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The Intra-rater Reliability of the Clavicular Jump Test (CJT)

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Dissertation Committee:

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Submitted in partial fulfillment of the
Requirements for the degree of Doctor of Philosophy in Health Science
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_____ Date: 6/8/17

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To everyone who volunteered to be subjects in this research study, for this would not be possible without all of you.

Dedication

This document is dedicated to my family. I hope this paper is evidence that I have lived up to everyone's expectations.

To my parents Catherine and Thomas Koc who endorsed "the one thing in life, no one can take away from you, is your education", to my brother Matthew Koc, and sister in law Magdalen Czykier Koc. To my best friend, my fiancée, my wife to be, Stephanie Alampi, I cannot say thank you enough. Thank you for bearing with me over the last several years with my work and school schedule. Thank you for your patience with the countless nights I spent at our kitchen table, staying endless hours of the night, to complete this research project. Your love, support, and words of encouragement have made this all possible.

To my colleagues in academia and clinical practice, I hope this dissertation provides new ideas, new concepts, and perhaps new challenges for future research. I leave this dedication page with several quotes.

1. "What we observe is not nature itself, but nature exposed to our method of questioning" – Werner Heisenberg
2. "Your idea, is of course insane. The question is, whether it is crazy enough to be true". – Niels Bohr
3. "Intelligence is the ability to adapt to change" – Stephen Hawking
4. "The important thing is not to stop questioning. Curiosity has its own reason for existing" – Albert Einstein

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ABSTRACT

Background: Shoulder pain is the third most common musculoskeletal complaint in today's society. Approximately 50% of patients with shoulder pain seek medical attention, which includes physical therapy. A thorough understanding of the anatomy of the shoulder, including its fascial attachments, its biomechanics, and functional relationship to nearby spinal regions is crucial for successful rehabilitation diagnostics and treatment interventions. **Purpose:** The purpose of this study is to determine the intra-rater reliability of the Clavicular Jump Test (CJT). **Methods:** This study is a quasi-experimental, one-group pretest-posttest (repeated measures), and correlation design. A total of 96 subjects (47 males and 49 females) volunteered to participate in this research project. The average age for the subjects was 28 (± 4.78) and ranged from 18 to 49 years old. **Results:** The results of a Pearson Chi-square test of the Clavicular Jump Test of Trial 1 and Trial 2 on the Right side indicate a statistically significant agreement, χ^2 (1) = 44.293, $p < 0.05$. The calculated kappa statistic (k) of the Clavicular Jump Test of Trial 1 and Trial 2 on the Right side indicate "substantial levels" of agreement, $k = .672$, $p < .05$. The results of a Pearson Chi-square test of the Clavicular Jump Test of Trial 1 and Trial 2 on the Left side indicate a statistically significant agreement, χ^2 (1) = 5.696, $p < 0.05$. The calculated kappa statistic (k) of the Clavicular Jump Test of Trial 1 and Trial 2 on the Left side indicate "fair" levels of agreement, $k = .241$, $p < .05$. A post-hoc power analysis was conducted and showed to have a power $(1-\beta) = 0.84$ for the Chi-square testing. **Conclusion:** There is now intra-rater reliability for the Clavicular Jump test. There is

methodology created during this study that makes assessing the reliability of the Clavicular Jump Test in a practice environment possible. Based on this methodology it is possible to test and educate clinicians for using the Clavicular Jump Test.

Key words: Clavicular Jump Test, Intra-rater reliability, Physical Therapy, Hand Dominance

Chapter I

INTRODUCTION

Background

Shoulder pain and resulting disability is a common problem with an annual incidence ranging from 4.7% to 46.7% depending on age (Haddick, 2007; Pribicevic, Pollard, Bonello, 2009). The 1 year occurrence of shoulder pain is 51% and the lifetime prevalence is ~10%. Approximately 50% of patients with shoulder pain seek medical attention. The majority (~95%) of these patients are treated in a primary health care practice such as medical and physiotherapy. Approximately half of patients with shoulder pain who present to a primary health care practice appear to resolve within 6 months and ~40% persist for up to 12 months (Pribicevic, Pollard, & Bonello, 2009).

The direct costs for the treatment of shoulder pain in the U.S. for 2000 totaled 7 billion dollars. This is linked with a high cost to society and a significant burden to the patient (Pribicevic, Pollard, Bonello, 2009). Shoulder pain is the third most common type of musculoskeletal pain which is only surpassed by low back and neck pain (Pribicevic, Pollard, & Bonello, 2009).

Idiopathic loss of shoulder range of motion (ROM), affects ~3% of the population, and complaints include disturbances in sleep, personal hygiene, donning and doffing clothing, overhead movements, reaching, and rotational activities (Shaffer, 1992).

In previous studies, it has been reported that there is limited evidence supporting the efficacy of treatment interventions for shoulder pain. A factor which limits the ability to interpret relevant research is the lack of consistently applied diagnostics which may limit treatment interventions. This may be traced to the contributing factors that influence the function and mobility of the shoulder (Haddick, 2007).

The shoulder is complex, the functional and anatomical relationship to adjacent regions of the spine, suggests that shoulder pain may originate from a number of sources found within and distant from the shoulder. Shoulder pain may be referred from multiple musculoskeletal sources, such as the glenohumeral joint, the acromioclavicular joint, the scapulothoracic joint, the sternoclavicular joint, the sub-acromial space, the cervical spine, and the elbow (Haddick, 2007; Hassett & Barnsley, 2001). Thus, shoulder pain that is persistent, often has a multifactorial underlying pathology (Pribicevic, Pollard, & Bonello, 2009).

A thorough understanding of the anatomy of the shoulder, including its fascial attachments, its biomechanics, and functional relationship to nearby spinal regions is crucial for successful rehabilitation diagnostics and treatment interventions (Pribicevic, Pollard, & Bonello, 2009).

The art of palpation, and in particular, motion palpation, is considered by many to be of primary importance in the diagnosis of functional musculoskeletal derangements and, therefore in their appropriate treatment (Wiles, 1980).

Operational Definitions

- Arthrokinematics: includes the set of concepts that allows us to describe the motion (or displacement) of a segment without regard to the forces that cause that movement. (Levangie & Norkin, 2005).
- Fascia: is defined as a dissectible mass of fibroelastic connective tissue of the body that has a supportive function, including ligaments, tendons, dural membranes, and the linings of body cavities. Fascia surrounds every and compartmentalizes muscle, forms sheaths around nerves and blood vessels, connects bone to bone, muscle to bone, and forms tendinous bands and pulleys. (DiGiovanna, Schiowitz, & Dowling, 2005).
- Clavicular Jump Test: To perform the clavicular jump test, the examiner instructs the participant to place his/her arms at their sides. The examiner will place the pads of the index and middle fingers on the proximal ends of the clavicles. The participant is instructed to slowly raise their arms over their head without bending the elbows or rotating the arms. If the clavicles were even to start with and are not uneven, the problem may be found in the pelvis on the side which is now superior (with the most likely dysfunction being an upslip. The participant's feet will be placed flat of the floor to minimize postural compensations. (Marcus, 2004).

Theoretical Framework

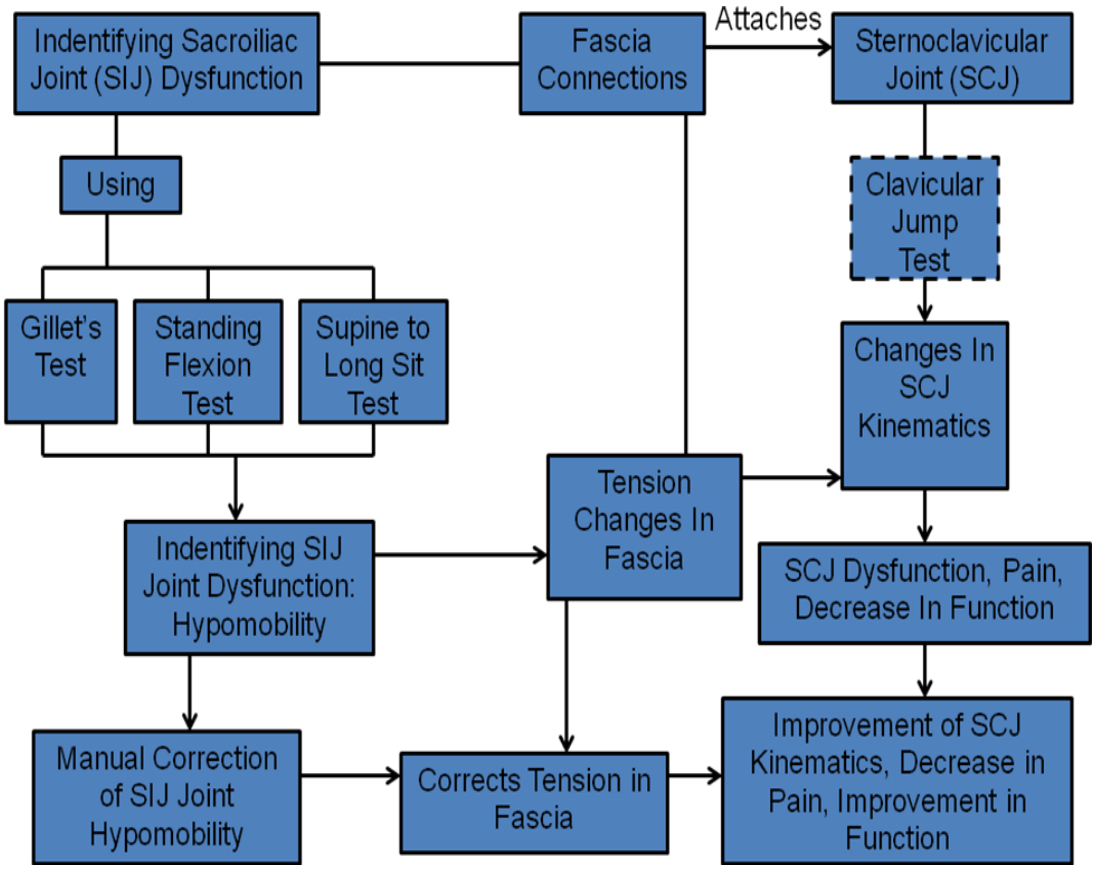


Figure 1. Principal Investigator Self-Developed Theoretical Framework.

Conceptual Framework

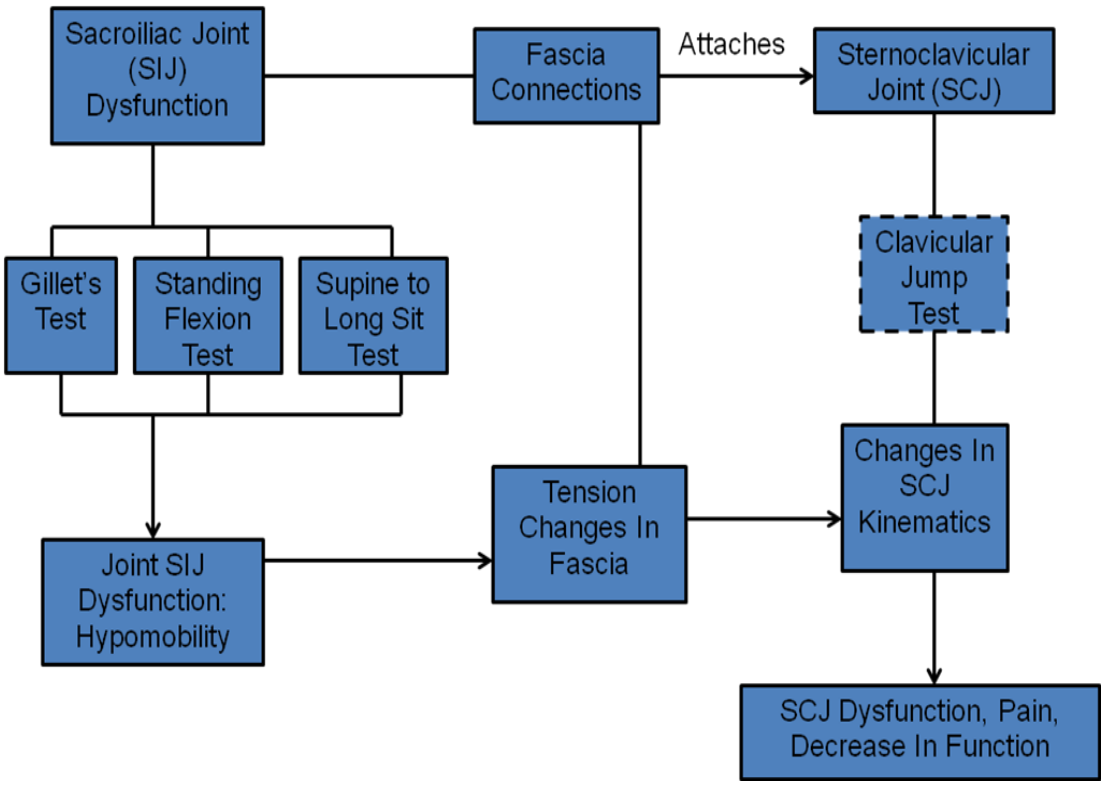


Figure 2. Principal Investigator Self-Developed Conceptual Framework.

Purpose of the study

The purpose of this study is to determine the intra-rater reliability of the Clavicular Jump Test (CJT).

Research Questions

RQ1: What is the intra-rater reliability of the Clavicular Jump Test (CJT) on the right side?

RQ2: What is the intra-rater reliability of the Clavicular Jump Test (CJT) on the left side?

Research Hypotheses

The corresponding hypothesis for RQ1 is:

H1: There is an agreement between Trial 1 and Trial 2 using the Clavicular Jump Test (CJT) on the Right side.

The corresponding hypothesis for RQ2 is:

H2: There is an agreement between Trial 1 and Trial 2 using the Clavicular Jump Test (CJT) on the Left side.

Significance of study

Fascia has direct connections between the pelvis and the upper extremity and therefore may have a direct influence on shoulder kinematics. Without performing clinical mobility tests for the sacroiliac joint (SI joint) for patients who present with shoulder and/or low back pain/dysfunction an examiner may not be including treatment strategies that may yield longer lasting benefits and be more cost effective. By performing clinical mobility testing (i.e the CJT) and identifying pathomechanics of the sternoclavicular joint (SC joint) and SI joint a clinician will be able to incorporate more precise treatments based on objective findings. This will also provide a clinician a clinical rationale that is based on fascia anatomy and applied joint kinematics. By indentifying a dysfunction of the SI joint, by using the CJT, with a patient with a shoulder and/or low back pain/dysfunction, will allow a clinician to develop a more targeted plan of care to correct structures and use more precise techniques to assist a patient who presents with a shoulder and/or low back pain/dysfunction.

