MANAGEMENT OF UPPER CROSS SYNDROME THROUGH THE USE OF ACTIVE RELEASE TECHNIQUE AND PRESCRIBED EXERCISES

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April 2011

ABSTRACT

Background: Upper cross syndrome (UCS) for the purpose of this study is defined as "tightness of the upper trapezius, pectoralis major, and levator scapulae and weakness of the rhomboids, serratus anterior, middle and lower trapezius, and the deep neck flexors, especially the scalene muscles."[1] This syndrome is part of an epidemic within the workplace that leads to days missed from work. "Work related musculoskeletal disorders and complaints constitute an important health problem in many industrialized countries, as they account for a large number of working days lost and considerable workers compensation and disability payments."[2]

Introduction: The purpose of this investigation is to evaluate Upper Cross Syndrome (UCS) through postural analysis. This research will test if exercise along with Active Release Technique (ART®) will effect postural distortion. Posture Print Biotonix System will collect postural data. The study will determine if exercise and ART® is a more effective way to treat upper cross syndrome than traditional methods. In an effort to create a database of related symptoms of UCS, the researcher will evaluate the subjects for impact of environmental factors, functional headache, and shoulder disability using the corresponding Oswestry Disability Index Questionnaires. The questionnaires provide a subjective assessment from the patient and an objective measure for the clinician.

Methods: Subjects included in the study were screened for UCS by the Posture Print Biotonix System and were required to show a minimum five degree anterior head carriage. Screening of subjects for tight musculature included pectoralis major, levator scapulae, upper trapezius, serratus anterior, rhomboids, and deep neck flexors. Subjects were prescribed stretches and exercises to perform on a daily basis. The stretches included sitting chair stretch, Bruegger's, wall angels, and doorway stretches. The exercises included push-up-plus, head-neck-retraction, and Kibler squeeze. The control group and the experimental group both performed the stretches as well as the exercises. The experimental group received ART® treatments to the pectoralis major, levator scapulae, and upper trapezius bilaterally. The study concluded after a three-week period. Re-evaluation by the Posture Print Biotonix System of the subjects concluded the study.

Results: The findings of the experimental group showed improvement in anterior head carriage versus the control group. These findings however were limited and arguably not clinically significant in comparison.

Conclusion: This study, as do the majority of research studies, has components that, retrospectively, the researchers would change. This study warrants repeating with the addition of variables prior to making any definitive decisions whether the use of ART® is advantageous in the treatment of UCS. Future studies may use this study's relationships to project appropriate clinical use of protocols to treat Upper Cross Syndrome.

Keywords: Upper Cross Syndrome, Crossed, Swimmers Shoulder, Active Release Technique, Exercise (related to UCS), and Janda

Introduction

Upper cross syndrome (UCS) for the purpose of this study is defined as "tightness of the upper trapezius, pectoralis major, and levator scapulae and weakness of the rhomboids, serratus anterior, middle and lower trapezius, and the deep neck flexors, especially the scalene muscles."[3] This syndrome can cause a multitude of dysfunctions within the body including headaches, early degeneration of the cervical spine, and loss of the cervical curve. In addition, UCS can cause an abnormal kyphotic thoracic spine and altered biomechanics of the glenohumeral joint. Altered biomechanics of the cervical spine may lead to a loss of cervical curve and, if not addressed, degeneration of the cervical spine. The alterations in function of the musculature, in people with UCS, often cause these individuals to develop chronic headaches. "Age-related degenerative changes have an impact on the structure of tissues and the subsequent mechanics of the cervical spine. Studies have shown a reduction in proprioception for neck movements of persons over the age of 45 years, regardless of NP. Therefore, age-related changes may well contribute to a more forward head posture even in the absence of pain."[4]

Posture is a product of multiple biomechanical processes within the body to include but not limited to, joint structure and function, muscle balance, nervous system function, and the righting reflex. Through the aging process, UCS affects one's ability to compensate for aberrant functioning systems within our bodies. This decline in compensation and increase in symptomatology can lead to more chronic and degenerative changes.

