *would* have; but I was driving 200 miles to teach off campus three times a week.” The repetitive use of “I would” indicates that he is not currently content with his situation, and he blames others for this situation. Here, he hypothesizes what would be if “they” had done a better job of dealing with the situation.

In the post-therapy ethnographic interview, he rarely used probability. When asked about how he deals with changes, he responded, “The reason I was a little bit late, I got up and then around 11:30 a.m. I sat down and watched something boring on the news and out I went, just sitting and in the past, before my accident that would not have happened. I would have been going and going.” The use of “would” here indicates an awareness of how things were different before his accident. The awareness is not forward focused, as it speaks of what he was able to do before his accident and not his future plans; however, it represents

more self-awareness than noted in the pre-therapy interview. This indicates Scott's perspective to have changed into more introspective thoughts.

*Modality analysis: Expression of potential*

Scott expressed negative potential frequently in the pre-therapy ethnographic interview. His statement "I went through a period, the first three years, I would get so mad, so angry, somebody could just send me off and I'd get there quicker than I *could* stop myself. You know what I mean? I couldn't stop" highlights Scott's lack of control of his anger, which portrays a negative perspective of his self-control. This indicates Scott felt he could not control his emotions and reactions as well as he previously could.

The post-therapy interview did not contain any expressions of potential. Although no negative or positive expressions of potential were used this indicates a change of perspective. In the pre-therapy interview, Scott used expressions of potential in a negative light. He spoke of what he was not able to do. In the post-therapy interview, Scott did not speak of what he could not do, indicating he felt more confident in his self-control.

*Appraisal analysis: Affect*

The majority of the pre-therapy ethnographic interview contained elements of negative affect. Among these were word choices such as "hell," "angry," "dwell," and "blame". The prevalence of negative affect indicates Scott's overall feelings towards his TBI to be predominantly negative. A few utterances included elements of positive appraisal such

as the use of “very well” and “miracle” when describing his recovery and experiences.

However, majority of utterances represented were negative affect.

The linguistic analysis of the post-therapy ethnographic interview revealed many more elements indicating positive affect. His statement “...I got a letter saying I have been classified permanently disabled, thus they’re dropping all my school loans. Well, that’s *good*. There’s a thing about just the label ‘permanently disabled’ kind of turned me off ‘cause I don’t look at myself and perceive myself that way. I know I have a lot more to bring to the table.” The statements indicate how he feels about himself as well as the “good” feelings towards having a label highlighting Scott’s self-confidence and positive affect. Improved self-confidence may provide more motivation, as Scott believes he can accomplish more than others perceive.

#### *Appraisal analysis: Appreciation*

In the pre-therapy ethnographic interview, Scott described waking up in the hospital after his TBI and realizing he was strapped to the bed and unable to recognize family. He stated, “it was *hell*.” The word “hell” indicates Scott’s perception and evaluation of his experience as negative. The post-therapy ethnographic interview did not include aspects of appreciation. Although no aspects of appreciation were used, this lack of negative appreciation indicates that Scott possesses a more positive attitude by the end of the study.

### *Appraisal analysis: Judgment*

The pre-therapy ethnographic interview contained many words and descriptions of judgment, or Scott's attitudes towards others. He states, "I have six degrees and I could teach one of those courses and people would never think (that he had a TBI); in fact the problem is people think you're *lying* or they don't *trust* you." The use of "lying" and "trust" represent judgments of behavior. They indicate Scott's perception of being misunderstood and doubted.

During the post-therapy interview, in response to what Scott felt the pranayama breathing practices to influence, he responded "Here's what it impacts; I'm very *organized* as it is. I was an organization analysis for uh, anyways; it's the stealth of understanding. The depth and breath of understanding. It's deep, wide, wider, more encompassing." The use of "organized" indicates Scott's judgment of himself. This highlights Scott's attitude towards organization how it benefits his understanding. He believes to be an organized person as is, but after practicing pranayama breathing he feels it increases his organizational skills, improving his understanding.

### *Summary*

Scott reported declines and improvements on the QOL scale. Scott believed his recent diagnosis of sleep apnea to be the cause of his declines. The improvements noted on the final QOL scale were found in all four domains of HRQOL. The mental domain included the most improvements. Pranayama breathing has been shown to improve stress levels,

motor speed, attention, and memory (Subramanian et al., 2014). After practicing the breathing techniques, Scott's improvement included less difficulty with judgments, planning, and problem solving, as well as learning new things and forgetting information. Scott also indicated improvements with respiration, stating to feel short of breath less often. It makes sense, since HRQOL is multi-dimensional, a physical improvement, such as improved respiration, would influence improvement in the mental, emotional, and social domains.

