

Cody J. Mansfield, Charlie Domnisch, Laura Iglar, Laura Boucher, James Onate & Matthew Briggs (2020) Systematic review of the diagnostic accuracy, reliability, and safety of the sharp-purser test, *Journal of Manual & Manipulative Therapy*, 28:2, 72-81, doi: 10.1080/10669817.2019.1667045

Review submitted by: Helen Shepard

Purpose: There were four aims of this systematic review. First, to determine the diagnostic accuracy of the sharp purser test to update and expand upon a previous review done in 2013. Second, to determine the reliability of the sharp purser test. Third, to determine if any evidence suggested a safety concern with use of the sharp purser test in clinical practice. Fourth, to understand patterns for use of the sharp purser test in clinical practice.

Methods: Five databases were searched from inception to December 19th, 2018, including PubMed, CINAHL, SPORTDiscus, EMBASE, and Google Scholar. All papers published in peer reviewed journals that discussed the sharp purser test were included. Relevant data was gathered in tables, including each study's author, year, number of subjects, age, sex, imaging reference standard, setting, and complications with use of the test. Sensitivity and specificity were calculated, as were positive and negative likelihood ratios.

Results: A total of 32 articles were included in analysis. Due to high heterogeneity, meta-analysis was not advisable. Sensitivity ranged from 0.19 to 1.00, specificity ranged from 0.71 to 0.98, positive likelihood ratios ranged from 0.655 to 22 and negative likelihood ratios ranged from 0.323 to 1.14. Seven RCTs attempted to use the sharp purser test to exclude subjects from research trials, however, there was not a single positive test. A positive sharp purser test was found in six case reports, five of which involved pathological conditions affecting the atlantoaxial joint. In regards to safety, in all 31 studies analyzed, there was no evidence that the sharp purser test was unsafe to perform, however, no study assessed the safety of the test as part of a research question so conclusions are limited.

Conclusion: The reliability of the sharp purser test was only assessed in two studies, but based on that data it has poor reliability which limits the use of the test in clinical practice and research. There was no evidence to suggest potential harm or safety concerns with the use of the sharp purser test. In the cases of positive findings, there was no evidence that performing the test led to a complication and instead seemed to assist clinical reasoning. However, since research has not been done on high risk populations, caution is needed when performing the test on those patients. This article concludes that there is insufficient evidence to support the use of the sharp purser test on patients without rheumatoid arthritis, as the only studies done with diagnostic properties were completed on that patient population.

Commentary: There has always been much debate about the clinical use of the sharp purser test, similar to the controversy on vertebral artery insufficiency tests. Based on this systematic review and my clinical judgment, I think the test should still be used. Research has not found any safety concerns, though clinicians should proceed with caution with high risk patients. While more research on safety is needed, current research seems to support the use of the test particularly in outpatient settings where the strain you are placing on the system is unlikely to be greater than

the strain of daily living. Like most things in physical therapy, detecting upper cervical instability should be a cluster of subjective and objective signs and symptoms and not just based on one test. Prior to performing manual intervention aimed at the upper cervical spine, I believe it is important to have as many data points about safety as possible, which includes using the sharp purser test. It would be interesting to see the reliability of the test when performed as part of a cluster instead of a stand alone test.

Citation: McNicholas K, Comyns TM. Attentional Focus and the Effect on Change-of-Direction and Acceleration Performance. *J Strength Cond Res.* 2020. doi:10.1519/jsc.0000000000003610

Review Submitted by: Anna Wilson

Objective: The purpose of this study was to investigate the effects of varied cues for focus of attention on performance of a change of direction and acceleration task.

Methods: The study included 17 college aged males who were actively involved in field based sports and deemed to be “intermediate trained athletes.” They each performed 3 trials of the Change-of-Direction and Acceleration Test (CODAT) under 3 different conditions with verbal cues to induce neutral (NEU), internal (INT), or external (EXT) focus of attention (described in table below). The trials for the separate conditions were performed on different days and the order of INT vs EXT was varied between subjects. The average of the 3 trials for each condition was used for data analysis. Each subject also filled out a questionnaire at the end of testing that asked- 1) completing the trials, did you follow the instructions that you were given from the audio recording? 2) Did you focus/think about anything else while performing the trials? 3) What did you focus/think about during the trials? A qualitative analysis was then performed that categorized the responses into internal, external, mixed, and other/neutral.