> "As we grow older, our posture tends to decline: not only do the shoulders become more rounded, but the head becomes protracted forward and the thoracic spine (or upper back), more curved. In time, faulty alignment and poor posture can add abnormal stress to tissues, leading to degenerative joint changes and pain. Bad posture has also been linked to poor balance, as well as to decreases in gait and functional performance. In fact, research shows that poor posture is even associated with increased mortality rates in older adults."[5] "Typically, muscles overused in a certain direction will become tighter and shorter—an effect known as *adaptive shortening*. Opposing muscles to repetitive movements sustain stretches during prolonged postures. As a result, these muscles will tend to become longer and weaker—an effect known as *stretch weakness."*[6]

Our society is technologically oriented today. "It has been proposed that this postural syndrome may develop due to an array of factors including work habits, proprioceptive inputs and even psychogenic factors like low self-esteem or depression."[7] In a great number of professions around the world, employees' jobs center on a sedentary lifestyle through office related work compared to years past. "Most occupations require sustained forward arm use in predominant flexor synergies e.g. manual physiotherapist, computer operator."[8] As our workforce continues to evolve, the use of computer terminals as well as automated devices force workers into a seated posture. "In response to pain, overuse, joint dysfunction or proprioceptive changes muscles react by becoming either short and tight or weak and inhibited. These reactions do not occur at random, but rather in

predictable patterns. The postural muscles tend to become tight while the phasic muscles tend to develop weakness and inhibition. Therefore, once muscle dysfunction begins, typical patterns of muscle imbalance and altered posture ensue."[9] The seated posture is a flexor-dominated posture that further shortens and tightens the musculature on the ventral side of the body and lengthens while weakening the musculature on the dorsal side of the body. "As a result of the muscle imbalances that develop in our musculoskeletal system, postural distortions occur that tend to correspond with the muscular findings."[10] Both groups of this musculature are involved in UCS. "The effects of the static posture assumed when working at a visual display terminal are most pronounced in the neck and shoulder regions, resulting in increased forward neck flexion and increased static muscle tension in the region."[11] The posture of UCS starts in childhood from imbalances of flexor versus extensor musculature. "The habitual neuromuscular strategy creates the joint dysfunction over time, which in turn influences and perpetuates the neuromuscular strategy."[12] Perpetuation of this muscular imbalance occurs through hours in the classroom as well as sitting for other activities of daily living. Children are not as active today and the incidence of UCS is on the rise. This lifestyle continues into adulthood where it only worsens as we age. "Muscle function strongly influences that of the Articular and central nervous systems, and vice versa."[13]

This syndrome is part® of an epidemic within the workplace that leads to days missed from work. "Work related musculoskeletal disorders and complaints constitute an important health problem in many industrialized countries, as they account for a large number of working days lost and considerable workers compensation and disability payments."[14] "…Population studies suggest that 6-48% of adults have pain in one of these areas."[15] "Musculoskeletal disorders are one of the most frequent reasons of long-term sickness absence, and those of the neck and upper limb account for approximately three-quarters of work-related musculoskeletal disease…"[16] With the prevalence of this syndrome, related problems and complaints from patients, the need to find an effective and comprehensive treatment plan is paramount.

After extensive research of the literature, no studies have been located that use a combination of exercise and Active Release Technique to treat this syndrome. Search terms included Upper Cross Syndrome, Crossed, Swimmers Shoulder, Active Release Technique, Exercise (related to UCS), and Janda. Our theory proposes that prescribed exercises with the addition of ART® will more effectively correct this postural and mechanical distortion. Results from this study can help set a research protocol to further our professions need for evidence-based treatment. In the future, others can use this study to provide a better understanding of how best to treat our patients.

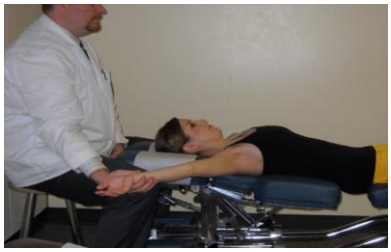
Methods

The researchers selected participants for this study through multiple methods, encompassing students, faculty, and staff, age eighteen to sixty within the university system. The age of subjects represents the greatest majority of the work force within the United States. There were 21 subjects screened where 20 met the criteria and were included within the study. There were three female subjects included in the experimental

group and two female subjects in the control group. The study only included subjects that demonstrated Upper Cross Syndrome with anterior head carriage greater than five degrees when evaluated on the Posture Print Biotonix System. Recruitment of subjects included announcements throughout the university system as well as posted flyers. The subjects received no compensation for their participation.