Further improvements were indicated in the final ethnographic interview as Scott indicated his perception of his experiences to be more positive after practicing pranayama breathing practices. His attitude also improved as indicated by the positive elements of appraisal used in the final interview. Scott stated he felt pranayama breathing gives him "...greater insight" and stated pranayama breathing to help find where his "consciousness exist, I mean that seriously, consciousness being awareness." Like Kara, Scott indicated introspective improvements when using pranayama breathing and utilized more elements of positive appraisal, indicating a more positive and enhanced HRQOL.

## **Conclusion**

Both participants reported independently using pranayama breathing practices outside of the study, indicating pranayama to be beneficial. The participants reported improvements in all of the HRQOL domains. The improvements were individualized; each participant reporting different improvements. However, common changes were reported. First, both participants reported an improvement in respiration and reporting feeling short of breath less often. Second, the linguistic analysis of the ethnographic interview indicated that both participants had increasingly positive perspectives and attitudes. After practicing pranayama breathing, Kara and Scott both discussed their TBI and QOL in a more positive light through use of increasingly positive verbs, modality choices, and appraisal. Third, both participants indicated feeling as though pranayama breathing brought “more awareness.” Awareness indicates an introspective view, which is the beginning of change. Awareness allows for a healthier mental state, as being able to indicate your own feelings, thoughts, difficulties, and strength enables acceptance and motivation. Acceptance and motivation both influence improvement. To conclude, participants in this study showed marked improvements in all the HRQOL domains, perspective, and attitude when practicing pranayama breathing in conjunction with cognitive therapy.

### **Limitations & Future Research**

This research however does have limitations. First, because of the rural area, this research was conducted on only a small number of participants who have experienced a TBI and results cannot be generalized to all individuals that have experienced a TBI. Second, post-therapy information was not available for one of the participants. The participant had a stroke and relocated. Lastly, it is not certain that pranayama breathing is fully responsible for the reported improvements which could be attributed to other things, such as receiving cognitive therapy in conjunction with pranayama breathing, increasing time post injury or since life related events. Future research employing a control group and accounting for external influences would provide more specific data on the causal factor of increased quality of life. However, in most everyday setting it is difficult to control for external influences, since the Pranayama breathing indicates potential advancement of HRQOL, it may be a relevant, easily employed treatment technique. In order to validate, further research is warranted, but clinically appears to do no harm and may have notable potential benefits. Hence this researcher recommends continued use of Pranayama breathing techniques in conjunction with therapy and continued clinical case-based research on its application. Ideally, further research should use pranayama breathing techniques in conjunction with cognitive therapy. Pranayama breathing should be practiced at both the beginning and end of therapy sessions. The sequence of pranayama breathing techniques used should researched and chosen to best suite the participants difficulties and to better observe changes over time,

the study should last longer than 8 weeks. Observing changes over a longer period of time would allow pranayama breathing to be utilized through more external influences experienced in life. Homework should be given to the participants, requesting pranayama breathing to be practiced outside of the study, once a day. A log of daily breathing practice should be kept. A journal describing the participant's feelings after practicing the breathing techniques should be used. This would allow a more substantial amount of information to be transcribed and linguistically analyzed. This may reveal a more accurate understanding of the participant's attitudes and perspectives, as the journal would follow their daily lives and thoughts. As a quantitative measure, it would be interesting to administer a standardized test, such as the ALFA, pre- and post- therapy to note any changes.



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## Appendix A

The questions were subject to change based on the flexible nature of this interview style, to allow for a more ethnographic emergence of data.

### Pre-Therapy Ethnographic Interview Questions

1. Tell me about your injury.
2. How do you feel your life has changed since your injury?
  - a. How do you deal with the things that have changed?
3. What would you say is the most significant difference?
  - a. How do you feel about this?
4. What are some daily struggles you face?
  - a. Expand on this
5. How would you say your injury affected your quality of life?
  - a. Describe experiences
  - b. How?
6. How do you feel in social situations?
  - a. Describe experiences

### Post-Therapy Ethnographic Interview Questions

7. How has your life changed since the first interview?
  - a. Describe
8. How do you feel about these changes?
9. How do you deal with the changes?
  - a. Describe some of the strategies that you use to help with the changes?
  - b. Describe what future plans/goals you have to overcome/maintain/strengthen (depending if it is a positive or negative change) these changes?
10. Could you describe how you feel after completing the breathing techniques?
11. When do you find these techniques to be most effective?
  - a. Describe experiences
  - b. How?
12. Have you practiced these techniques on your own?
  - a. When and why?
  - b. How did they make be a difference?
13. How would you describe your quality of life at the present time?
  - a. Expand

### **Vita**

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