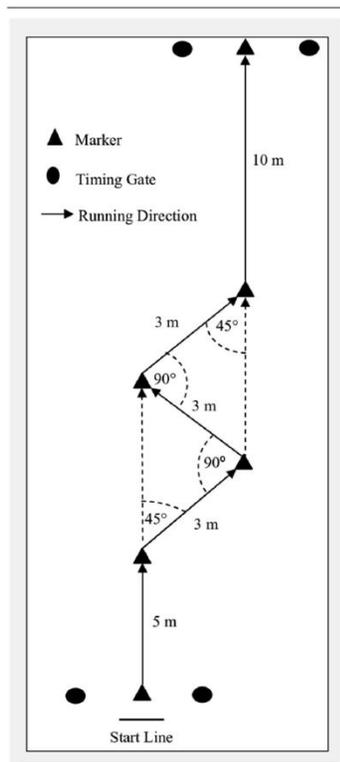


Figure 1. CODAT layout adapted from the study by Lockie et al. (2013). CODAT = change-of-direction and acceleration test.

Table 1
Change-of-direction (COD) verbal instructions for prescribed testing day/session.

Focus of attention	Verbal instructions
Neutral	“Run through the course as quickly as you can with maximum effort”
Internal	“Run through the course as quickly as you can with maximum effort. This change-of-direction and acceleration test consists of 2 parts, a running component and a turning component. For each running component, I want you to focus on moving your legs as rapidly as possible. For the turning component, I want you to focus on planting your foot as firmly as possible”
External	“Run through the course as quickly as you can with maximum effort. This change-of-direction and acceleration test consists of 2 parts, a running component and a turning component. For each running component, I want you to focus on running to the cones as rapidly as possible. For the turning component, I want you to focus on pushing off the ground as forcefully as possible”

Results: Repeated-measures analysis of variance revealed that the run times under the EXT experimental condition were significantly faster than both the NEU and INT experimental conditions. The NEU and INT experimental conditions were not significantly different. Questionnaire responses provided qualitative data that showed subjects performing in the INT and EXT conditions invoked the desired focus of attention 47 and 82% of the time, respectively. The qualitative data also showed that subjects performing in the NEU condition did not use an explicit INT or EXT focus of attention 82% of the time.

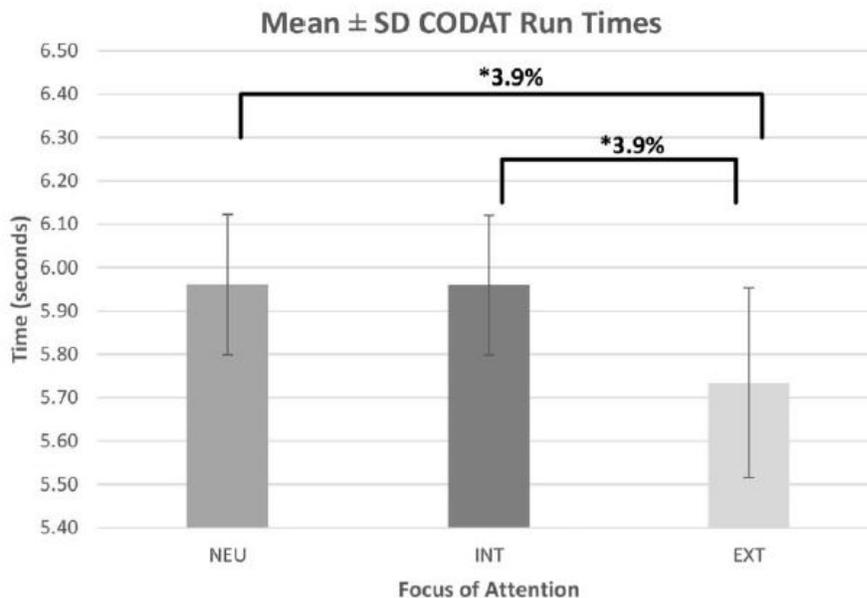


Figure 2. Mean ± SD CODAT times for NEU, INT, and EXT conditions. * $p \leq 0.001$. COD = change-of-direction and acceleration test.

Conclusion: The results of this study showed that complex motor skills such as change of direction and acceleration, as measured by the CODAT, can be enhanced when an athlete's attention is focused externally. Consideration should also be given to the verbal instructions that are being used and the impact that they ultimately have on performance.