Chapter II

REVIEW OF THE LITERATURE

A review of the anatomy and biomechanics of the shoulder, the fascial system, and the anatomy of the pelvis is important to clinically establish a connection between. This would provide a clinician justification for the treatment of the pelvis for patients who present with shoulder pain/dysfunction. This is done by utilizing selected clinical mobility tests (i.e CJT) used to diagnosis patients who present with pain and/or joint dysfunctions.

Shoulder Kinematics

In a static position, the SC joint space is wedge-shaped and opens superiorly (Figure 3). The motions of elevation and depression occur between a convex clavicular surface and a concave surface of the manubrium and the first costal cartilage. During upper extremity elevation the convex surface of the proximal clavicle glides inferiorly on the concave manubrium and first costal cartilage, in a direction opposite to movement of the distal end of the clavicle. During upper extremity elevation, the distal end of the clavicle rotates upward, and with depression, the distal clavicle rotates downward. The available motion of clavicular elevation can range to up to 48 degrees and depression is limited is less than 15 degrees. During elevation and depression of the clavicle, the proximal end of the clavicle glides on the disc, with the upper attachment of the disc serving as a pivot point (Levangie & Norkin, 2005). During protraction, the distal clavicle rotates anteriorly, and with retraction, the distal clavicle rotates posteriorly. During protraction, the proximal

clavicle is expected to slide anteriorly on the manubrium and first costal cartilage. There are about 15 to 20 degrees protraction and 20 to 30 degrees retraction of the clavicle available. The available anterior rotation is less than 10 degrees and posterior rotation is as much as 50 degrees (Levangie & Norkin, 2005).

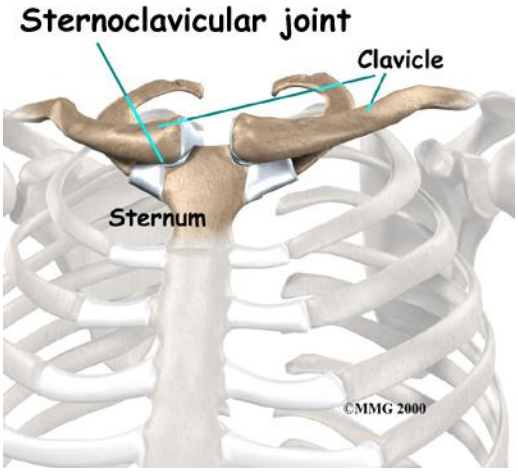


Figure 3. The Sternoclavicular Joint. www.eorthopod.com. Retrived on 5/6/2013.

Fascia Anatomy

Fascia is defined as a dissectible mass of fibroelastic connective tissue. The osteopathic physicians define fascia as connective tissue of the body that has a supportive function, including ligaments, tendons, dural membranes, and the linings of body cavities. Fascia surrounds every muscle and compartmentalizes muscle, forms sheaths around nerves and vessels, connects bone to bone, muscle to bone, and forms tendinous bands and pulleys (DiGiovanna, Schiowitz, & Dowling, 2005).

Fascia is continuous throughout the body. The majority of the fascial planes are oriented in a longitudinal fashion. Hypertonicity of muscular or an imbalance of

tension can interfere with functional movement on the typical longitudinal glide of the body's fascia sheets. As a result, one area of restriction or impairment can influence an adjacent area (DiGiovanna, Schiowitz, & Dowling, 2005).

In the pelvis the deep fascia is divided into three different layers: the superficial layer, the intermediate layer, and the deep layer, and each layer surrounds specific muscular groups. Stecco et al. (2008) hypothesized that the deep fascia of the limbs have two different functions. One of the two functions, the thinner layers, may be implicated in proprioception system. The other function, the stronger layers, may be able to transmit tension by connecting different segments of the body (Stecco et al, 2008).

The fascia has many identified functions. It functions to stabilize and maintain upright posture through the thoracolumbar fascia, the iliotibial band, the gluteal fascia, and the cervical fascia. Fascia protects muscles groups while allowing their motion. Fascia channels muscle energy into certain actions while concurrently preventing muscles from rupturing and tearing. Hence, fascia coordinates the action of muscle and muscle groups for smoother coordination (DiGiovanna, Schiowitz, & Dowling, 2005).

The Superior front line's (Figure 4) bone attachments for the myofascial track extends from the pelvis to the shoulder complex from inferior to superior: the pubic tubercle, then the 5^{th} rib, then the sternal manubrium, and then ending at the mastoid process. The myofascial tracks, from inferior to superior, begin from the rectus

abdominis, then the sternalis/sternochondral fascia, then the sternocleiodmastoid (SCM) muscle, then ending at the fascia of the scalp (Myer, 2009).

Figure 4. The Superior front line (pp. 96). *Anatomy trains: Myofascial Meridians for Manual and Movement Therapists*. By T.W. Myer (2nd ed.) New York: Elsevier.

The Lateral line's (Figure 5) bone attachments for the myofascial track from the pelvis to the shoulder complex from inferior to superior: the iliac crest, anterior superior iliac spine (ASIS), and posterior superior iliac spine (PSIS), then the ribs, then to the 1st and 2nd rib, then to the occipital ridge/mastoid process. The myofascial tracks, from inferior to superior, begin from gluteus maximus, then the lateral

abdominal obliques, then the external and internal intercostals, then ending at the splenius capitis and sternocleidomastoid (SCM) (Myer, 2009).

The SCM muscle is made up of two divisions: the short head which attaches to the medial aspect of the clavicle and the long head which attaches to the manubrium of the sternum. These divisions of the SCM attach to the mastoid process and the superior nucheal line (Missaghi, 2004).

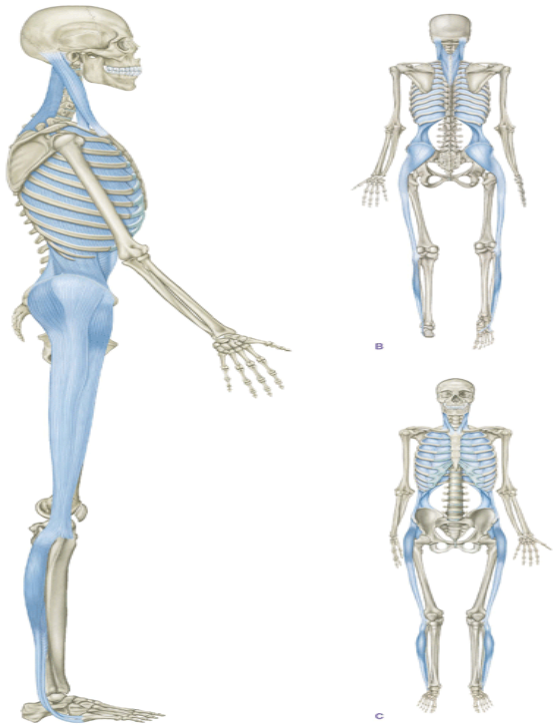


Figure 5. The Lateral line. *Anatomy trains: Myofascial Meridians for Manual and Movement Therapists* (p. 114). By T.W. Myer (2nd ed.) New York: Elsevier.

The Thoracolumbar fascia (Figure 6) is the deep fascia of the back. The two muscle groups that connect via the thoracolumbar fascia are the latissimus dorsi and the gluteus maximus. These muscles contribute to the reciprocal motions of the upper and lower extremities (Benjamin, 2009). It is found in both thoracic and lumbar

regions of the trunk. It is attached to the iliolumbar ligament, the iliac crest, the sacroiliac joint, and inserts of the shaft of the humerus (Benjamin, 2009; Myer, 2009).

Figure 6. The Thoracolumbar fascia. *Anatomy trains: Myofascial Meridians for Manual and Movement Therapists* (p. 170). By T.W. Myer (2nd ed.) New York: Elsevier.

The connections for these fascial tracks are important for understanding their anatomical connection between the upper and lower extremities.

The Pelvic Girdle Anatomy

The functional pelvic girdle actually includes L4 and L5, the two ilia, the sacrum, and the two femurs. It consists of at least 11 joints (and surrounding joints) and 33 muscles (Alderink, 1991; Cuppet & Paladino, 2001). The pelvic girdle constitutes the base of the trunk, supporting the superincumbent body structures and linking the vertebral column to the lower extremities (Cuppet & Paladino, 2001).

The SI joint articulates is a true joint that possesses synovial membranes. Classification of the SI joint has been argued to be a true diarthrrrodial joint, as amphiarthrodial, an intermediary between a synarthrosis and diarthrosis, and diarthromaphiathrodial. The SI joint has been reported to be diathrodrial until the mid-adult years and then motion progressively decreases (Alderink,1991). In some anatomical textbooks the SI joint is defined as a symphysis of an intermediate from between amphiarthrosis and diathrosis. In others it is considered an atypical arthrodia, although most authors classify it among the diathroses (Paci,1999; Cuppet & Paladino, 2001).

SI joint Kinematics

In the study by Davis Hammonds et al evaluated the effects of passive hamstring stretching on 34 subjects (both male and female) who underwent a passive hamstring stretch 3 times for 30 seconds (experimental group) or no stretching (control group). Pre-post test angles were measured using anatomical landmark markers with 6 infrared cameras. The results for the male subjects (n=17) and female subjects (n=17) were: 9.4 ± 3.9 degrees and 4.8 ± 4.4 degrees respectfully for mean anterior tilt (Davis Hammonds, Laudner, McCaw, & McLoda, 2012).

In the study by Schache et al studied 44 subjects to determine if there were any differences between the males and females in the three dimensional angular rotations of the lumbo-pelvic-hip complex during running. The results for the males subjects (n=22) and female subjects (n=22) were 16.9 ± 4.3 degrees and 20.2 ± 4.0

degrees respectfully for mean anterior to posterior tilt (Schache, Blanch, Rath, Wrigley, & Bennell, 2003).

Kroll et al investigated the relationship between clinical measures of pelvic tilt angle, range of pelvic movement, and the lumbar lordosis category observed in normal, healthy, asymptomatic volunteers. A total of 44 subjects (n=14 males and n=38 females) were recruited. It is commonly believed that deviations from healthy posture can lead to back pain. In fact, treatment regimens in physical therapy have commonly focused on techniques designed to enhance, control, and normalize pelvic position and pelvic motions in the hopes of decreasing low back pain. The results for mean anterior and posterior tilt were 18.7 ± 5.5 degrees and 4.2 ± 4.4 degrees respectfully (Kroll, Arnofsk, Leeds, Peckham, & Rabinowitz, 2000).

Bickham et al investigated whether there was a relationship between lumbo-pelvic stabilization strength and pelvic motion during running on a treadmill, using 16 elite middle and long distance runners. The results of this study had a mean anterior and posterior tilt of 7.63 ± 1.47 degrees (Bickham, Young, & Blanch, 2000).

Herrington studied the effect of the 2 extremes of pelvic position (maximum anterior and posterior tilt) on popliteal angle during the standard clinical test of hamstring muscle length passive knee extension from the 90 deg hip-flexed position. A total of 60 male subjects were recruited. The results for mean anterior and posterior tilt were 13.4 ± 9 degrees (Herrington, 2013).

Anatomical Explanation of Variability

Preece et al examined 30 cadaver pelves that were positioned in a fixed anatomical reference position and the angle between the ASIS and PSIS measured bilaterally. The study found a range of values for the ASIS-PSIS of 0-23 degrees, with a mean of 13 deg and standard deviation of 5 degrees. These results suggest that variations in pelvic morphology may significantly influence measures of pelvic tilt and innominate rotational asymmetry (Preece et al., 2008).

Literature Review: Clavicular Jump Test

There are no studies performed using the Clavicular Jump Test to report reliability.

Connection

The trunk has been reported to contribute as much as 50% of the kinetic energy and force production during the entire throwing motion. The actions at and about the shoulder are strongly related to the actions of the pelvis and torso throughout the pitching motion. If torso rotation influences what is happening at the shoulder, then more training focus should be on the torso (Oliver & Keeley, 2010). It will be noted that there is no literature found for linking the kinematics of the SI joint and the SC joint.

Clinically, the use of physical examination procedures, such as SI joint mobility tests, to assess potential pathokinematics, remains a topic of much debate, particularly in light of their demonstrated poor inter-therapist and intra-therapist reliability (Rosatelli et al., 2006).

However, the available movement permissible in this joint depends not only on the morphology of the articular surfaces themselves but also on that of surrounding areas, including the interosseous region of the SI joint complex. It is important therefore to understand the anatomy of the interosseous region and how this may change with advancing age. Joint morphology inevitably influences not only the type of clinical tests that can be performed but also the types of treatment that are theoretically possible (Rosatelli et al., 2006).

Clinical Mobility Test: Clavicular Jump Test

Another test that is not typically used in a basic orthopaedic exam is the Clavicular Jump Test (CJT) (Marcus, 2004). This test is used to exam three areas of the body: lumbar spine, thoracic spine, and pelvis. The patient begins with their arms down at their sides. The examiner first instructs the participant to place the palms of their hands against the sides of their legs. Next, the examiner places the pads of his index fingers on the proximal ends of the clavicles and evaluates for levelness of the clavicles. Then the examiner instructs the participant to slowly raise their arms over their head without bending the elbows or rotating the arms, while evaluating the new position of the proximal end of the clavicle. The possible clinical findings suggest: if the clavicles were uneven to start with and are now even (level), the dysfunction may be found from T10 inferiorly, if the clavicles were even to start with and are no uneven, the dysfunction may be found in the pelvis on the side which is now superior (with the most likely dysfunction being an upslip), if the clavicles were uneven to start with and are now uneven but the sides are reversed, the dysfunction may be

found above T6. This test is not indicated in a participant who has sustained a fracture of the clavicle or who has limited range in the shoulder due to any pathology (Marcus, 2004). The current literature does not contain studies of reliability or validity of this clinical test.

Significance

In a clinical setting, the same therapist is the person who is examining and re-examining (intra-rater reliability) a patient instead of two different therapists (inter-rater reliability) examining a patient to locate a dysfunction when pain or limited ROM exists in and around the shoulder region, within the same treatment session. For this reason, the intra-rater reliability will be studied, since that focuses on the reliability of one person administering a diagnostic test in a consistent manner from individual to individual. However, there is currently no evidence establishing the intra-rather reliability of the Clavicular Jump Test (CJT). Establishing reliability of this diagnostic test method may provide clinicians with a means by which to reliably examine an individual with SI joint dysfunction using a clinical mobility test that is no longer merely subjective in nature but has quantitative and objective measures associated with it.

Chapter III

METHODS

Institutional Review Board (IRB)

As per Seton Hall University protocol, the research project was submitted to Hackensack University Medical Center's Institutional Review Board, located at 30 Prospect Avenue, Hackensack, NJ 07601. The project was approved on 10/30/2017 (Appendix A).

Study Design

This study is a quasi-experimental, one-group pretest-posttest (repeated measures), and correlation design.

