

## The Intra-rater Reliability of the Clavicular Jump Test (CJT): A Case Control Study

Thomas A Koc<sup>1\*</sup>, H Jim Phillips<sup>2</sup>, Deborah A DeLuca<sup>3</sup>, Annette Kirchgessner<sup>3</sup>

<sup>1</sup>School of Physical Therapy, Kean University, 1000 Morris Ave Union, NJ 07083, USA; <sup>2</sup>Bergen P. T. Associates 495 Mola Blvd #7 Elmwood Park, NJ 07407, USA; <sup>3</sup>Interprofessional Health Sciences Campus, Seton Hall University, 340 Kingsland St, Nutley, NJ 07110, USA

### ABSTRACT

**Level of evidence:** A case control study.

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

**Design:** This is a case control one-group pretest-posttest (repeated measures) study.

**Methods:** 96 participants with an average age of 28 ( $\pm$  4.78) volunteered to participate in this research project. A single examiner, blinded to the identity of the participants, conducted the CJT on both shoulders, then repeated the test on each participant in a random order.

**Results:** The results of a Pearson chi-square test of the CJT of trial 1 and trial 2 on the right side indicated a statistically significant agreement,  $\chi^2(1)=44.29$ ,  $p<0.05$  with kappa statistic (k) of the CJT of trial 1 and trial 2 on the right side indicating "substantial levels" of agreement,  $k=0.67$ ,  $p<0.05$ . The results of a Pearson chi-square test of the CJT of trial 1 and trial 2 on the left side indicated a statistically significant agreement,  $\chi^2(1)=5.69$ ,  $p<0.05$  with kappa statistic (k) of the CJT of Trial 1 and Trial 2 on the Left side indicating "fair" levels of agreement,  $k=0.24$ ,  $p<0.05$ . A post-hoc power analysis showed to have a power  $(1-\beta)=0.84$ .

**Conclusion:** There is now intra-rater reliability for the CJT. There is methodology created during this study that makes assessing the reliability of the CJT in a practice environment possible.

**Keywords:** Special tests; Sacroiliac joint; Shoulder

### INTRODUCTION

#### Shoulder pain

Shoulder pain and resulting disability is a common problem with an annual incidence ranging from 4.7% to 46.7% depending on age [1,2]. The 1-year occurrence of shoulder pain is 51% and the lifetime prevalence is  $\sim$ 10%. Approximately 50% of patients with shoulder pain seek medical attention [2]. The majority ( $\sim$ 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  $\sim$ 40% persist for up to 12 months.

The direct costs for the treatment of shoulder pain in the U.S. for 2000 totaled 7 billion dollars [2,3]. This is linked with a high cost to society and a significant burden to the patient. Shoulder pain is the third most common type of musculoskeletal pain which is only surpassed by low back and neck pain [2].

In previous studies, it has been reported that there is limited evidence supporting the efficacy of treatment interventions for shoulder pain [4]. 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.

**Correspondence to:** Thomas A Koc, School of Physical Therapy, Kean University, 1000 Morris Ave Union, NJ 07083, USA, Tel: (908)7376175; E-mail: tkoc@kean.edu

**Received date:** June 19, 2020; **Accepted date:** July 03, 2020; **Published date:** July 10, 2020

**Citation:** Koc TA, Phillips HJ, DeLuca DA, Kirchgessner A (2020) The Intra-Rater Reliability of the Clavicular Jump Test (CJT): A Case Control Study. Int J Phys Med Rehabil. 8:557. DOI: 10.35248/2329-9096.20.08.557

**Copyright:** © 2020 Koc TA, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

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 [4,5]. Shoulder pain may be referred from multiple musculoskeletal sources, such as the glenohumeral joint, the acromioclavicular joint, the scapulothoracic joint, the sternoclavicular joint, the subacromial space, the cervical spine, and the elbow. Thus, shoulder pain that is persistent, often has a multifactorial underlying pathology.

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 [2].

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 [6].