Commentary: This article definitely has its flaws- no power analysis, unsure how subjects were recruited, there was no information on the method of randomizing order of trials or if this was evenly distributed, and the actual change between the groups seems to be < 0.3 s with no information given on if this is a meaningful change for this test. However, this article is one of the many out there that demonstrates the power of verbal cues and how using external cues can result in improved outcomes. I think this is important to remember when training specific attributes, movement patterns, outcomes, etc. to facilitate return to sport/function. For me it also points out that sometimes less is more if there was similar results with minimal (neutral) cuing versus internal cuing and qualitatively poor focus on incorporating internal cues.

Harris-Hayes M, Hillen TJ, Commean PK, et al. Hip Kinematics During Single-Leg Tasks in People With and Without Hip-Related Groin Pain and the Association Among Kinematics, Hip Muscle Strength, and Bony Morphology. *J Orthop Sports Phys Ther.* 2020;50(5):243-251. doi:10.2519/jospt.2020.9150

Review Submitted by: Taylor Blattenberger PT, DPT

Objective: To compare the kinematics during a single-leg squat and step-down in people with and without hip related groin pain.

Methods: The researchers recruited patients with hip related groin pain that was reproducible with FADIR test. They also recruited a control group consisting of age and BMI matched subjects without history of hip or LE pain or injury. Subjects were excluded from the study if they had a history of hip surgery or fracture, BMI greater than 30 kg/m², contraindications to MRI, current pregnancy, neuromuscular deficits, or lumbar radiculopathy.

Each subject was evaluated for hip external rotation and abduction strength via handheld dynamometer. They also underwent assessment of bony morphology via MRI. Functionally, subjects were assessed for kinematic data during a single-leg squat and a step-down test. Kinematic data was gathered via an 8-camera Vicon motion capture system.

Results: Subjects with hip related groin pain demonstrated smaller peak hip flexion angles, smaller knee flexion angles at peak hip flexion, and an overall shallower squat depth than asymptomatic subjects during a single-leg squat. Subjects with hip related groin pain also demonstrated weaker hip musculature than asymptomatic individuals. There was no between group differences in hip adduction or IR angles during functional tests nor did bony morphology differ significantly between groups.

In subjects with hip related groin pain weaker hip abductor strength was associated with smaller hip flexion angles during a single leg squat. In subjects without hip related groin pain there was no association between hip muscle strength and hip kinematics.

Conclusion: Subjects with hip related groin pain had smaller hip flexion angles, smaller knee flexion angles, and shallower squat depth than asymptomatic individuals. Smaller hip flexion angles were associated with hip abduction weakness in subjects with symptoms.

Commentary: The key differences between symptomatic and asymptomatic subjects in this study were the decreased squat depth and hip abductor and external rotator weakness. It is difficult to identify whether the decreased depth was due to decreased ROM, pain, avoidance patterns, or insufficient motor control of the hip abductors and external rotators to control descent into deeper ranges. The researchers did add an a posteriori assessment indicating that those with hip related groin pain that reported pain at single-leg squat depth were statistically similar in kinematics to those that did not experience pain in the assessment. This may indicate that pain itself was not a limiting factor and that the associated weakness may be more relevant.

Bony morphology was not significantly different between groups nor was there any association

between it and any other factors. This strengthens the understanding that bony morphology alone does not drive development of symptoms.

Citation: Reid, Susan & Andersen, Josef & Vicenzino, Bill. (2020). Adding mobilisation with movement to exercise and advice hastens the improvement in range, pain and function after non-operative cast immobilisation for distal radius fracture: a multicentre, randomised trial. *Journal of Physiotherapy*. 66. 10.1016/j.jphys.2020.03.010.

Review Submitted by: Steven J. Lagasse

Objective: The study's objective was to assess the effectiveness of combining mobilization with movement (MWM) with exercise and advice for individuals post distal radius fracture and subsequent cast immobilization. The authors' hypothesis was in favor of the experimental group. The primary measure being assessed was forearm supination range of motion (ROM). Secondary measures were wrist extension and flexion ROM, forearm pronation ROM, grip strength, a functional pouring task, and a myriad of patient-reported outcomes measures.