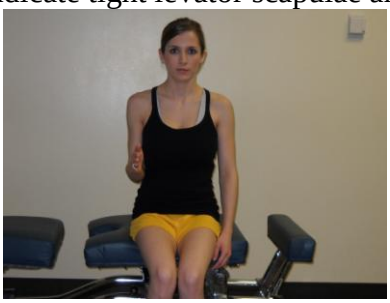
The researchers screened the participants for tight musculature by testing the pectoralis major in a supine position (Figure 1(Position 1), extending the arm at a forty-five degree angle above the head (Figure 2 (Position 2).

Position 1 Fig. 1

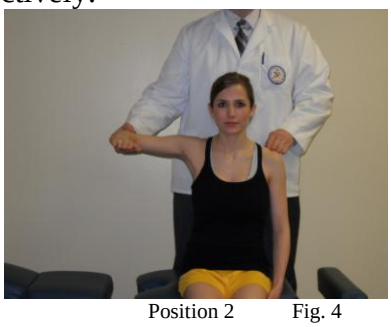


Position 2 Fig. 2

In a seated position with the arm at the subject's side and elbow flexed to ninety degrees (Figure 3(Position 1), the researchers evaluated the levator scapulae and upper trapezius. While the subjects abducted their arm (Figure 4 (Position 2), the researcher evaluated for shoulder hike within the first sixty degrees as well for the presence of a gothic shoulder to indicate tight levator scapulae and upper trapezius respectively.



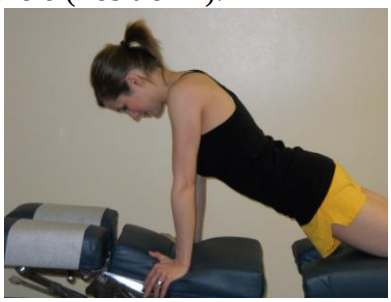
Position 1 Fig. 3



Position 2 Fig. 4

Subjects conducted the push up test for evaluation of the serratus anterior. The subjects lay prone on a table and performed a push up (Figure 5 (Position 1). Evaluation of the scapula for winging off the dorsal surface of the thoracic cage is an indication of weakened and lengthened serratus anterior musculature. Superior travel of the scapula indicates tight levator and upper trapezius muscles (Figure 6 (Position 2).

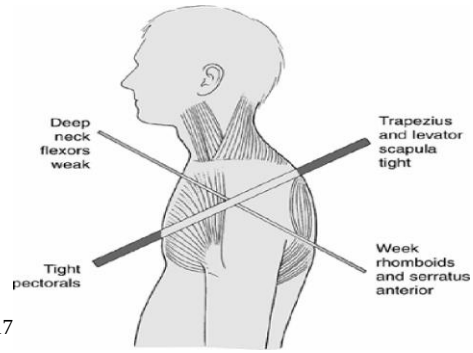
Position 1 Fig. 5



Position 2 Fig. 6

Evaluation of the deep neck flexors using the deep neck flexor test indicated weak or dysfunctional musculature. Evaluation of the rhomboids by posture analysis looking for internally rotated shoulders indicated weak or dysfunctional musculature. Researchers

included subjects demonstrating deficiencies in these areas along with postural abnormalities.