### Fascia

Fascia is continuous throughout the body. The majority of the fascial planes are oriented in a longitudinal fashion. Hypertonicity of muscles 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 [7].

The superior front line's bone attachments for the myofascial track extends from the pelvis to the shoulder complex from inferior to superior: the pubic tubercle, then the 5<sup>th</sup> 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 sternocleidomastoid (SCM) muscle, then ending at the fascia of the scalp [8].

The lateral line's 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 1<sup>st</sup> and 2<sup>nd</sup> rib, then to the occipital ridge/mastoid process [8]. 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) [8].

The thoracolumbar fascia 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 [9]. 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 [8,9].

### The pelvic girdle

The functional pelvic girdle actually includes L4 and L5, the two ilia, the sacrum, and the two femurs [10,11]. It consists of at least

11 joints (and surrounding joints) and 33 muscles. The pelvic girdle constitutes the base of the trunk, supporting the superincumbent body structures and linking the vertebral column to the lower extremities [11].

The SI joint is a true joint that possesses synovial membranes [10]. The SI joint has been argued to be a true diarthrodial joint, an amphiarthrodial, an intermediary between a synarthrosis and diarthrosis, and a diarthromphiarthrodial joint. The SI joint has been reported to be diarthrodial until the mid-adult years and then motion progressively decreases [10]. In some anatomical textbooks the SI joint is defined as a symphysis, an intermediate between amphiarthrosis and diarthrosis [11,12]. In others it is considered an atypical arthrodia, although most authors classify it among the diarthroses.

### 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 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 identifying a dysfunction of the SI joint, by using the CJT, with a patient with a shoulder and/or low back pain/dysfunction, a clinician may develop a more targeted plan of care to correct structures and use techniques that are more precise to assist a patient who presents with a shoulder and/or low back pain/dysfunction.

### Purpose

There is no research that has been conducted that has established the intra-rater reliability of the CJT. Therefore, the purpose of this study is to determine the intra-rater reliability of the CJT on the right and left sides.

### METHODS

#### Study design

This is a case control one-group pretest-posttest (repeated measures) study that was conducted in the movement science laboratory on the campus of Seton Hall University, in South Orange, NJ. The Hackensack University Medical Center's Institutional Review Board approved this study (Study # Pro2016-0381). Participants were required to have read and sign the written informed consent prior to the start of the study.

#### Participant recruitment and eligibility

A total of 96 participants (47 males and 49 females) were recruited using a sample of convenience from the campus of Seton Hall University in South Orange, NJ. The participants were male and female, ages 18 to 50 years.

Potential participants were recruited through the use of recruitment flyers and subsequent snowball sampling. Participants were included in they were able to read and write in English, were generally healthy, and read and signed the informed consent form.

### Variables

The independent variables are the performance of the Clavicular Jump Test (CJT) on the right and left sides. The dependent variables were percentages of agreement of the CJT on the right and left sides between Trial 1 and Trial 2.

### Operational definitions

To perform the CJT, 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 was 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 on the floor to minimize postural compensations [13].

### Study protocol and data collection

The examiner was a licensed Physical Therapist and board certified Orthopaedic Clinical Specialist. To limit and decrease potential bias from the examiner's clinical experience and/or any teaching/learning effects, prior to the testing, a training script and check list was reviewed by the PI. For trial 1 of testing, participants were randomized in the exam room, where the examiner performed and recorded outcomes for each participant.

The PI remained outside of the exam room and was blinded to the outcomes of trial 1. For trial 2 of testing, the examiner was blind folded using a Prime Effects TM Sweet Dreams eye mask, participants were randomized, and brought into the exam room by the PI.

The PI placed the examiner's fingers on the proximal ends of the clavicles and the CTJ was performed. The examiner then verbalized the outcomes to the PI and the PI recorded the outcomes.