Methods: This study was a prospective, randomized trial that was conducted with concealed allocation, and blinding. The study took place throughout seven physiotherapy centers in Sydney, Australia. Subjects were screened based on inclusion and exclusion criteria before reporting to one of seven clinics for baseline measures. All follow-up measures were taken at four and 12 weeks, however, at 26 and 52 weeks, only patient-reported outcome measures were assessed. Subjects were randomized into either the experimental group, which consisted of MWM + exercises and advice (n = 33) or the control group which consisted of exercises and advice (n = 34). Randomization was created via a computerized randomization sequence, and subject allocation was carried out by an independent statistician. The researchers (licensed physical therapists) who assess the subjects at baseline, were blinded to subject allocation. The subjects were blinded to the study's hypothesis.

Both groups received four physical therapy interventions over the course of four weeks. Each session lasted between 20 and 30 minutes. During the initial session, all subjects were educated to perform upper limb range of motion exercises twice daily. Subjects in the experimental group also received forearm supination and wrist extension MWM exercises. During subsequent sessions, therapists continued to provide advice, and exercise form correction. For the experimental group, the therapists manually performed both MWM exercises for the patient.

Results: At four weeks there was a significant difference in the primary outcome of forearm supination ROM, which favored the experimental group. These differences were still seen at week 12. These findings were similar for secondary ROM outcome measures such as wrist extension and flexion. Subjects also improved in the PRWE, Quick-Dash, and GROG at weeks 4, however, by 12 weeks these differences were no longer seen. By weeks 26 and 52, there were no significant differences between groups regarding primary and secondary outcome measures.

Conclusion: The addition of MWM to physical therapy practice which involved exercise and advice, allowed subjects to more readily experience improve function and ROM. However, these benefits are not apparent at long-term follow-up.

Commentary: The strengths of this study come in the form of rigorous study design and methodology. This study blinded their primary researchers, subjects, and incorporated independent statisticians. This study also clearly states how they measured their primary outcome, while also including minimum clinically important difference and confidence intervals. Further, information was provided regarding power analysis, how they came to their sample size and the standard use of alpha value. Finally, the authors collected information on adherence to the exercise program and adverse events through participant diaries and physiotherapist records.

The weaknesses and/or limitations of the study are the wide confidence intervals backing the authors' findings. This makes many of the findings ambiguous, however, to the authors' merit, this is acknowledged and addressed in the discussion. Additionally, this study's design takes on an "A + B" approach to their interventions, and there were also between-group differences at base-line. Both of these topics are acknowledged by the authors in the article.

Regarding implications, based on this study, I believe the implementation of MWM to be a beneficial intervention. The rationale being that once taught in the clinic, the subjects were able to perform these interventions independently at home. This decreases patient reliance on the therapist which is a common concern regarding the use of manual and/or passive treatment approaches. Additionally, there were benefits seen in favor of the experimental group. Although the confident intervals backing these benefits are wide, there were limited adverse reactions and subject dependence. Thus, the potential for enhanced improvement, even if only in the short term, come with little to no subject risk.

Sadi J, Torchia E, Faber KJ, et al. Posterior Shoulder Instability Classification, Assessment, and Management: An International Delphi Study [published online ahead of print, 2020 Apr 29]. *J Orthop Sports Phys Ther.* 2020;1-63. doi:10.2519/jospt.2020.9225

Review Submitted By: Lauren Carroll

Objective: The purpose of this study was to reach a consensus on the most appropriate clinical examination and treatment strategies for posterior shoulder instability by a group of expert shoulder clinicians of varying backgrounds.

Methods: 3 round e-Delphi study conducted from June 2017 to January 2018 with expert shoulder clinicians recruited from 5 countries in multiple disciplines. Consensus was defined as 70% agreement for each round of questions.

Results: The response rate varied from 81% (round 1) to 94% (round 3), with the majority of responses coming from physical therapists (38%), orthopedic surgeons (34%), and shoulder clinical researchers (15%). Three subgroups were identified based mechanism, direction, and type of injury: traumatic, microtraumatic, and atraumatic.

Conclusion: Subjective reports, management strategies, and outcome measures differ for each of the 3 categories defined in this Delphi study, but there was a consensus achieved for a general framework of management for each subgroup of PSI.

Commentary: This study presents good qualitative information regarding posterior shoulder instability and the management of the different categories of instability. This study recruited experts from multiple countries and multiple disciplines to ensure a “substantial and adequate sample,” but there may have been some regional bias because more than half of the participants were from 1 country. There may have also been an increased risk of bias from the majority of the study being completed by physical therapists and orthopedic surgeons.