Subject Selection and Screening

A total of 96 subjects were be recruited using a sample of convenience from the campus of Seton Hall University South Orange. The subjects will be adult males/females, from 18 to 50 years old. Subjects older than 50 years old may demonstrate an increased amount of articular joints changes that may interfere with range of motion (ROM) (Ludewig et al., 2004). Subjects will be able to read and write in English. Subjects will be generally healthy. Prior to participation in the study subjects will be instructed to read and sign an informed consent form (Appendix B), medical screening form (Appendix C), and will have the opportunity to ask the principal investigator questions regarding any parts of the research study. The principal investigator will answer any question(s) the subject(s) may have.

Recruitment strategy

Subject recruitment will be performed by contacting the department chairs at Seton Hall University as relevant for permission to access their relevant student population for purposive sampling by flyer (Appendix F), letter of solicitation (Appendix G) or electronic e-mail access and subsequent snowball sampling.

Inclusion Criteria

This study will include adult males and females (who are not pregnant, if known) 18 to 50 years old (including the ages of 18 and 50). Subjects older than 50 years old may demonstrate an increased amount of articular joints changes that may interfere with range of motion (ROM) (Ludewig et al., 2004). Subjects will be able to read and write in English. Subjects will be generally health.

Exclusion Criteria

This study will exclude: adult males and females who are not 18 to 50 years old, subjects evidencing current treatment or recent treatment in the last 12 months for shoulder or low back pain, subjects who are unable to read, write, and understand the English language, and female subjects who are pregnant.

Independent Variables

1. Performance of the Clavicular Jump Test on the Right side.
2. Performance of the Clavicular Jump Test on the Left side.

Dependent Variables

1. The percentage of agreement of the Clavicular Jump Test on the Right side between Trial 1 and Trial 2.

2. The percentage of agreement of the Clavicular Jump Test on the Left side between Trial 1 and Trial 2.

Summary of Data Collection

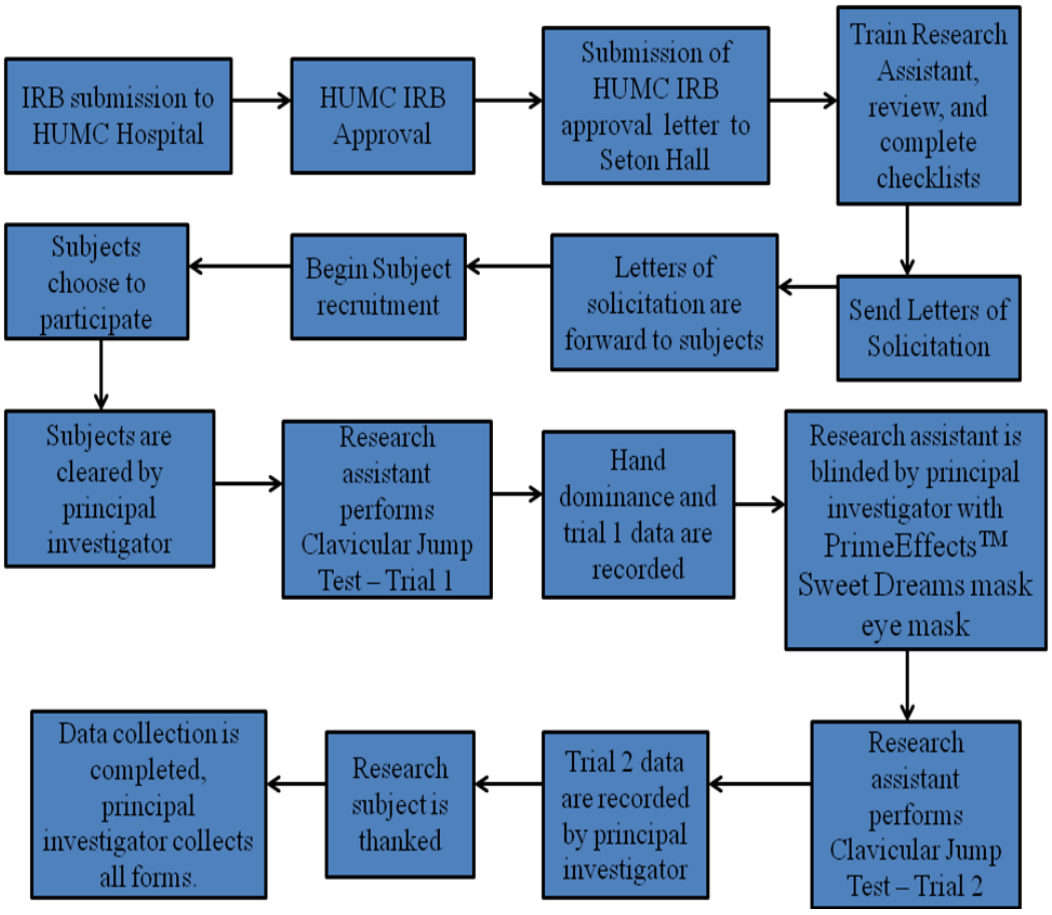


Figure 7. Data Collection Flow Chart

Data Analysis

A Chi-square test (a non-parametric test) will be performed for independence to determine if an agreement exists between Trial 1 and Trial 2 of the Clavicular Jump Test on the Right side and if an agreement exists between Trial 1 and Trial 2 of the Clavicular Jump Test on the Left side. A Chi-square test is performed under the assumptions that the data have been randomly selected from the population, values for the variable are mutually exclusive, and a minimum expectation of five occurrences in each category.

By evaluating the data that will be collected for each subject for Trial 1 and Trial 2 for both the Right and Left side then the percentage of agreement can be calculated by using the kappa statistic (k).

A Dependent T-test, which is the parametric equivalent of the Chi-square test, will also be conducted. The Dependent T-test will be performed under the assumptions that the data have been randomly selected from the population, sample data consist of matched pairs, and data are measured at least at the interval level. To test for normality a Kolmogorov-Smirnov test will be performed.

IBM's SPSS version 24 statistical software will be used for analysis of the data.

A Priori Power Analysis

This study will require a convenience sample of 88 (Chi-square) – 90 (Dependent T-test) subjects. The number of subjects to be administered was determined following the calculation using G*Power 3.1.7 (Faul, Erdfelder, Buchner,

& Lang, 2013). The power of a statistical test is the probability of detecting a true relationship. The power analysis can reduce the risk for type II errors (a false negative) by estimating the number of subjects that are required.

The first *a priori* power analysis was based upon my assumption that I will be conducting a Chi-square test. For the first analysis, based on the results, this study will require a total sample size of 88 subjects. This is not based on prior studies, instead, the power analysis was initiated and completed for this particular study. This power analysis was conducted using G*Power 3.1.7 (Faul, Erdfelder, Buchner, & Lang, 2013) to determine a sufficient sample size using an alpha of 0.05 (the level of significance the probability of detecting a Type I error (otherwise known as a false positive), a power $(1-\beta) = 0.80$ (the probability of detecting a true relationship or group differences), a medium effect size of 0.3, confidence interval of 0.95 (or 95%) and degree of freedom of 1 (Appendix D).

The second *a priori* power analysis was also an *a priori* power analysis that was calculated to determine the sample size for the study; however, this time for a Dependent T-test. The Dependent T-test is the parametric equivalent to the Chi-square test. Based upon the G*Power 3.1.7 (Faul, Erdfelder, Buchner, & Lang, 2013) results, this study will required a total sample size of 90 subjects. This too is not based on prior studies, instead, the power analysis was initiated and completed for this particular study. The effect size chosen is 0.3 ((which a medium effect size appropriate for a Dependent T-test), this demonstrates how strong the relationship is between the independent and dependent variable)). The alpha is 0.05 (the level of

significance the probability of detecting a Type I error, otherwise known as a false positive), a power of 0.80 (the probability of detecting a true relationship or group differences), and degree of freedom of 89 (Appendix E).

Although a G*Power analysis was performed, the amount of subjects recruited in previous research studies range from 14 to 25 (Arab et al., 2009; Rundquist & Ludewig, 2005; Vincent-Smith & Gibbons, 1999).

Data will be calculated for the first 15-20 subjects at which point intra-rater reliability will be determined. If a range of 0.6-0.8 is achieved for Chronbach's alpha, then the test will be considered as having good reliability (Portney & Watkins, 2009) for experimental studies. If this level of reliability as calculated for Chronbach's alpha is not attained, then an additional 15-20 subjects will be sought and added to the first group's results and a new Chronbach's alpha will be calculated for intra-rater reliability. This process will continue until a Chronbach's alpha of between 0.6 and 0.8 is achieved or the maximum calculated N of 88 (Chi-square) – 90 (Dependent T-test) is achieved. Once a good reliability has been established then a post-hoc power analysis will be conducted to ensure that the study is sufficiently powered (power of 0.8 has been achieved for this study). However, if sufficient power is not achieved then an additional 15-20 subjects will be sought and this process continued until sufficient power is achieved.

Summary of Steps of Methodology

The following steps will be performed and specifically in this order:

1. IRB submission to Hackensack University Medical Center (HUMC).

2. HUMC IRB is approved.
3. IRB submission to Seton Hall University.
4. Training of the Research Assistant (RA), review, and complete Principal Investigator (PI) and RA check lists (Appendix H, I, J, K, and L).
5. Letters of Solicitation will be sent out (Appendix G).
6. Letters of Solicitation are forwarded to prospective subjects.
7. Subject recruitment will begin.
8. Subjects will choose to participate.
9. Subjects receive and complete informed consent form and Medical Evaluation Questionnaire (Appendix: B,C).
10. Subjects are cleared by PI.
11. RA performs the Clavicular Jump Test – Trial 1.
12. Hand dominance and Trial 1 data are collected.
13. RA is then blinded folded by PI with PrimeEffects™ Sweet Dreams mask eye mask.
14. RA performs the Clavicular Jump Test – Trial 2.
15. Trial 2 data are recorded by PI.
16. Subjects are thanked.
17. Data collection is completed and the PI collects all forms.

Chapter IV

RESULTS

According to Field, the Chi-square test does not rely on assumptions such as having continuous normally distributed data (Field, 2009).

A total of 96 subjects (47 males and 49 females) volunteered to participate in this research project (Table 1). Of the 96 subjects, 84 subjects were Right hand dominant and 12 were Left hand dominant (Table 2). The average age for the subjects was 28 (± 4.78) and ranged from 18 to 49 years old (Table 3).

Table 1

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	47	49.0	49.0	49.0
	Female	49	51.0	51.0	100.0
	Total	96	100.0	100.0	

Table 2

Hand Dominance

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Right	84	87.5	87.5	87.5
	Left	12	12.5	12.5	100.0
	Total	96	100.0	100.0	

Table 3

Age Statistics

N	Valid	9
	Missing	
Mean		28.1
Std. Deviation		4.79
Minimum		1
Maximum		4

Table 4 demonstrates the crosstabulation of positive and negative for Trial 1 and Trial 2 on the Right side of the Clavicular Jump Test. The results of a Pearson Chi-square test of the Clavicular Jump Test of Trial 1 and Trial 2 on the Right side indicate a statistically significant agreement, χ^2 (1) = 44.293, p < 0.05 (Table 5). The calculated kappa statistic (k) of the Clavicular Jump Test of Trial 1 and Trial 2 on the Right side indicate "substantial levels" (Portney & Watkins, 2009), of agreement, k = .672, p < .05 (Table 6).

Table 4

Crosstabulation of the Clavicular Jump Test of Trial 1 and Trial 2 on the Right side

			Trial 2 - R		
			Negative	Positive	Total
Trial 1 - R	Negative	Count	16	3	19
		Expected Count	4.8	14.3	19.0
		% of Total	16.7%	3.1%	19.8%
	Positive	Count	8	69	77
		Expected Count	19.3	57.8	77.0
		% of Total	8.3%	71.9%	80.2%
Total		Count	24	72	96
		Expected Count	24.0	72.0	96.0
		% of Total	25.0%	75.0%	100.0%

Table 5

Chi-square Test of the Clavicular Jump Test of Trial 1 and Trial 2 on the Right side

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	44.293[a]	1	.000		
Continuity Correction[b]	40.443	1	.000		
Likelihood Ratio	40.026	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	43.831	1	.000		
N of Valid Cases	96				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.75.

b. Computed only for a 2x2 table

Table 6

Symmetric Measures of the Clavicular Jump Test of Trial 1 and Trial 2 on the Right side

		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Measure of Agreement	Kappa	.672	.091	6.655	.000
N of Valid Cases		96			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Table 7 demonstrates the crosstabulation of positive and negative for Trial 1 and Trial 2 on the Left side of the Clavicular Jump Test. The results of a Pearson Chi-square test of the Clavicular Jump Test of Trial 1 and Trial 2 on the Left side indicate a statistically significant agreement, χ^2 (1) = 5.696, $p < 0.05$ (Table 8). The calculated kappa statistic (k) of the Clavicular Jump Test of Trial 1 and Trial 2 on the Left side indicate "fair" levels (Portney & Watkins, 2009) of agreement, $k = .241$, $p < .05$ (Table 9).

Table 7

Crosstabulation of the Clavicular Jump Test of Trial 1 and Trial 2 on the Left side.

			Trial 2 - L		
			Negative	Positive	Total
Trial 1 - L	Negative	Count	15	19	34
		Expected Count	9.9	24.1	34.0
		% of Total	15.6%	19.8%	35.4%
	Positive	Count	13	49	62
		Expected Count	18.1	43.9	62.0
		% of Total	13.5%	51.0%	64.6%
Total		Count	28	68	96
		Expected Count	28.0	68.0	96.0
		% of Total	29.2%	70.8%	100.0%

Table 8

Chi-square Test of the Clavicular Jump Test of Trial 1 and Trial 2 on the Left side

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.696[a]	1	.017		
Continuity Correction[b]	4.631	1	.031		
Likelihood Ratio	5.558	1	.018		
Fisher's Exact Test				.021	.017
Linear-by-Linear Association	5.637	1	.018		
N of Valid Cases	96				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 9.92.

b. Computed only for a 2x2 table

Table 9

Symmetric Measures of the Clavicular Jump Test of Trial 1 and Trial 2 on the Left side

		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Measure of Agreement	Kappa	.241	.103	2.387	.017
N of Valid Cases		96			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

The values of skewness for Trial 1 and Trial 2 on the Right side are: -1.541 and -1.173, respectfully (Table 10). According to Portney and Watkins (Portney & Watkins, 2009), since neither of these values are 0 or close to 0, then these results are not normally distributed. To test for normality a Kolmogorov-Smirnov tests were be performed for the Clavicular Jump Test of Trial 1 and Trial 2 on the Right side (Table 11). The results of the Kolmogorov-Smirnov Test of the Clavicular Jump Test of Trial 1 and Trial 2 on the Right side are: Trial 1 Right (96) = .491, $p < .05$ and Trial 2 Right (96) = .467, $p < .05$. The results of these tests indicate that the data were not normally distributed. Therefore the parametric equivalent of the Chi-square test, the Dependent T-test, was not performed (Figures 8 and 9).