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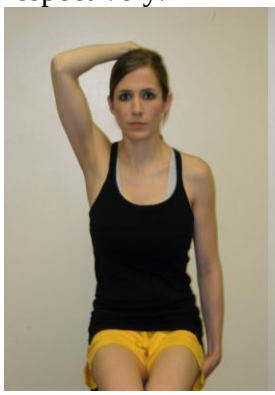
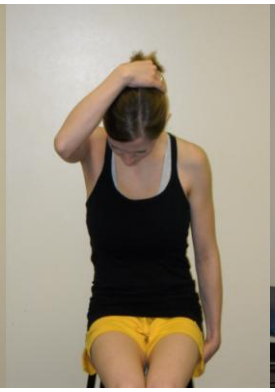
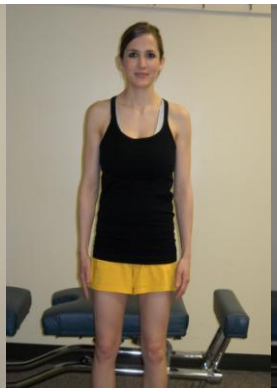
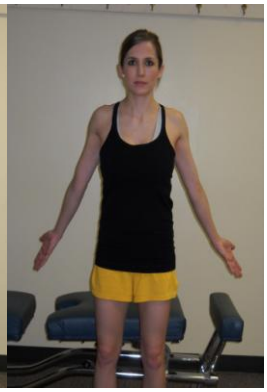
The researchers excluded any subject that did not meet the above inclusion criteria. Other exclusion criteria included, surgeries to the related area, subjects taking analgesics and/or muscle relaxants, known thoracic scoliosis, known rotator cuff tear, or pregnancy. Researchers also excluded subjects not willing to forego chiropractic adjustments and or manipulations within forty-eight hours of each treatment phase.

The study's construction included two groups of randomly divided subjects. Group one, the control group, comprised of subjects identified to have upper cross syndrome through the screening process, received the prescribed exercises protocol. The subjects performed the prescribed exercise protocol on a daily basis and recorded their progress in a home exercise log. The researchers and subjects scheduled to meet two times weekly to monitor exercise performance to ensure the safety and compliance of the subjects. The study set a three-week interval for treatment and monitoring of the subjects. The subjects received instruction in proper performance of each exercise to include, sitting chair stretch (Figure 7 &8 (Position 1 & 2), Bruegger's (Figure 9 & 10 (Position 1 & 2), wall angels (Figure 11 & 12 (Position 1 & 2), and doorway stretches (Figure 13 & 14 (Position 1 & 2) to address the levator scapulae, upper trapezius, and pectoralis major respectively.