### Statistical analysis

A Chi-square test was performed for independence to determine if an agreement exists between Trial 1 and Trial 2 of the Clavicular Jump Test on the right and left sides. An a priori power analysis was conducted using G\*Power 3. 1. 7 [14] to determine a sufficient sample size the authors used: an alpha of 0. 05, a power  $(1-\beta)=0. 80$ , a medium effect size of 0. 3,

confidence interval of 0. 95 (or 95%), and degree of freedom of 1.

This study required a total sample size of 88 participants. Cohen's kappa values were used to establish reliability between trials 1 and 2 for the right and left sides. A post-hoc power analysis was conducted using the 96 participants that were recruited at the end of the study. IBM's SPSS version 24 statistical software was used for analysis of the data.

### RESULTS

A total of 96 participants (47 males and 49 females) volunteered to participate in this research project. Of the 96 participants, 84 (87. 5) participants were Right hand dominant and 12 (12. 5%) were Left hand dominant (Table 1). The average age for the participants was 28 ( $\pm 4. 79$ ) and ranged from 18 to 49 years old (Table 2).

**Table 1:** Statistics of gender and hand dominance of the participants.

	Frequency	Percent
Male	47	49%
Female	49	51%
Right Hand Dominant	84	87. 50%
Left Hand Dominant	12	12. 50%

**Table 2:** Age statistics.

N	96
Mean	28. 17
Median	28
Std Deviation	4. 79
Variance	23. 02
Minimum	18
Maximum	49

Pearson Chi-Square ( $\chi^2=44. 29$ ,  $p=0. 00$ ) revealed a substantial level of agreement for the CJT between trial 1 and trial 2 on the right side. The calculated kappa statistic (k) of the CJT of trial 1 and trial 2 on the right side indicated substantial levels [15], of agreement,  $k=0. 67$ ,  $p=0. 00$  (Table 3). Pearson Chi-Square ( $\chi^2=5. 69$ ,  $p=0. 02$ ) revealed a fair level of agreement for the CJT between trial 1 and trial 2 on the left side.

The calculated kappa statistic (k) of the CJT of trial 1 and trial 2 on the left side indicated fair levels of agreement,  $k=0. 24$ ,  $p=0.$

02. A post-hoc power analysis using the 96 participants indicated a power of 0.84 for the Chi-square testing.

**Table 3:** Summary of results.

Intra-Reliability Testing	Pearson Chi-Square value	Kappa (k) value	Standard error	Significance
Trial 1 and Trial 2 of Right side	44.29	0.67	0.09	0.00
Trial 1 and Trial 2 of Left side	5.69	0.24	0.10	0.02

## DISCUSSION

The Dynamic Systems Theory was used to integrate and further explain the results of this study [16]. The instrument used in this study was the CJT. The constructs used in this study were: task, environment, and individual.

Each construct was evaluated to further explore the limitations of this study. The task remained the same for each participant. Each participant 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 participant. The only remaining difference within the environmental construct was the participant's clothing, the clothing of each participant was not consistent from one participant to the next. However, it will be noted that each participant's clothing was consistent from trial 1 and trial 2 for both the right and left sides. The individual, the examiner, remained the same throughout the testing. One area that the PI did not examine on the examiner was the examiner'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.

An extensive review of the literature revealed that hand dominance of a rater has never been studied while performing clinical mobility or pain provocation tests. According to Marcus [13], 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)". There is also no research that indicates the type of dysfunction of the SI joint or incidence of dysfunction found on the ipsilateral or contralateral side.

There are several limitations for this study. This study only utilized 96 participants and therefore does not demonstrate generalizability to larger populations. This study did not incorporate participants who were symptomatic. The participants who participated were asymptomatic. The hand dominance of the examiner was not tested prior to the study. The clothing of the participants was not consistent from participant to participant. This study is limited to only intra-rater reliability and not to inter-rater reliability or validity. The CJT was also studied in isolation and was not studied with a clustering of already established and tested clinical mobility and pain provocation tests.