Table 10

Descriptive Statistics of the Clavicular Jump Test of Trial 1 and Trial 2 on the Right side

		Trial 1 - R	Trial 2 - R
N	Valid	96	96
	Missing	0	0
Mean		1.80	1.75
Std. Error of Mean		.041	.044
Std. Deviation		.401	.435
Variance		.160	.189
Skewness		-1.541	-1.173
Std. Error of Skewness		.246	.246
Kurtosis		.381	-.638
Std. Error of Kurtosis		.488	.488
Range		1	1
Minimum		1	1
Maximum		2	2

Table 11

Test of Normality: Kolmogorov-Smirnov Test of the Clavicular Jump Test of Trial 1 and Trial 2 on the Right side

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Trial 1 - R	.491	96	.000	.487	96	.000
Trial 2 - R	.467	96	.000	.538	96	.000

a. Lilliefors Significance Correction

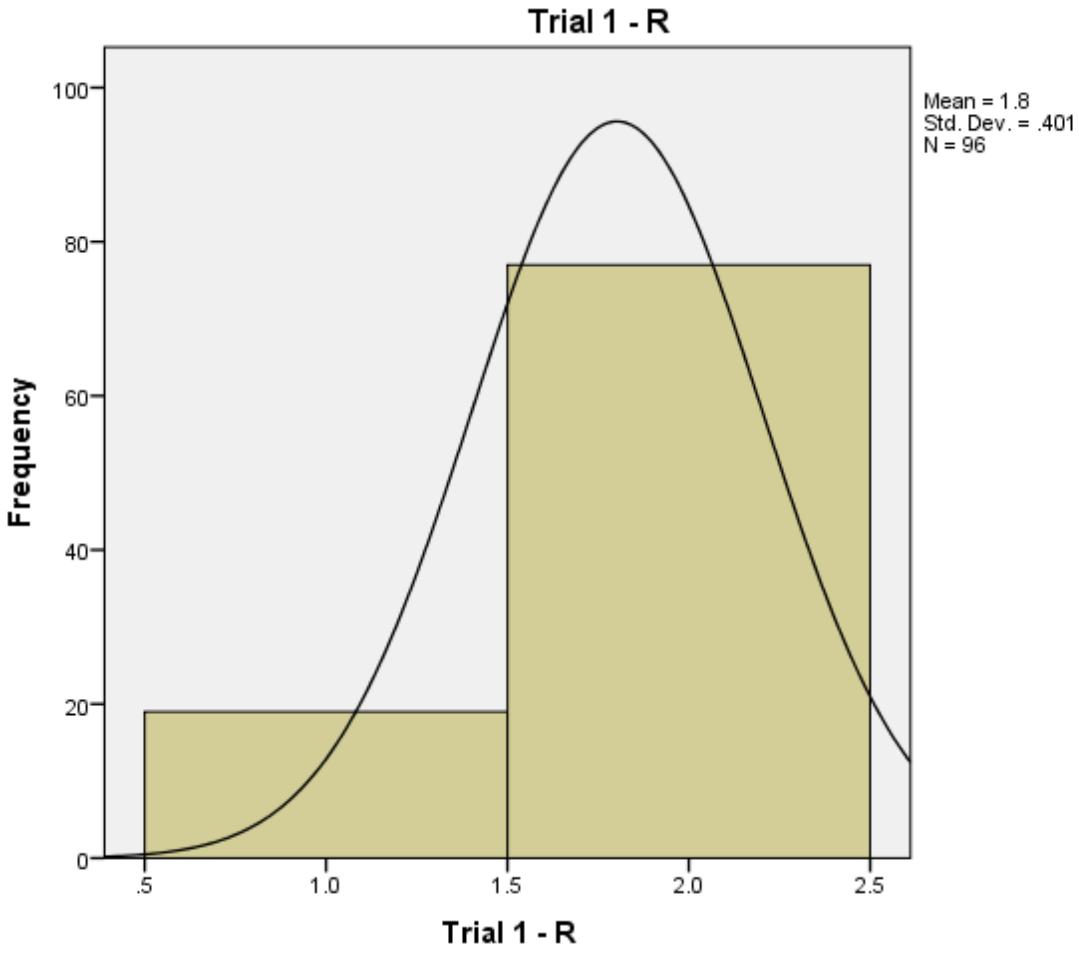


Figure 8. Histogram of the Clavicular Jump Test of Trial 1 on the Right side.

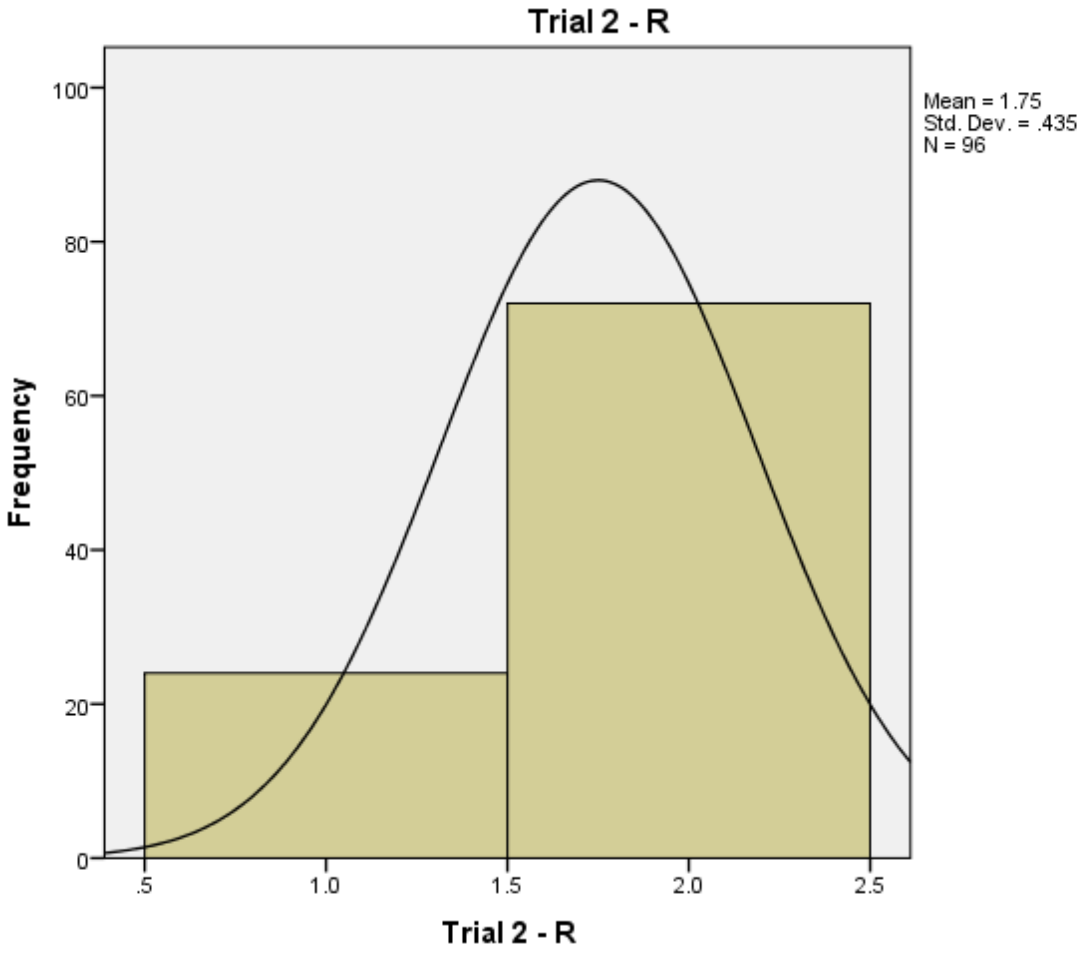


Figure 9. Histogram of the Clavicular Jump Test of Trial 2 on the Right side.

The values of skewness for Trial 1 and Trial 2 on the Left side are: -.620 and -.931, respectfully (Table 12). According to Portney and Watkins (Portney & Watkins, 2009), since neither of these values are 0 or close to 0, then these results are not normally distributed. To test for normality a Kolmogorov-Smirnov Test of the Clavicular Jump Test of Trial 1 and Trial 2 on the Left side (Table 13). The results of the Kolmogorov-Smirnov Test of the Clavicular Jump Test of Trial 1 and Trial 2 on the Left side are: Trial 1 Left (96) = .415, $p < .05$ and Trial 2 Left (96) = .447, $p < .05$.

The results of these tests indicate that the data were not normally distributed. Therefore the parametric equivalent of the Chi-square test, the Dependent T-test, was not performed (Figures 10 and 11).

Table 12

Descriptive Statistics of the Clavicular Jump Test of Trial 1 and Trial 2 on the Left side

		Trial 1 - L	Trial 2 - L
N	Valid	96	96
	Missing	0	0
Mean		1.65	1.71
Std. Error of Mean		.049	.047
Std. Deviation		.481	.457
Variance		.231	.209
Skewness		-.620	-.931
Std. Error of Skewness		.246	.246
Kurtosis		-1.651	-1.157
Std. Error of Kurtosis		.488	.488
Range		1	1
Minimum		1	1
Maximum		2	2

Table 13

Test of Normality: Kolmogorov-Smirnov Test of the Clavicular Jump Test of Trial 1 and Trial 2 on the Left side

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Trial 1 - L	.415	96	.000	.605	96	.000
Trial 2 - L	.447	96	.000	.570	96	.000

a. Lilliefors Significance Correction

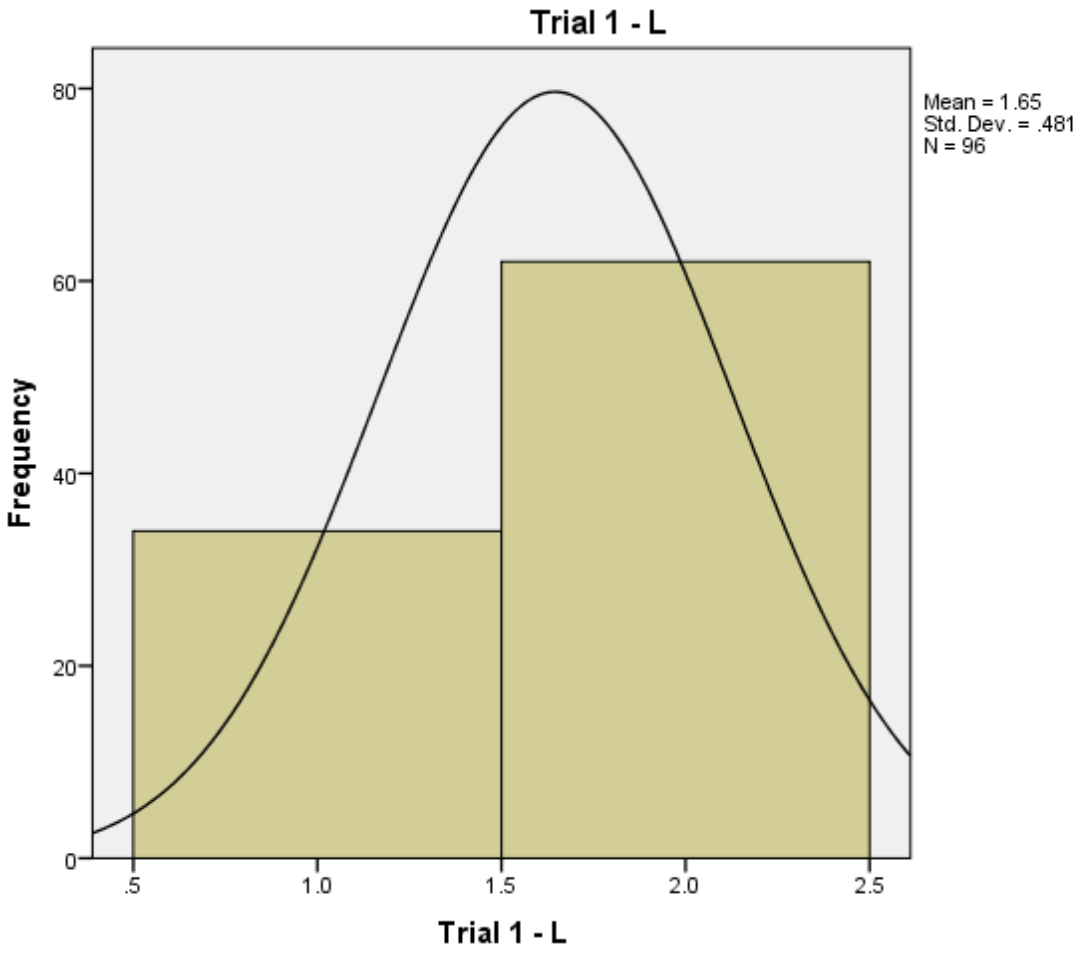


Figure 10. Histogram of the Clavicular Jump Test of Trial 1 on the Left side.