Position 1 Fig. 7

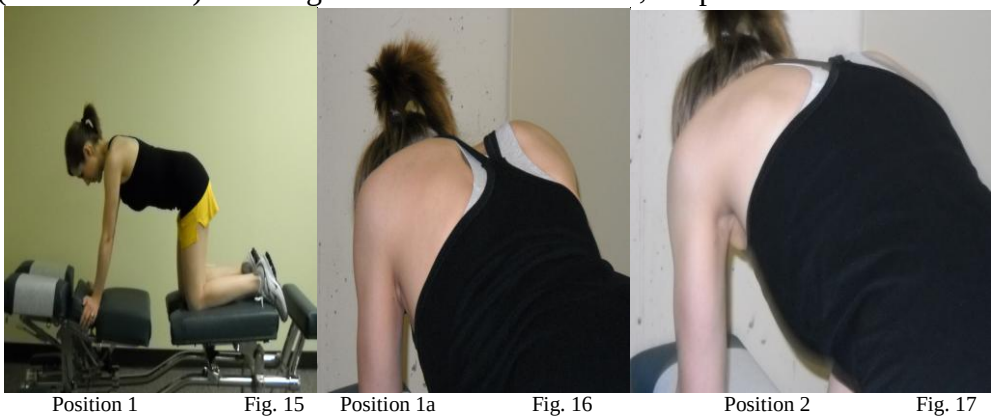

Position 2 Fig. 8


Position 1 Fig. 9

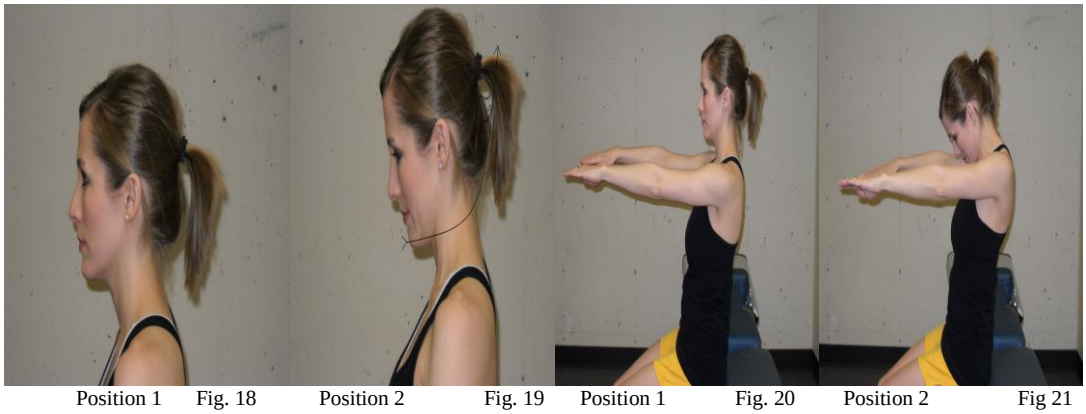

Position 2 Fig. 10

Position 1 Fig. 11 Position F Fig. 12 Position G Fig. 13 Position H Fig. 14

The participants also performed push-up-plus (Figure 15, 16 & 17 (Position 1, 1a& 2), head-neck retraction (Figure 18 & 19 (Position 1 & 2), and Kibler squeeze (Figure 20 & 21 (Position 1 & 2) to strengthen the serratus anterior, deep neck flexors and rhomboids.



Position 1 Fig. 15 Position 1a Fig. 16 Position 2 Fig. 17



Position 1 Fig. 18 Position 2 Fig. 19 Position 1 Fig. 20 Position 2 Fig 21

Group two, the experimental group preformed the same prescribed exercise routine. In addition to the prescribed exercise protocol, the researchers performed ART® at weekly intervals for three weeks. The addition of ART® to these subjects treatment protocol is the variable the researchers chose to study. The ART® consisted of protocols for the pectoralis major, levator scapulae, and upper trapezius bilaterally. Due to proprietary constraints, the researchers will not divulge these protocols within this paper. The experimental group received treatment of ART® from licensed Doctor of Chiropractic licensed in ART® of the spine as well as upper extremity. The treating physicians evaluated the subjects at each scheduled treatment for involved musculature. The

physicians then administered treatment only to the musculature found to be involved during that phase of the research.

Results

In group two, the experimental group, six of the ten subjects showed a decrease in anterior head carriage, ranging from 1%-74% improvement with an average of 36.3% as measured by the Biotonix Posture Print System. The four subjects that showed an increase in anterior head carriage ranged from 21%-55% which correlates with a negative outcome. This showed an average increase of 34% measured by use of the Biotonix Posture Print System. Physicians treated the Levator Scapulae, Trapezius, and Pectoralis Major musculature. Researchers noted that during the first treatment phase 60% of the subjects demonstrated involvement of the levator scapulae, 40% demonstrated involvement of the trapezius, and 80% of subjects demonstrated involvement of the pectoralis major. During the second treatment phase 70% of subjects demonstrated involvement of the levator scapulae, 90% demonstrated involvement of the trapezius, and 80% demonstrated involvement of the pectoralis major. Researchers noted a 10% increase of involvement of the levator scapulae and 50% increase in trapezius musculature involvement between the first phase and second phase of treatments. In the third phase of treatment researchers noted, the levator scapulae to be involved in 70% of subjects, trapezius in 60% of subjects, and the pectoralis major musculature in 100% of the subjects. Researchers noted from the second to third phase of treatment 30% of subjects demonstrated decreased involvement of the trapezius musculature and 20% of the subjects demonstrated an increase in pectoralis major musculature involvement.

In the control group six of the ten subjects showed a decrease in anterior head carriage, ranging from 4%-72% improvement with an average of 35.6% improvement as measured by the Biotonix Posture Print System. The four subjects that showed an increase in anterior head carriage ranged from 16%-72% which correlates with a negative outcome. The four subjects averaged an increase of 23.2% when measured by the Biotonix Posture Print System. With no change in the treatment protocol of the control group, weekly assessments of the individual musculature did not need evaluation.