Future research study may be conducted to explore if there is a relationship between outcomes of a clinical mobility test and hand dominance of a rater or raters. Perhaps, hand dominance may be a factor to explain the poor inter-therapist and intra-therapist reliability of the SI joint pathokinematics.

## CONCLUSION

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

## DECLARATION OF CONFLICTING INTERESTS

The authors declare no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

## INSTITUTIONAL REVIEW BOARD OF ETHICS COMMITTEE

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 (Study # Pro2016-0381).

## ACKNOWLEDGEMENTS

Joseph Biland, PT, DPT, OCS, FAAOMPT for his willingness to participate as the examiner for this study.

## STATEMENT OF FINANCIAL DISCLOSURE AND CONFLICT OF INTEREST

I affirm that I have no financial affiliation (including research funding) or involvement with any commercial organization that has a direct financial interest in any matter included in this manuscript, except as disclosed in an attachment and cited in the manuscript. Any other conflict of interest (i. e. , personal associations or involvement as a director, officer, or expert witness) is also disclosed in an attachment.

## REFERENCES

1. Haddick E. Management of a patient with shoulder pain and disability: A manual physical therapy approach addressing impairments of the cervical spine and upper limb neural tissue. *J Orthop Sports Phys Ther.* 2007;37(6):342-350.
2. Pribicevic M, Pollard H, Bonello R. An Epidemiologic survey of shoulder pain in chiropractic practice in Australia. *J Manipulative Physiol Ther.* 2009;32(2):107-117.

3. Rodeghero JR, Cleland JA, Mintken PE, Cook CE. Risk stratification of patients with shoulder pain seen in physical therapy practice. *J Eval Clin Pract.* 2017;23(2):257-263.
4. Rodeghero JR, Cleland JA, Mintken PE, Cook CE. Risk stratification of patients with shoulder pain seen in physical therapy practice. *J Eval Clin Pract.* 2017;23(2):257-263.
5. Hassett G, Barnsley L. Pain Referral from the Sternoclavicular Joint: A study in normal volunteers. *Rheumatology (Oxford).* 2001;40:859-862.
6. Pribicevic M, Pollard H, Bonello R. An Epidemiologic Survey of Shoulder Pain in Chiropractic Practice in Australia. *J Manipulative Physiol Ther.* 2009;32(2):107-117.
7. Wiles MR. Reproducibility and interexaminer correlation of motion palpation findings of the sacroiliac joints. *J Can Chiropr Assoc.* 1980;24(2):59-69.
8. DiGiovanna EL, Schiowitz S, Dowling DJ. *An Osteopathic Approach to Diagnosis and Treatment.* 3rd ed. Philadelphia, PA: Lippincott Williams and Wilkins, 2005:25-26.
9. Myer TW. *Anatomy trains: Myofascial Meridians for Manual and Movement Therapists.* 2nd ed. New York: Elsevier. 2009: 96-170.
10. Alderink G. The Sacroiliac Joint: Review of Anatomy, Mechanics, and Function. *J Orthop Sports Phys Ther.* 1991;13(2):71-84.
11. Cuppet M, Paladino J. The anatomy and pathomechanics of the sacroiliac joint. *Athl Ther Today.* 2001;6(4):6-14.
12. Paci M. Structure, physiopathology, and rehabilitation of the sacroiliac joint. *Eur J Phys Rehabil Med.* 1999;35(4):207-218.
13. Marcus A. *Foundations for integrative musculoskeletal medicine.* Berkeley, California, 2004:474.
14. Faul F, Erdfelder E, Lang AG, Buchner A. G\*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behav Res Methods.* 2007;39:175-191.
15. Portney LG, Watkins MP. *Foundations of clinical research: applications to practice.* 3rd edn. Upper Saddle River, New Jersey: Pearson Prentice Hall, 2009:94, 580-581, 598-605.
16. Shumway-Cook A, Wollacott MH. Postural control. In: *Motor control Theory and Practical Applications.* 2nd edn. Baltimore, MD: Lippincott Williams and Wilkins, 2003.