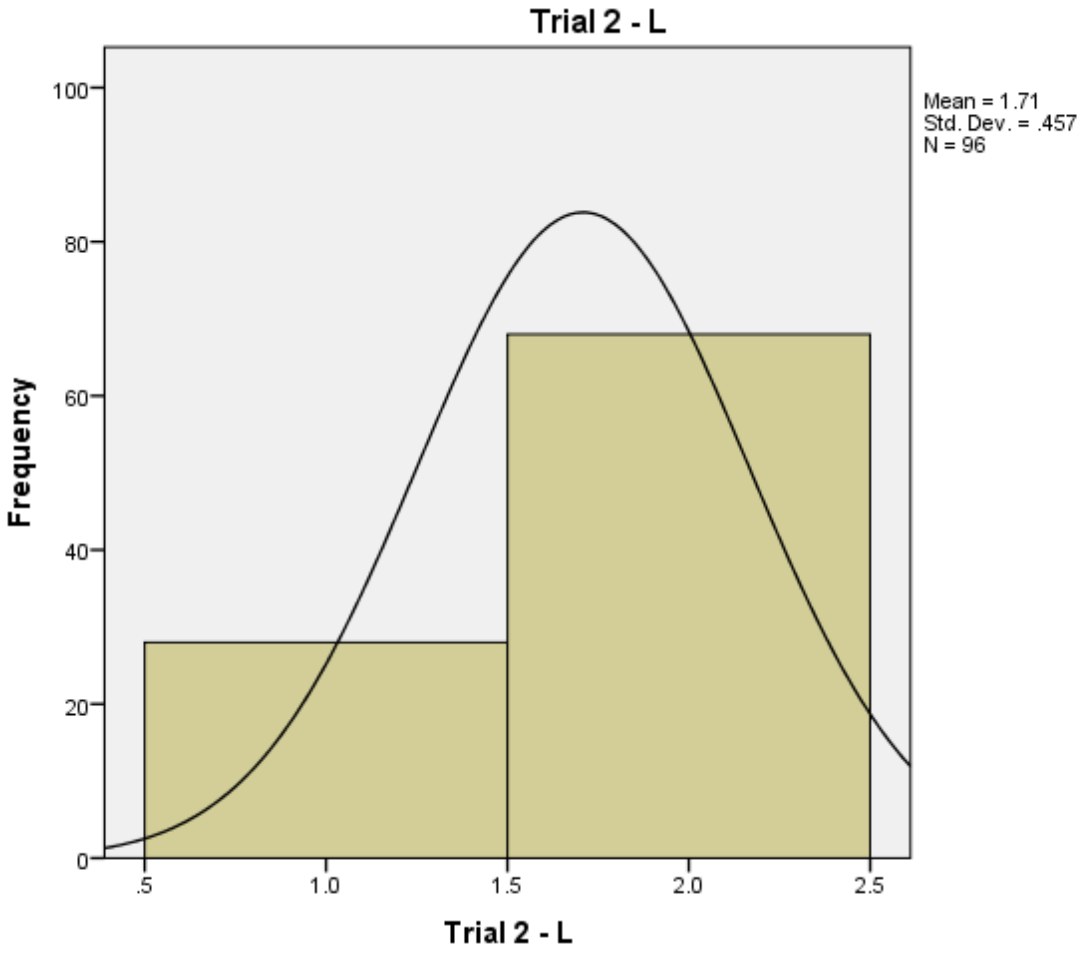
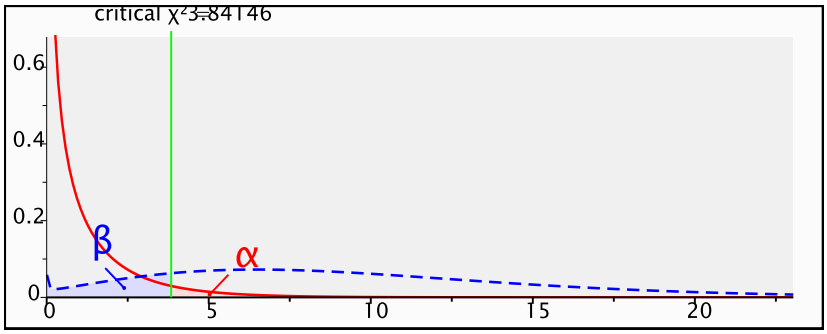


Figure 11. Histogram of the Clavicular Jump Test of Trial 2 on the Left side

A post-hoc power analysis was conducted and showed to have a power (1-β) = 0.84 for the Chi-square testing (Figure 12).



χ² tests - Goodness-of-fit tests: Contingency tables

Analysis:	Post hoc: Compute achieved power		
Input:	Effect size w	=	0.3
	α err prob	=	0.05
	Total sample size	=	96
	Df	=	1
Output:	Noncentrality parameter λ	=	8.640000
	Critical χ²	=	3.841459
	Power (1-β err prob)	=	0.836315

Figure 12. G*Power Analysis (post-hoc) for Ch-square testing.

Results Summary

There is a "substantial" level of agreement for the CJT between Trial 1 and Trial 2 on the Right side. There is a "fair" level of agreement for the CJT between Trial 1 and Trial 2 on the Left side. Post hoc analysis indicated a power of .84 or 84% change of detecting a true relationship.

Chapter V

DISCUSSION

By reviewing previous literature, Dynamic Systems Theory was used to integrate and further explain the results of this research project (Shumway-Cook & Wollacott, 2003). The instrument used in this study was the Clavicular Jump Test (CJT). The constructs used in this study were: task, environment, and individual.

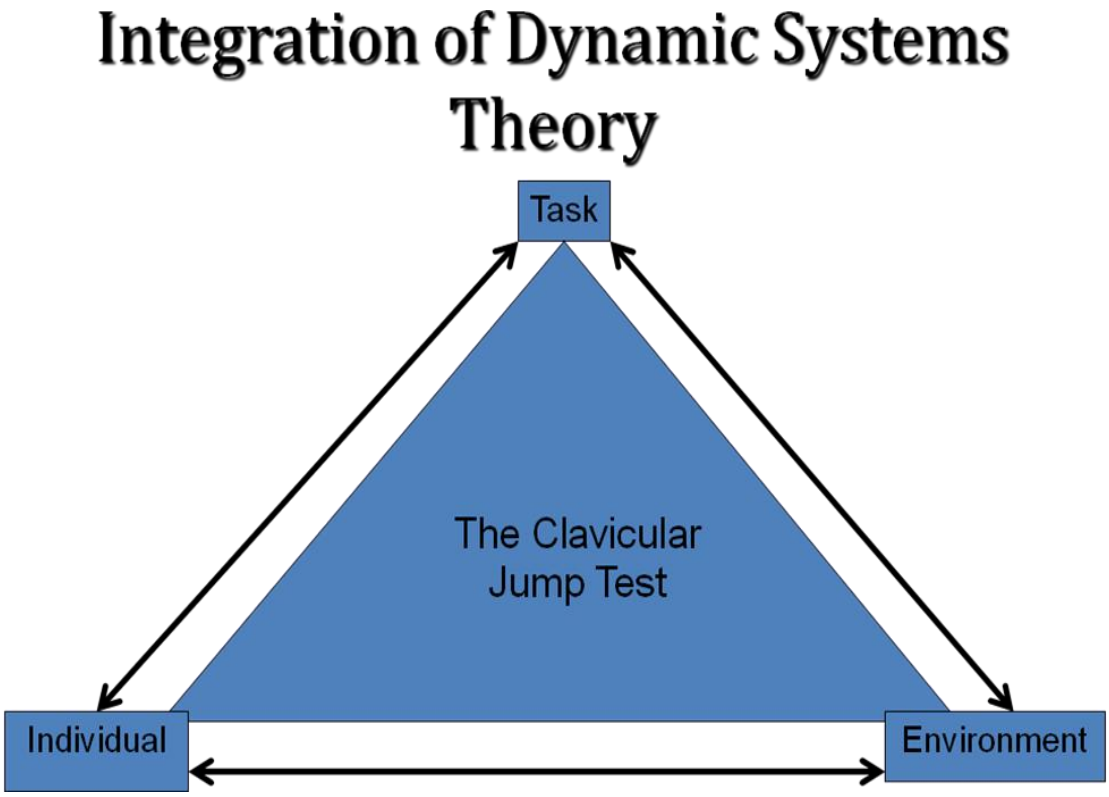


Figure 13. Integration of Dynamic Systems Theory. Adapted from Shumway-Cook & Wollacott, 2003.

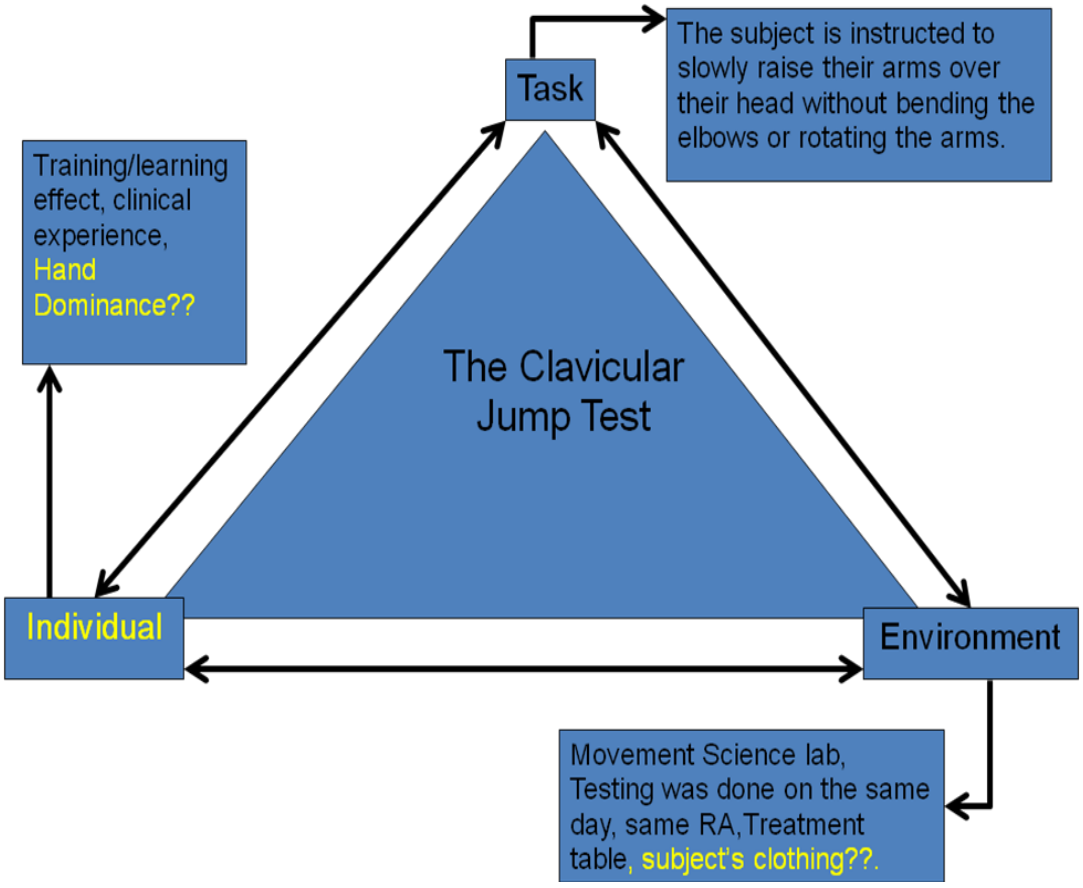


Figure 14. Integration of Dynamic Systems Theory with constructs. Adapted from Shumway-Cook & Wollacott, 2003.

Each construct was further evaluated to further explore the limitations of this study. The task remained the same for each subject. Each subject was instructed to slowly raise their arms over their head without bending the elbows or rotating the arms. The environment remained the same throughout the study. The Movement Science Laboratory was always used, testing was always performed on the same day, and the same examination table was used per subject (Figure 14). The only remaining difference within the environmental construct was the subjects clothing, the clothing of each subject was not consistent from one subject to the next. However, it will be noted that each subject's clothing was consistent from Trial 1 and Trial 2 for both the Right and Left sides. The individual, the RA, remained the same throughout the testing. To limit and decreased potential bias from the RA's clinical experience and/or any teaching/learning effects, prior to the testing a training script and check list was reviewed by the PI (Appendix H and I). One area that the PI did not examine on the RA was the RA's hand dominance. Since the conditions were the same for testing for the Right and Left sides, hand dominance is a logical and reasonable explanation to explain the differences between the results of Trial 1 and Trial 2 between the Right and Left sides.

Additional Gaps in the Literature

An extensive review of the literature was performed following the results of this study to investigate if hand dominance of a rater has ever been studied. The author, his research committee, and the assistance of additional faculty members were

not able to find any articles that studied hand dominance in raters while performing clinical mobility tests.

In reflection to Marcus, that "If the clavicles were even to start with and are not uneven, the problem may be found in the pelvis on the side which is now superior (with the most likely dysfunction being an upslip)" (Marcus, 2004). I am looking to further question indication in the text that the dysfunctional SI joint is on the ipsilateral side of the positive Clavicular Jump Test. There is also no research that indicates the type of dysfunction of the SI joint. I am proposing further investigation is required to examine if a subject were to demonstrate a positive and negative Clavicular Jump Test and the incidence of an anterior innominate rotation, a posterior rotation, and/or an innominate upslip on the ipsilateral and contralateral SI joints.

Future Modifications to Methodology

There are two significant modifications that would be adapted to the methodology for future studies. The first modification would be standardization of the clothing of each subject, such as using a hospital gown for each subject. The second modification would be to test the hand dominance of the rater prior to the start of the study. The Flinders Handedness Survey (FLANDERS) explores 31 questions regarding hand preferences (Nicholls, Thomas, Loetscher, & Grimshaw, 2013) which would be useful in determining hand dominance of the rater.

Future results can then be further analyzed to explore if there is a relationship between outcomes of a clinical mobility test and hand dominance of a rater. Perhaps, hand dominance may be a factor to explain the poor inter-therapist and intra-therapist

reliability of the SI joint pathokinematics as reported by Rosatelli et al in 2006 ((Rosatelli et al., 2006).

Chapter VI

SUMMARY AND CONCLUSIONS

Practical Implications

There is now intra-rater reliability for the Clavicular Jump test. There is methodology created during this study that makes assessing the reliability of the Clavicular Jump Test in a practice environment possible. Based on this methodology it is possible to test and educate clinicians for using the Clavicular Jump Test.

With appropriate training this test can be performed in a clinical setting. This test does not take long to perform. In regards in cost effectiveness, in the clinic and in research, the CJT has not been studied with an intervention. Therefore, it is still unknown whether or not using the Clavicular Jump Test as part of an evaluation, for a clinician to determine more precise treatment interventions, will yield more cost effective patient outcomes (i.e less treatment sessions needed in physical therapy).

Limitations

The limitations for this study are as follows:

1. This study only utilized 96 subjects and therefore does not demonstrate generalizability to larger populations.
2. This study did not incorporate subjects who were symptomatic. The subjects who participate were asymptomatic.
3. The hand dominance of the rater (RA) was not tested prior to the study.
4. The clothing of the subjects was not consistent from subject to subject.

5. This study is limited to only intra-rater reliability and not to inter-rater reliability.

Suggestions for Future Research

Including the modifications to the methodology as listed above, the same methodology format may be utilized with:

1. Asymptomatic and symptomatic subjects (including subjects with back, shoulder, and/or both back and shoulder pain, symptoms, limitations).
2. Other clinical mobility tests may also be studied such as, Gillet's Test, Standing Flexion Test, and Supine to Long Sit Test.
3. Adding an intervention technique to the SI joint (i.e a manual therapy technique). Then reviewing the data before and after an intervention.
4. Comparing the results to a Gold Standard (SI joint injections performed by a medical doctor) to provide results to be compared for validity.
5. Studying for intra-rater reliability of entry level Physical Therapists
6. Studying inter-rater reliability.
7. Studying hand dominance with regards to the outcome of the clinical test(s) performed.
8. Exploring the incidence SI joint dysfunctions (both ipsilateral and contralateral), the types of SI joint dysfunctions (i.e anterior rotation, posterior rotation, and/or upslip), and the correlation to positive or negative results of the Clavicular Jump Test on the Right and Left.

   a. This may provide results to strengthen or dispute whether or not a Positive test indicates an upslip on the ipsilateral side, as indicated by Marcus (Marcus, 2004).