The researchers screened subjects for headaches and evaluated the impact it caused to each subject on an environmental as well as functional basis. The Headache Disability Index Questionnaire evaluated if headaches were a major symptom of UCS strictly in an effort to build a database, not as a measure of outcome. This questionnaire is a patient centered subjective tool that gives objective data to the clinician. During pre-screening thirteen of the twenty subjects reported having headaches. Six of the thirteen subjects reported having one headache per month, five reported having more than one but less than four a month, and two reported having more than one per week. Six subjects classified their headaches as mild, six classified them as moderate, and one classified their headache as severe. One reported that his headaches were strictly environmental; four reported that their headaches were completely functional, seven had environmental and functional components to their headaches, and one reported no environmental or functional component to their headaches. The environmental disability percentage ranged

from 3.8%-73% with an average of 17.8%. The functional disability percentage ranged from 4.1%-95% with an average of 27.1%. Post screening evaluation of the subjects revealed two subjects whom no longer experience headaches. Subjects that reported a functional component to their headaches had a disability ranging from 4%-62.5% with an average of 15.6%. The subjects that had an environmental component ranged from 3.8%-7.7% with an average of 5.4%.

Researchers screened subjects for shoulder disability prior to treatment irrespective of their assigned group using The Shoulder Pain and Disability Index (SPADI). The SPADI is a patient center subjective tool that gives objective results to the clinician. Eleven of the twenty subjects reported having shoulder pain. The range of the subjects shoulder pain at its worst was one to eight. Eight of the eleven subjects reported pain at its worst greater than five. The average pain at its worst was five out of ten. The severity of symptoms on a scale of one to ten ranged from one to eight with an average of three. The functional disability percentage ranged from 0% to 47.5% with an average of 9%.

Discussion

The Researchers designed this study as a randomized, controlled, home exercise program with periodic supervision and weekly administration of ART®. This study is unique in that it used Active Release Technique with exercise to correct UCS. The addition of ART® to the subject's treatment protocol is the variable the researchers used in an attempt to effect change of UCS beyond traditional exercises. The efficacy of adding ART® to the treatment protocol to correct UCS evaluated through changes in anterior head carriage is the desired outcome measure. A biweekly consultation with a researcher experienced in exercise prescription was included to enhance compliance and ensure safe exercise progression.

Documentation of the research indicates the use of exercises alone can be moderately successful in correcting this syndrome. Harman et. al., found that a ten-week program of exercises and stretches could decrease forward head posture in a randomized control study.[18] There are no known studies using ART® for treatment of upper cross syndrome. The addition of ART® to form this new protocol of treatment hypothesizes to increase the effectiveness of the results as well as decrease the time to achieve those results. The outcomes of patients will determine the efficacy of the protocol. The most important factors include decrease in time missed from work or activities in which the patient wishes to participate. The decrease in the frequency of headaches as well as the correction of posture through changes in structure is also very important. The correction in posture will decrease the risk and development of future problems for the patient. If the altered posture continues, the patient will have altered biomechanics. The alteration in biomechanics can and will lead to a multitude of complications. The complications range from headaches, Arthritis of the cervical and thoracic spine to rotator cuff tears, labral tears of the glenohumeral complex and musculoskeletal pain. This syndrome can start in childhood and continue into adulthood. "Recurrent neck pain and headaches are among the most commonly occurring pain syndromes in childhood. This is a concern because there has been an increase in prevalence of both neck pain and/or headaches in

childhood and because these pain syndromes more often become chronic in adolescence as well as in adulthood."[19] The symptomatology sometimes increases in the severity causing years of suffering as well as multiple days to weeks of missed work per year. Not only are the sufferers of UCS missing work which costs the workforce millions of dollars yearly they are also losing time from family and leisure activities. "Forward head posture is associated with neck pain, cervicogenic headache, tension- type headache and migraine headache in adults."[20]

Based on the data collected, it is evident that the ART® group demonstrated only a slight increase in percentage of change between the pre-measurement versus post-measurement values in comparison to the control group. Study results for reduction in headaches, pain, and musculoskeletal complaints were inconsistent as both groups demonstrated some reduction in symptoms or no changes at all.