9. Comparing the results with the Clavicular Jump Test performed with the subjects arms performed in varying planes of motion such as: sagittal, coronal, and scaption. In regards to Marcus (Marcus, 2004), the instructions do not specifically indicate what plane of motion is preferred while performing this test.

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APPENDICES

Appendix A

Hackensack University Medical Center Institutional Review Board Approval Letter

Hackensack Meridian
HEALTH

EXPEDITED REVIEW APPROVAL

To: Thomas Koc Jr

CC: Deborah DeLuca
Annette Kirchgessner
H. James Phillips

Re: Study# Pro2016 0381
Methodology: Intra-rater Reliability of the Clavicular Jump Test

Study Expiration Date: 10/30/2017

This is to advise you that the above Study has been presented to the Institutional Review Board for expedited review.

Please be reminded that all modifications to approved projects must be reviewed and approved by the Institutional Review Board before they may be implemented. Any changes to this protocol must be submitted for IRB approval before initiated.

All serious adverse events and unexpected adverse events must be reported to Institutional Review Board within seven days.

Please do not make any changes to the IRB approved consent without approval of the IRB. Only the IRB stamped approved consent should be used.

If your study meets the definition of a qualifying study that meets the FDAAA 801 definition of an "applicable clinical trial", you are responsible for ensuring that the trial has been registered properly on the Clinical Trials.gov website prior to the enrollment of any subject.

"Applicable clinical trials" generally include controlled clinical investigations, other than phase 1 clinical investigations (with one or more arms) of FDA regulated drugs, biological products, or devices, that meet one of the following conditions:

- The trial has one or more sites in the United States
- The trial is conducted under an FDA investigational new drug application or investigational device exemption
- The trial involves a drug, biologic, or device that is manufactured in the United States or its territories and is exported for research

For complete statutory definitions and more information on the meaning of "applicable clinical trial," see Elaboration of Definitions of Responsible Party and Applicable Clinical Trial (PDF).

This study has been reviewed and approved via expedited review on 10/31/2016.

HIPAA waiver granted.

Appendix B

Informed Consent Form

Hackensack University Medical Center

Consent Form

Title of Protocol

Methodology: Intra-rater Reliability of the Clavicular Jump Test

Who is conducting this study?

The principal investigator for this study is Thomas A. Koc, Jr. PT, DPT. His Ph.D committee includes H. James Phillips, PT, Ph.D, OCS, FAAOMPT (Dissertation Chair), Deborah A. DeLuca, MS, JD, and Annette Kirchgessner, MA, Ph.D. His research assistant (RA) is Joseph Biland PT, DPT.

Why have I been asked to take part in this research study?

You have been asked to take part in this study to assist the principal investigator with establishing the intra-rater reliability of the Clavicular Jump Test.

It is up to you to decide whether or not to take part in this study. Please read this entire consent form. This consent form may contain words that you do not understand. Please ask the study doctor or the study staff to explain any words or information that you do not clearly understand. You may take home an unsigned copy of this consent form to think about or discuss with family or friends before making your decision.

Why is this study being conducted?

The purpose of this study is to determine the intra-rater reliability of the Clavicular Jump Test (CJT). The purpose of this study is two-fold: 1) to determine the reliability of test method used by Physical Therapists to determine if there is a dysfunction in the sacroiliac (SI) joint and 2) to test the methodology employed in determining the reliability of this test method before employing it in a greater population.

How many people will participate in this study?

A total of 88 participants are expected to participate in this study.

What is involved in this study?

The population for study will be adult men and women between the ages of 18 to 50 years of age. You will be asked to read and sign an informed consent form and complete a medical screen forming that will be reviewed by Thomas A. Koc, Jr. PT, DPT, the Principal Investigator (PI). You will have the opportunity to ask the PI questions regarding any parts of the research study. The PI will answer any questions you may have. You are welcomed to consider participating at your own leisure and may return to participate on a different day if you desire.

On the day of the test, you will be asked to participate in 1 testing session (Trial 1 and Trial 2) that may last approximately 1 hour in duration (each trial lasts approximately 1 minute in duration with approximately 15 minutes of wait time in between; depending on the number of participants in a group the total time may extend to one hour for the entire testing period: Trial 1, Trial 2, and wait time).

Testing will be conducted in the Interprofessional Health Science and health Administration (IHSA) Human Performance Laboratory on the South Orange Campus on Seton Hall University, 400 South Orange Avenue, South Orange, New Jersey 07079.

You will be asked to meet with the PI at the location of the Interprofessional Health Science and Health Administration (IHSA) Human Performance Laboratory on the South Orange Campus on Seton Hall University, 400 South Orange Avenue, South Orange, New Jersey 07079. The PI will distribute the informed consent and medical screening forms to you. The PI will then collect these forms from you once they are completed and the PI will review eligibility with you. If you are eligible for participation, the PI will issue a number/letter code to identify you and to protect your identity. The number/letter code will be given to you, written on a piece of paper, folded, and placed into a cardboard box (for randomization purposes). You will then be asked to form a line outside the Human Performance Laboratory while the Research Assistant (RA), Joseph Biland, will enter the room and the door will then be closed. The PI will randomly select a number of each participant by drawing a folded paper from the cardboard box, reading it out loud, and will then bring you into the room (once your number has been called).

The PI will then leave the room, where the RA will instruct you to sit at the edge of the treatment table. The RA will perform the Clavicular Jump Test (Trial 1). The RA will instruct you to place your arms at your sides, will place the tips of the index and middle fingers on the top of the collar cone by the breast bone, and will instruct you to slowly raise your arms over your head without bending the elbows or rotating the arms. The RA will then record the findings on the data collection form.

You will be asked to leave the room, where these steps will be repeated for each participant, until all the participants have participated in Trial 1.

Once all participants have participated in Trial 1, the RA will be blind folded with a PrimeEffects™ Sweet Dreams Eye Mask by the PI. The same procedure will be followed for Trial 2.

The participants will then be asked to form a line outside the Human Performance Laboratory while the RA remains in the room with a PrimeEffects™ Sweet Dreams Eye Mask on with the door closed. The PI will randomly select a number of each participant by drawing a folded paper from the cardboard box, reading it out loud, and will then bring you into the room (once your number has been called). The PI will bring you back into the room (when your number is called) where the PI will instruct you to sit at the edge of the treatment table. The PI will place the tips of the RA's index and middle fingers on the top of your collar cone by the breast bone, instructing you to slowly raise your arms over your head without bending the elbows or rotating the arms. The RA will then tell the findings to the PI and the PI will record the results onto the data collection form. The RA will remain blind folded, the PI will bring you out of the room, and the next participant will be randomly brought into the room in the same fashion.

How long will I be in the study?

On the day of the test, you will be asked to participate in 1 testing session (Trial 1 and Trial 2) that may last approximately 1 hour in duration (each trial lasts approximately 1 minute in duration with approximately 15 minutes of wait time in between; depending on the number of participants in a group the total time may extend to one hour for the entire testing period: Trial 1, Trial 2, and wait time).

What are the risks involved in this study?

There are no anticipated direct health risks to you. In the event of any health concerns during Trial 1 or Trial 2 of the Clavicular Jump Test (CJT), you must inform the PI immediately. In the event a participant will require medical attention, you will be referred to Seton Hall University Health Services, Located at 303 Centre Street, South Orange, NJ, 07079.

Are there benefits to taking part in the study?

There are no anticipated direct health benefits to you. You will not receive any monetary benefits for your participation in this study.

What other treatment options are there?

There are no treatments being investigated in this study and therefore no other treatment options are available.

How will information about me be kept private?

Protection and confidentiality will be maintained throughout the duration of the research project. No personal identifying information will be collected from you.

However, upon the completion of the study, the informed consent, data collection, and the medical screen forms will be kept in a locked filing cabinet in the Principal Investigator's home for three years after which time all data will be destroyed. Similarly, all electronic data will be stored on a USB memory key with access to the file protected b use of password only known to the Principal Investigator. The memory key will also remain in a secured filing cabinet for three years, upon which time the data will be destroyed

Your identity and participation are confidential to the extent permitted by law. If investigational drugs and/or medical devices subject to U.S. Food and Drug Administration regulation (FDA) are involved, however, it may be necessary for this consent form and other medical records to be reviewed by representatives of the FDA. In addition the sponsor (list the name of the sponsor), representatives of the sponsor, the Director of Research or designee, or the Institutional Review Board will be granted direct access to your original medical records for verification of clinical trial procedures and/or data without violating your confidentiality to the extent permitted by applicable laws and regulations. By signing this consent you or your legally acceptable representative is authorizing such access.
Records identifying you will be kept confidential to the extent permitted by applicable law. If the results of the trial are published your identity will remain confidential.

What are the costs?

There are no costs associated with this study.

What are my rights as a research participant?

Your decision to take part in this study is voluntary. If you decide not to participate or if you choose to withdraw after beginning the study, you will not lose any benefits associated with your medical care. You are encouraged to ask questions before deciding whether you wish to participate and at any time during the course of the project. Your participation may be terminated by the investigator or sponsor without regard to your consent. You will be told of any new findings that may influence your decision to continue to participate in this research project. If information becomes available that may influence your decision to take part in this study you will be asked to sign a revised consent or consent addendum. This will be at the discretion of the Institutional Review Board. In the case of physical injury resulting from participation in the study, treatment determined by a physician will be made available to you. This care will be billed to you/your insurance company in the usual and customary manner. There will be no monetary compensation by Hackensack University Medical Center and/or Seton Hall University.

Who can I call if I have questions or problems?

For questions concerning this research project and/or research subjects' rights, you should call The Research Integrity Office at 551-996-2255. In the event that medical assistance is required, you are instructed to call Seton Hall University Health Services at 973-761-9175. A description of this clinical trial will be available on

http://www.ClinicalTrials.gov, as required by U.S. Law. This Web site will not include information that can identify you. At most, the Web site will include a summary of the results. You can search this Web site at any time.

Financial Disclosure

The Principal investigator is not receiving payment for this study and/or for his participation in this protocol. If you have questions about this disclosure please call the Research Integrity Office at (551) 996-2255.

Consent

- **I have read this consent form or it has been read to me.**
- **All of the questions that I had were answered to my satisfaction.**
- **I have been told that I will receive a signed copy of this consent form for my records.**
- **By signing this consent form I have not waived any of the legal rights which I otherwise would have as a participant in a research study.**

I hereby consent to participate.

_____

Subject's Name

_____ _____/_____

Signature of Subject Date Time

_____

Name of Legally Authorized Representative *[when applicable]*

_____ _____/_____

Signature of Legally Authorized Representative *[when applicable]* Date Time

_____

Name of Person Conducting Informed Consent Discussion

_____ _____/_____

Signature of Person Conducting Date Time

Appendix C
American Physical Therapy Association (2003).

DOCUMENTATION TEMPLATE FOR PHYSICAL THERAPIST PATIENT/CLIENT MANAGEMENT
Outpatient Form, Page 2

22 MEDICAL/SURGICAL HISTORY

a Please check if you have ever had:

(1) ☐ Arthritis
(2) ☐ Broken bones/ fractures
(3) ☐ Osteoporosis
(4) ☐ Blood disorders
(5) ☐ Circulation/vascular problems
(6) ☐ Heart problems
(7) ☐ High blood pressure
(8) ☐ Lung problems
(9) ☐ Stroke
(10) ☐ Diabetes/ high blood sugar
(11) ☐ Low blood sugar/ hypoglycemia
(12) ☐ Head injury
(13) ☐ Multiple sclerosis
(14) ☐ Muscular dystrophy
(15) ☐ Parkinson disease
(16) ☐ Seizures/epilepsy
(17) ☐ Allergies
(18) ☐ Developmental or growth problems
(19) ☐ Thyroid problems
(20) ☐ Cancer
(21) ☐ Infectious disease (eg, tuberculosis, hepatitis)
(22) ☐ Kidney problems
(23) ☐ Repeated infections
(24) ☐ Ulcers/stomach problems
(25) ☐ Skin diseases
(26) ☐ Depression
(27) ☐ Other:_____

b Within the past year, have you had any of the following symptoms? (Check all that apply)

(1) ☐ Chest pain
(2) ☐ Heart palpitations
(3) ☐ Cough
(4) ☐ Hoarseness
(5) ☐ Shortness of breath
(6) ☐ Dizziness or blackouts
(7) ☐ Coordination problems
(8) ☐ Weakness in arms or legs
(9) ☐ Loss of balance
(10) ☐ Difficulty walking
(11) ☐ Joint pain or swelling
(12) ☐ Pain at night
(13) ☐ Difficulty sleeping
(14) ☐ Loss of appetite
(15) ☐ Nausea/vomiting
(16) ☐ Difficulty swallowing
(17) ☐ Bowel problems
(18) ☐ Weight loss/gain
(19) ☐ Urinary problems
(20) ☐ Fever/chills/sweats
(21) ☐ Headaches
(22) ☐ Hearing problems
(23) ☐ Vision problems
(24) ☐ Other:_____

c Have you ever had surgery? (1) ☐ Yes (2) ☐ No
If yes, please describe, and include dates:

	Month	Year
_____	☐☐	☐☐☐☐
_____	☐☐	☐☐☐☐
_____	☐☐	☐☐☐☐

For men only: d Have you been diagnosed with prostate disease? (1) ☐ Yes (2) ☐ No

For women only:
Have you been diagnosed with:
e Pelvic inflammatory disease? (1) ☐ Yes (2) ☐ No
f Endometriosis? (1) ☐ Yes (2) ☐ No
g Trouble with your period? (1) ☐ Yes (2) ☐ No
h Complicated pregnancies or deliveries? (1) ☐ Yes (2) ☐ No
i Pregnant, or think you might be pregnant? (1) ☐ Yes (2) ☐ No
j Other gynecological or obstetrical difficulties? (1) ☐ Yes (2) ☐ No
If yes, please describe: _____

23 CURRENT CONDITION(S)/CHIEF COMPLAINT(S)

a Describe the problem(s) for which you seek physical therapy:
_____
_____

b When did the problem(s) begin (date)? Month ☐☐ Year ☐☐☐☐
c What happened? _____
_____

d Have you ever had the problem(s) before?
(1) ☐ Yes
(a) What did you do for the problem(s)? _____
(b) Did the problem(s) get better? 1. ☐ Yes 2. ☐ No
(c) About how long did the problem(s) last? _____
(2) ☐ No

23 Current Condition(s)/Chief Complaint(s) (continued)

e How are you taking care of the problem(s) now? _____
_____

f What makes the problem(s) better? _____
_____

g What makes the problem(s) worse? _____
_____

h What are your goals for physical therapy? _____
_____

i Are you seeing anyone else for the problem(s)? (Check all that apply)