Limitations of this study include the length of time over which it was conducted and the size of the study group. Enhancement of postural awareness is likely in both groups because the subject's awareness of the evaluation of postural analysis that was conducted pre and post-study. Future studies would need to include a larger population sample, a shorter interval between treatments, and an overall lengthening to the period over which the study's evaluation occurred. In addition, further research should include long-term postural results as well as evaluation of changes in subject pain levels and abilities to perform activities of daily living. The rigor of the exercise protocol needs consideration when evaluating subject compliance. Maintaining a compliance rate of 100% is unusual and needs consideration when comparing this study to future studies.

A major flaw occurred that researchers did not discover until after the conclusion of the study. The control group was split into three groups each monitored by a researcher. Two of these groups did not comply with the set monitoring guidelines. One group met with a researcher only one time weekly throughout the study. The second group met with a researcher to receive their initial instruction of prescribed exercises then received no further monitoring. This appears to be a fatal flaw to this study. However, this protocol showed an improvement in sixty percent of the experimental subjects and warrants repeating to verify these results with a more accurate comparison to the control group. Researchers discovered a potential Hawthorn effect when a treating physician made negative comments to subjects in the experimental group regarding the design of the study during one treatment phase. Conducting future studies that include a third, control group that receive no treatment and no exercise program would be of interest. Also of interest would be a follow up study that incorporates osseous manipulation with active release technique in the treatment of upper cross syndrome.

Conclusion

In conclusion, this study contains flaws that researchers either overlooked due to inexperience or retrospectively discovered. However, this study has merit in the foundation of its design. Due to constraints from the presiding institution, the treatment required had to be limited due to the availability of licensed Doctors of Chiropractic also licensed in ART®. The Hawthorn effect is a scientifically proven event that occurs through the course of research. It is a form of reactivity whereby subjects improve or modify an aspect of their behavior being experimentally measured simply in response to a researcher's suggestion or the fact they are being studied.

The findings of the experimental group showed improvement in anterior head carriage versus the control group. These findings however were limited and arguably not clinically significant in comparison. Repeating this study to include an increase in treatment duration, frequency, and the laterality of the physician to treat any and all of the involved musculature that is all encompassing of Upper Cross Syndrome is well worth the investment. An approach that would correct this syndrome in a shortened length of time and more reliably would arguably save millions in health care costs annually.

The study assessed the environmental and functional impact of headaches in UCS strictly in an effort to build a database of involved symptomatology not as a measure of outcome. After evaluating the data from the Headache Disability Index Questionnaire, it is the opinion of the researchers that headaches are a major complication experienced by people who demonstrate UCS. Thirteen of the twenty subjects included in the study reported headaches. After completion of the study two subjects reported, they no longer suffered from headaches. The remaining eleven subjects that reported headaches had significant improvements in their symptoms in both the environmental as well as the functional component. These subjects received an evaluation for shoulder pain and disability prior to the start of the study; again strictly in an effort to build a database of involved symptomatology. Eleven of the twenty subjects reported having shoulder pain with eight reporting the pain at least at a moderate level. It is the opinion of the researchers that shoulder pain is also a major complication experienced by people with UCS.

Literature Search

The researchers conducted an extensive literature search using various combinations of variables. The search included Upper Cross Syndrome, Crossed, Swimmers Shoulder, Active Release Technique, Exercise (related to UCS), and Janda. After this extensive search of the literature, we were unable to find any reference to or research related to management of UCS using ART® and exercises. However, a substantial amount of research that focuses on the use of exercises as a treatment protocol for UCS. Dr. Janda coined the term Upper Cross Syndrome and identified exercises that are moderately effective in treating patients over an extended period.

Acknowledgments

We gratefully acknowledge Dr. Robert Kuhn for his work and dedication not only to this research study but also to the years of education he has provided to our profession. In addition, we would like to thank Michelle Thacker and Bethany Jameson for their time and support with preparation of this paper.

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