(1) ☐ Acupuncturist
(2) ☐ Cardiologist
(3) ☐ Chiropractor
(4) ☐ Dentist
(5) ☐ Family practitioner
(6) ☐ Internist
(7) ☐ Massage therapist
(8) ☐ Neurologist
(9) ☐ Obstetrician/gynecologist
(10) ☐ Occupational therapist
(11) ☐ Orthopedist
(12) ☐ Osteopath
(13) ☐ Pediatrician
(14) ☐ Podiatrist
(15) ☐ Primary care physician
(16) ☐ Rheumatologist
Other: _____

24 FUNCTIONAL STATUS/ACTIVITY LEVEL (Check all that apply)

a ☐ Difficulty with locomotion/movement:
(1) ☐ Bed mobility
(2) ☐ Transfers (such as moving from bed to chair, from bed to commode)
(3) ☐ Gait (walking)
(a) ☐ On level (c) ☐ On ramps
(b) ☐ On stairs (d) ☐ On uneven terrain
b ☐ Difficulty with self-care (such as bathing, dressing, eating, toileting)
c ☐ Difficulty with home management (such as household chores, shopping, driving/transportation, care of dependents)
d ☐ Difficulty with community and work activities/integration
(1) ☐ Work/school
(2) ☐ Recreation or play activity

25 MEDICATIONS

a Do you take any prescription medications? (1) ☐ Yes (2) ☐ No
If yes, please list: _____
_____

b Do you take any nonprescription medications? (Check all that apply)

(1) ☐ Advil/Aleve
(2) ☐ Antacids
(3) ☐ Ibuprofen/ Naproxen
(4) ☐ Antihistamines
(5) ☐ Aspirin
(6) ☐ Decongestants
(7) ☐ Herbal supplements
(8) ☐ Tylenol
(9) ☐ Other: _____
_____
_____

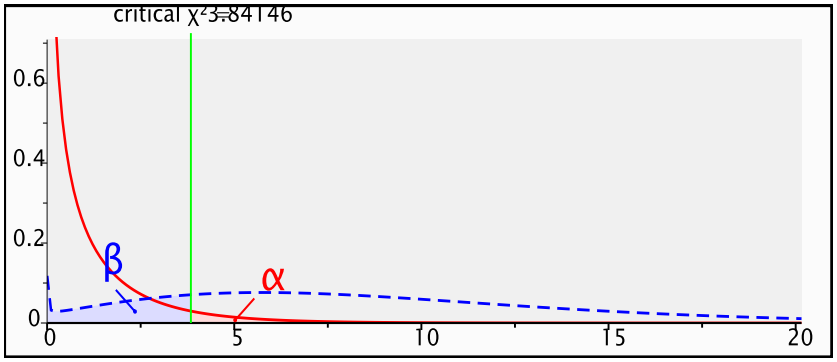
c Have you taken any medications previously for the condition for which you are seeing the physical therapist?
(1) ☐ Yes (2) ☐ No If yes, please list:
_____

26 OTHER CLINICAL TESTS Within the past year, have you had any of the following tests? (Check all that apply)

a ☐ Angiogram
b ☐ Arthroscopy
c ☐ Biopsy
d ☐ Blood tests
e ☐ Bone scan
f ☐ Bronchoscopy
g ☐ CT scan
h ☐ Doppler ultrasound
i ☐ Echocardiogram
j ☐ EEG (electroencephalogram)
k ☐ EKG (electrocardiogram)
l ☐ EMG (electromyogram)
m ☐ Mammogram
n ☐ MRI
o ☐ Myelogram
p ☐ NCV (nerve conduction velocity)
q ☐ Pap smear
r ☐ Pulmonary function test
s ☐ Spinal tap
t ☐ Stool tests
u ☐ Stress test (eg, treadmill, bicycle)
v ☐ Urine tests
w ☐ X-rays
x ☐ Other:_____

Appendix D

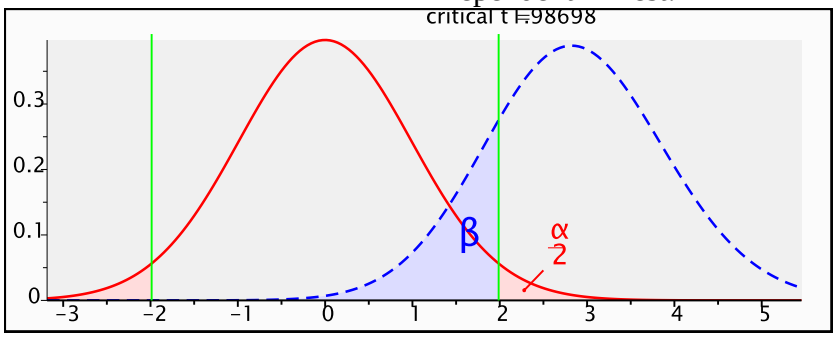
The first *a priori* analysis was based upon the assumption for the conduction of a Chi Square Test.



Chi Square Test:	Goodness-of-fit tests: Contingency Tables		
Type of power analysis: effect size	Compute required sample size – given α, power, and		
Input:	Effect size w:	=	0.3
	α effor probability:	=	0.05
	Power (1 – β error probability):	=	0.8
	Degrees of freedom:	=	1
Output:	Noncentrality parameter λ:	=	7.92
	Critical X^2:	=	3.84
	Total sample size:	=	88
	Actual power:	=	0.8

Appendix E

The second *a priori* analysis was based upon the assumption for the conduction of a Dependent T-Test.



Dependent T-Test: (matched pairs)	Means: Difference between two dependent means		
Type of power analysis: effect size	Compute required sample size – given α, power, and		
Input:	Effect size w:	=	0.3
	α effor probability:	=	0.05
	Power (1 – β error probability):	=	0.8
	Degrees of Freedeom:	=	1
Output:	Noncentrality parameter δ:	=	2.85
	Critical t:	=	1.99
	Degrees of freedeom:	=	89
	Total sample size	=	90
	Actual power	=	0.8

Appendix F

Actual Flyer for Participant Recruitment

Purpose of the Study

The purpose of this pilot study is to determine the intra-rater reliability of the Clavicular Jump Test (CJT). This study is considered a pilot study. The purpose of this pilot study is two-fold: 1) to determine the reliability of test method used by Physical Therapists to determine if there is a dysfunction in the sacroiliac (SI) joint and 2) to test the methodology employed in determining the reliability of this test method before employing it in a greater population.

Duration of the Study

Estimated length of time to participate in the study is approximately one hour.

Procedures

If you choose to participate, you will be asked to:

1. Complete an informed consent and medical screen form.
2. Be asked by the research assistant about which hand you use most often.
3. Be asked by the research assistant to sit at the edge of a treatment table, while the research assistant places his index and middle fingers on the collar bone as you are asked to raise your arms over your head.
4. You will then be asked to leave the room where the research is being conducted while another subject is brought into the room for the same exam.
5. Once all subjects have completed the first trial, the research assistant will be blinded folded, the principal investigator will bring you back into the room, where you will have the same test performed. The only difference for this trial is that the principal investigator will place the research assistant's fingers onto the collar bone.
6. Following your participation in the second trial of this test, you may leave.

Voluntary Nature of the Study

Participation is completely voluntary and subjects can withdraw at any time with no penalty, prejudice or questions asked.

Anonymity and Confidentiality

All information will be kept strictly confidential and anonymous. You will not be identified by name or description in any of the data collection forms. A numbered coding system on the data collection forms will be used to maintain complete anonymity. Protection and confidentiality will be maintained throughout the duration of the research project.

For Additional Details

Thomas A Koc, Jr. PT, DPT, CIMT, Doctoral Candidate, School of health and Medical Science – Seton Hall University at 201-693-0285 or Thomas.Koc@student.shu.edu.

Appendix G

Letter of Solicitation for Participant Recruitment

Date:

Study Title: *Methodology: Intra-rater Reliability of the Clavicular Jump Test.*

Dear ____:

You are reading the subject solicitation letter for the above mentioned study, *Methodology: Intra-rater Reliability of the Clavicular Jump Test*.

Who Am I?
My name is Thomas A. Koc, Jr. PT, DPT, CIMT. I am a licensed Physical Therapy, and a doctoral student at Seton Hall University in the Department of Interprofessional Health Sciences & Health Administration. I am conducting this research study in partial fulfillment of my dissertation requirement for the Ph.D in Health Sciences with a specialization in Movement Science. You are being invited to participate in this research.

What is the purpose of the study?
The purpose of this pilot study is to determine the intra-rater reliability of the Clavicular Jump Test (CJT). This study is considered a pilot study. The purpose of this pilot study is two-fold: 1) to determine the reliability of test method used by Physical Therapists to determine if there is a dysfunction in the sacroiliac (SI) joint and 2) to test the methodology employed in determining the reliability of this test method before employing it in a greater population.

What is the study procedure?
If you choose to participate:

1. You will be asked to complete an informed consent and medical screen form.
2. You will be asked about which hand you consider to be your dominant one or the hand you use most often.
3. You will be asked to sit at the edge of a treatment table, while the research assistant places his index and middle fingers on the collar bone. Then you will be asked to raise your arms over your head.

4. You will be then asked to leave the room where the research is being done while another person is brought into the room for the same exam.
5. Once everyone is done with the first trial, the research assistant will be blinded folded. The principal investigator will bring you back into the room and you will have the same test performed. The only difference for this trial is that the principal investigator will place the research assistant's fingers onto the collar bone.
6. Following your participation in the second trial of this test, you may leave.

Is participation voluntary?
Your participation in this research study is completely voluntary. You may decide to withdraw or discontinue participation in this study at any time. If you decide to withdraw or not participate, you will not be penalized.

What will happy to the study data?
You will not be identified by name or description in any of the data collection forms. A numbered coding system on the data collection forms will be used to maintain complete anonymity. Protection and confidentiality will be maintained throughout the duration of the research project. Upon completion of the study, after three years, all files will be destroyed. All electronic data will be stored on a USB memory key with access to the file protected password known only to the principal investigator. The USB memory key will be kept in a locked file cabinet for three years. The data on the USB memory key will be destroyed after three years.

Risks and Benefits to participating
There is no foreseeable risk or discomfort that is anticipated by participating in this study. There are no foreseeable direct benefits to you by participating in this study. However, the results of this study will off potential benefits of new knowledge to assist Physical Therapists perform clinical mobility tests for patients with shoulder pain/limitations/dysfunctions, which ultimately may influence a patient's plan or care.

Compensation
There will be no monetary of any kind of compensation for your participation.

Ways to participate in this study and request of further information
You have the right to ask questions concerning this study at any time. If you have any questions concerning this study or your rights as a study subject, please contact the principal investigator, Thomas A. Koc, Jr. PT, DPT, CIMT, through the office of Dr. H. James Phillips, PT, Ph.D OCS, FAAOMPT, Dissertation Chair in the Department of Interprofessional Health Sciences and Health Administration at 973-275-2250. Additionally, Christine Sedrak, Hackensack University Medical Center's Principal Investigator Overseer, in the Office of the IRB may be reached at 551-996-2255.

Thank you for considering participating and contributing to my dissertation research. Your time and consideration are greatly appreciated

Sincerely,

Thomas A. Koc, Jr. PT, DPT, CIMT
Principal Investigator

Appendix H

Research Assistant Training Script

The purpose of this training script is for the principal investigator (PI) to train the research assistant (RA) on how to perform the Clavicular Jump Test on an individual subject, to complete the data collection forms and the overall protocol for the dissertation research project that is to be followed.

*** * * * ***

Principal Investigator (PI) is Thomas A. Koc. Jr. PT, DPT, CIMT.
Research Assistant (RA) is Joseph Biland. PT, DPT, OCS, CIMT.

Training Script

Throughout the exchange between the PI and the RA, the RA will be told what the processes/procedures will be and what is expected of his performance and the RA will be encouraged to dialogue with the PI so that a clear understanding of the role and responsibilities of the RA occurs by the end of the training. Additionally the RA will understand that he is to utilize the training materials as he has been instructed so that consistency from subject to subject occurs as the testing begins.

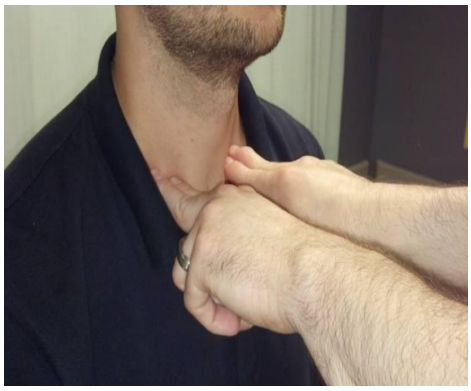
PI: You are asked to assist with this research project. To limit bias to this study you will not be informed of the purpose of this study. You will be performing the Clavicular Jump Test on a subject.

RA: Will verbalize to PI understanding. RA may ask questions to PI. PI will answer questions.

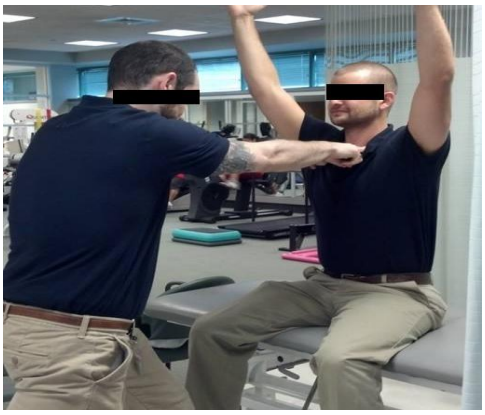
PI: I will now provide you the definition of the Clavicular Jump test. To perform the clavicular jump test, the examiner instructs the subject to place his/her arms at their sides. The examiner will place the pads of the index and middle fingers on the proximal ends of the clavicles. The subject is instructed to slowly raise their arms over their head without bending the elbows or rotating the arms. If the clavicles were even to start with and are not uneven, the problem may be found in the pelvis on the side which is now superior (with the most likely dysfunction being an upslip) (Marcus 2004). A positive test is indicated when the proximal clavicle moves in the superior direction. A negative test is indicated when the proximal clavicle moves in the inferior direction. Do you have any questions?
RA: Will verbalize to PI understanding. RA may ask questions to PI. PI will answer questions.

PI: I will now provide you with instructions on how to perform the Clavicular Jump Test. You will instruct the subject to place his/her arms at their sides. The investigator will place the pads of the index and middle fingers on top of the proximal clavicle at the sternum. The subject is instructed to slowly raise their arms over their

head without bending the elbows or rotating the arms (Figure 1a & b). Do you have any questions?



Clavicular Jump Test: Static
© 2015 Thomas A. Koc, Jr



Clavicular Jump Test: Dynamic
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During this instruction phase, images of how this test is performed will be provided to the RA along with the actual physical mechanics of how the test is performed. (Appendix C-4)

RA: Will verbalize to PI understanding. RA may ask questions to PI. PI will answer questions.

PI: I will now perform this test on you and I will read you the script that you will read to each subject.

"Place your arms at your side. I am going to place my fingers where you collar bone meets your breast bone. When I ask you to, slowly raise your arms over your head." The subject will then slowly raise their arms over his/her head. "You may lower your hands back down to your side. You are now finished. Thank you."

> Note: the PI will perform the Clavicular Jump Test on the RA while reading and explaining the steps of the test as indicated herein and repeat this step three times to ensure that the RA understands and verbalizes to the PI understanding of the protocol. Do you have any questions?

RA: Will verbalize to PI understanding. RA may ask questions to PI. PI will answer questions.

PI: You will now perform this on me and you will read the script that will be read to each subject.

"Place your arms at your side. I am going to place my fingers where you collar bone meets your breast bone. When I ask you to, slowly raise your arms over your head."

The subject will then slowly raise their arms over his/her head. ”You may lower your hands back down to your side. You are now finished. Thank you.”

> Note: the RA will perform the Clavicular Jump Test on the PI while reading and explaining the steps of the test as indicated herein and repeat this step three times to ensure to the PI that the RA knows how to perform the Clavicular Jump test and how to read the script of the protocol.

RA: You will perform the Clavicular Jump Test three times on the PI and read the script to the PI. RA demonstrates and verbalizes to PI understanding. RA may ask questions to PI.

PI: Now I will review with you the Hand Dominance section of the data collection form. The PI will hand the RA a copy of the data collection form (as seen below): You will ask each subject about their Hand dominance by stating, “What is your dominant hand, your right, or left?”. For example, if the subject states “Right”, then you will write “yes” in the box under “Right Hand” and write “no” under “Left Hand”.

Hand Dominance	Right Hand	Left Hand
	Yes	No

***Indicate: “Yes” in the column designating the hand that the patient indicates is “dominant” for them. For example: “Yes” is written in the column for the Right Hand (on the left side column) for the dominant hand the patient indicated, and “No” is written in (on the right side column) since the patient indicated his left hand is non-dominant.

RA: Will verbalize to PI understanding. RA may ask questions to PI. PI will answer questions.

PI: Now I will review with you the Initial Recording section of the data collection form. After performing the Clavicular Jump Test on each subject you will write “Positive” and/or “Negative” on the Right and Left side for each subject. For example, if the subject demonstrates a positive clavicular jump test on his/her right side and a negative clavicular jump test on his/her left side, you will write the following:

Initial Recording

	Right Side	Left Side
Clavicular Jump Test	Positive	Negative

*** Indicate: “Positive” for a positive test, “Negative” for a negative test.***

RA: Will verbalize to PI understanding. RA may ask questions to PI. PI will answer questions.

Data Collection Form (Trial 1)

Hand Dominance	Right Hand	Left Hand

***Indicate: "Yes" in the column designating the hand that the patient indicates is "dominant" for them. For example: "Yes" is written in the column for the Right Hand (on the left side column) for the dominant hand the patient indicated, and "No" is written in (on the right side column) since the patient indicated his left hand is non-dominant.

Initial Recording

	Right Side	Left Side
Clavicular Jump Test		

*** Indicate: "Positive" for a positive test, "Negative" for a negative test.***

For example: based on a test performed the patient demonstrated a "jump" in the clavicle on the right side of his body.

Initial Recording

	Right	Left
Clavicular Jump Test	Positive	Negative

*** Indicate: "Positive" for a positive test, "Negative" for a negative test.***

Data Collection Form (Trial 2)

Final Recording

	Right	Left
Clavicular Jump Test		

*** Indicate: "Positive" for a positive test, "Negative" for a negative test.***

Instructions for Part 2 of Test: Blindfold

PI: I will now review with you the second part of this research project. After you have performed the Clavicular Jump Test on each subject, have completed the data collection form, and all of the subjects are out of the room I will blind fold you with a

PrimeEffects™ Sweet Dreams eye mask (see below). This will limit your vision and help prevent bias while performing the Clavicular Jump Test for the second time. You will stay in the room and I will bring in one subject at a time. I will ask each subject to:
"Place your arms at your side. I am going to place Joe's fingers where you collar bone meets your breast bone. When I ask you to, slowly raise your arms over your head." The subject will then slowly raise their arms over his/her head. "You may lower your hands back down to your side. You are now finished. Thank you."

You will then verbalize the results, either Positive or Negative, on the right and left side to me and PI will complete the "Final Recording" portion of the data collection form. You will keep the PrimeEffects™ Sweet Dreams eye mask on at all times. I will escort each subject out of the room, I will bring the next subject into the room, and the next subject will be tested. This process will be continued until all subjects have been tested.

RA: Will verbalize to PI understanding. RA may ask questions to PI. PI will answer questions.

Appendix I

Research Assistant Checklist

Action	Completed		Comment
1. Participate in meeting with the principal investigator.	Yes	No	
2. Review Definition of Clavicular Jump Test with principal investigator.	Yes	No	
3.Review of performing the Clavicular Jump Test with principal investigator.	Yes	No	
4.Demonstration of Clavicular Jump Test on principal investigator.	Yes	No	
5.Review of Hand Dominance Collection with principal investigator.	Yes	No	
6.Review of Data Collection (Trial 1) with principal investigator.	Yes	No	
7.Participate in meeting the principal investigator to identify any problems and answer any questions, comments, or concerns.	Yes	No	
8. Research Assistant acknowledges “Thank you from principal investigator.	Yes	No	

Appendix J

Principal Investigator Checklist

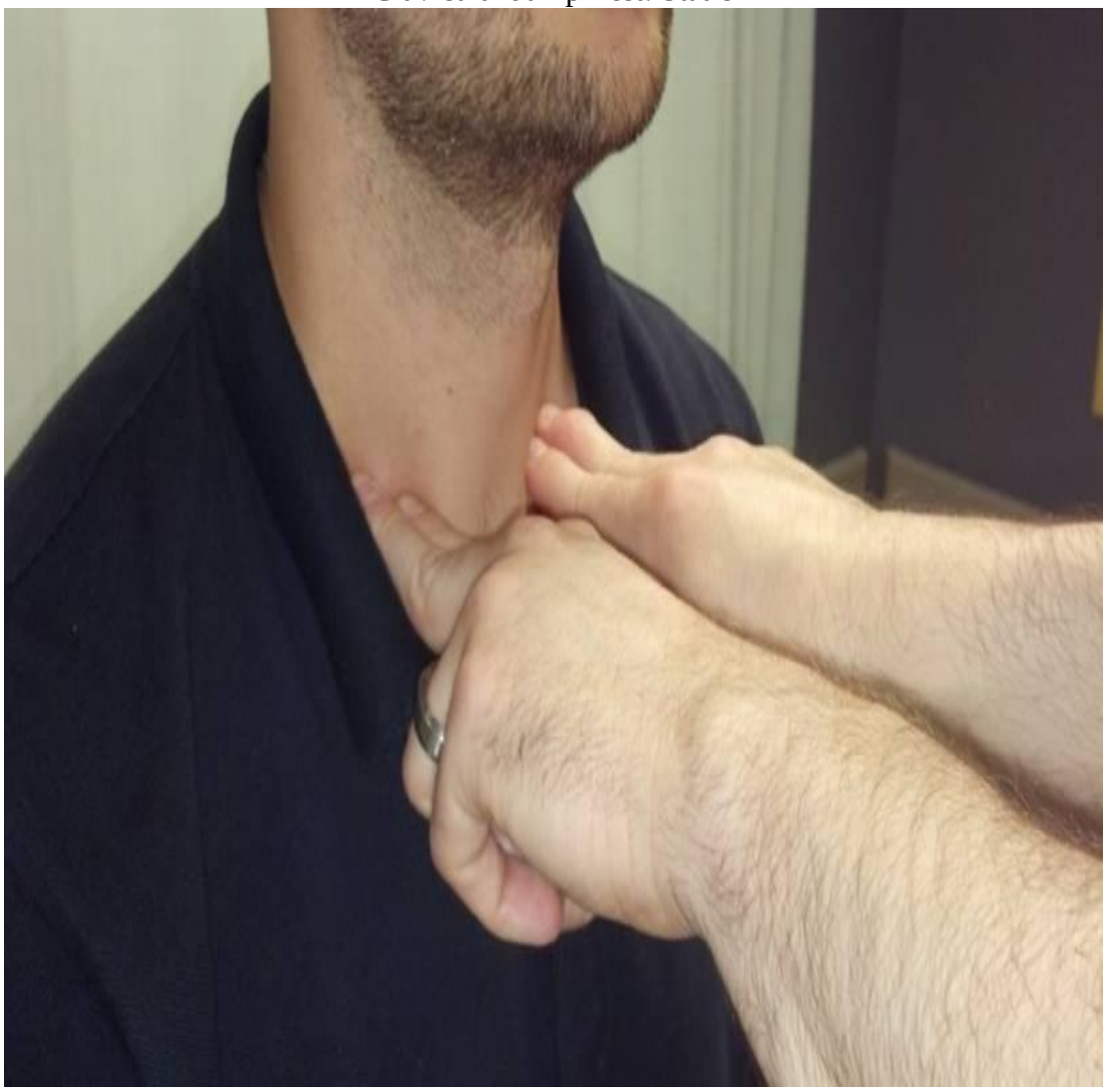
Action	Completed		Comment
1. Participate in meeting with the research assistant.	Yes	No	
2. Review Definition of Clavicular Jump Test with research assistant.	Yes	No	
3.Review of performing the Clavicular Jump Test with research assistant.	Yes	No	
4.Demonstration of Clavicular Jump Test on research assistant prior to research assistant demonstrating test on principal investigator.	Yes	No	
5.Review of Hand Dominance Collection with research assistant.	Yes	No	
6.Review of Data Collection (Trial 1) with research assistant.	Yes	No	
7.Participate in meeting the research assistant to identify any problems and answer any questions, comments, or concerns.	Yes	No	
8. Principal investigator says “Thank you” to the research assistant.	Yes	No	
9. Informed consent was obtained by each subject.	Yes	No	
10.Medical screening form was completed by each subject and individually reviewed by the principal investigator	Yes	No	

Appendix K

Images of How to Perform the Clavicular Jump Test

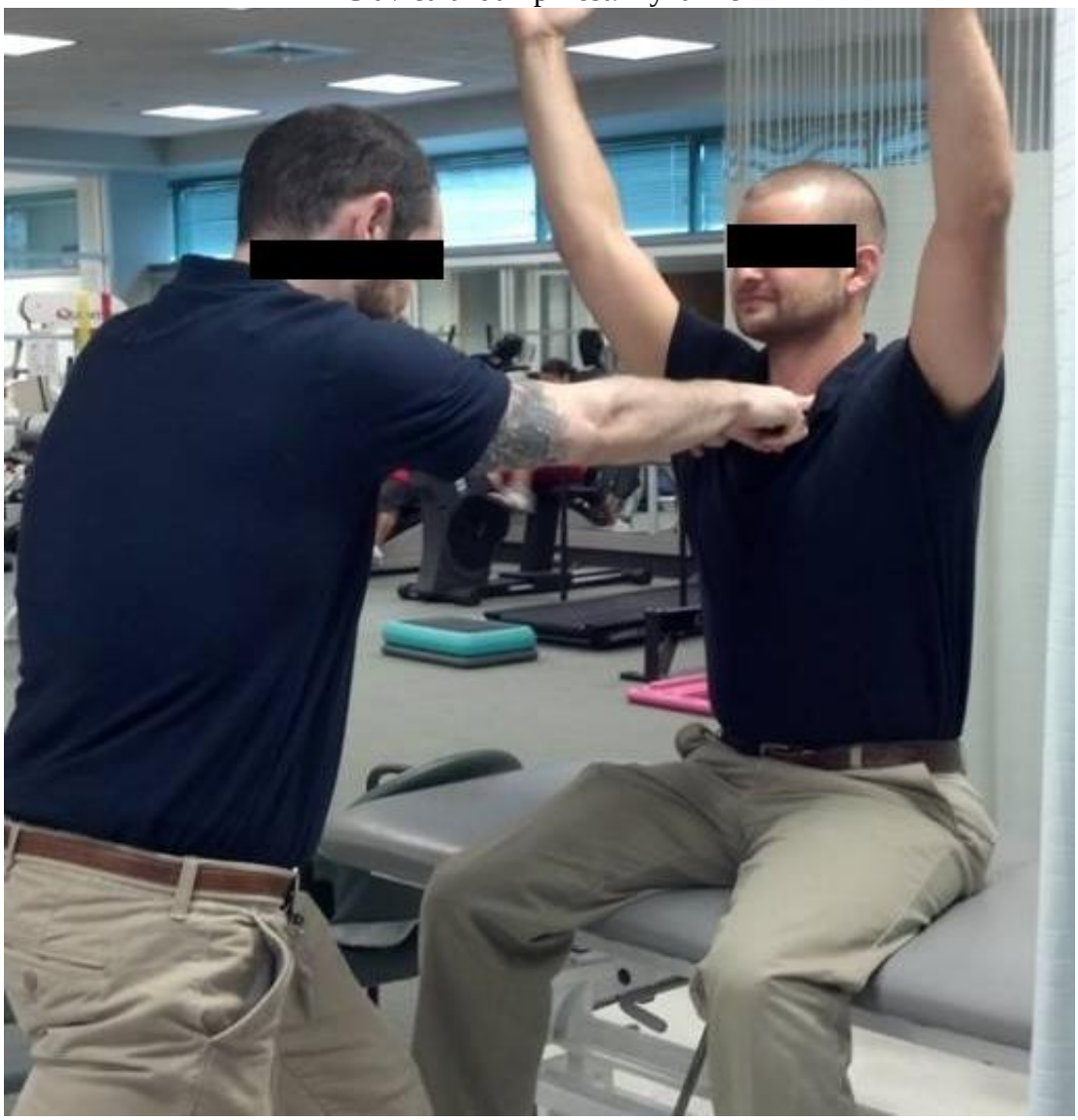
Appendix K-A

Clavicular Jump Test: Static



Appendix K-B

Clavicular Jump Test: Dynamic



Appendix L

Reference Form: Sample of a Finished Data Collection Form for one subject: Trial 1, 2, and Hand Dominance

Data Collection Form (Trial 1)

Hand Dominance	Right Hand	Left Hand
	Yes	No

***Indicate: "Yes" in the column designating the hand that the patient indicates is "dominant" for them. For example: "Yes" is written in the column for the Right Hand (on the left side column) for the dominant hand the patient indicated, and "No" is written in (on the right side column) since the patient indicated his left hand is non-dominant.

Initial Recording

	Right Side	Left Side
Clavicular Jump Test	Positive	Negative

*** Indicate: "Positive" for a positive test, "Negative" for a negative test.***

Data Collection Form (Trial 2)

Final Recording

	Right	Left
Clavicular Jump Test	Positive	Negative

*** Indicate: "Positive" for a positive test, "Negative" for a negative test.***