Clinically, I think this study can help us ask better questions in our subjective exam to rule in/out posterior instability, and then further guide us into better labeling our patients into the three categories presented. I think that having a general decision tree as far as medical management and treatment strategies is also helpful, especially for newer clinicians who haven't come across multiple cases of PSI, to be confident in our diagnosis and management of the issues. I think there is some value in the included objective tests performed as well, but as the study presents, the subjective exam will most likely be the most helpful diagnostic piece of this patient case.

Lindman I, Öhlin A, Desai N, et al. Five-Year Outcomes After Arthroscopic Surgery for Femoroacetabular Impingement Syndrome in Elite Athletes. The American Journal of Sports Medicine. 2020;48(6):1416-1422. doi:10.1177/0363546520908840.

Review Submitted By: Barrett Coleman

Objective: To evaluate outcomes 5 years after arthroscopic treatment for FAIS in elite athletes.

Methods: Elite athletes undergoing arthroscopic treatment for FAIS with a minimum 5-year follow-up were included. They were prospectively followed up with patient-reported outcome measures. An elite athlete was defined as having a Hip Sports Activity Scale level of 7 or 8 (a scale that defines how “elite” an athlete is by which level they play at). Preoperatively and 5 years after surgery, all athletes completed a variety of outcome measures, a visual analog scale for hip function, a HSAS, and reported satisfaction with surgery.

Results: A total of 64 elite athletes (52 men, 12 women) with a mean age of 24 w/ SD of +/- 6 years were included. Patients reported a statistically significant and clinically relevant improvement from preoperative patient-reported outcome measures to the 5-year follow-up with 90.5% reported satisfaction with their overall hip function. In total, 54% still participated in competitive sports (HSAS, 5-8) at follow-up, but 77% had decreased their level. Older patients and patients with longer duration of symptoms reported a significantly lower level of sports activity (HSAS, 0-4)

Conclusions: Arthroscopic treatment for FAIS in elite athletes results in a statistically significant and clinically relevant improvement regarding symptoms, hip function, quality of life, and pain 5 years after surgery. Approximately half of the cohort was still in competitive sports at follow-up, but 77% had decreased their level of sports. Nine of 10 patients were satisfied with their surgery.

Commentary: Since Isaiah Thomas is the only elite athlete I can recall with persistent FAI issues, I guess I assumed that it was a death sentence. There is some hope to be found within this study about outcomes after FAI surgery and where people end up, but the timeframe and main outcome measure of the HSAS makes it hard to discern exactly where everything ends up. The HSAS rates people from 0-8 depending on how competitive and elite their sport participation is. 0 is someone who does not participate in sports while 8 is a professional athlete. With a 5 year scope, it's reasonable to expect many people in this cohort to have decreased their level of sport. Collegiate athletes typically have four competitive seasons out of five. The average career in the NFL is three years. This makes the data convoluted because I wanted to know if they were able to return to their PLOF, not necessarily if they are still playing their sport

competitively 5 years later. The study also discusses this limitation of analyzing the HSAS in this way.

While we can't figure out exactly what happened to people's playing careers, it is good to know that everything else was a positive. From pain to function to satisfaction, people who got this surgery report much better outcomes 5 years later. 90% of people were satisfied with their surgery five years later, a testament to the overall satisfaction for the procedure.

McGuine T, Post E, Pfaller AY, et al. Does soccer headgear reduce the incidence of sport-related concussion? A cluster, randomised controlled trial of adolescent athletes*British Journal of Sports Medicine* 2020;54:408-413.

Review Submitted by: Brandon Reynolds

Objective: To determine if headgear reduces the incidence or severity of sport-related concussion in soccer players.

Methods: Randomised controlled trial using a stratified cluster randomization. High school soccer teams were contacted for participation during 2016/2017 and/or 2017/2018 school years. Schools that agreed to take part in the study were randomly assigned to be in the HG (headgear group) or the NoGH (no headgear/control group) based on a stratified randomization based on school size. If a team participated in both years, the assignment stayed the same for both.

Participants included all interscholastic soccer players aged 14-18, grades 9-12 and were recruited before the soccer season. Injury and exposures were recorded for each participant. Each player in the HG group were allowed to choose which headgear model they wanted to wear and all models met the ASTM testing standards and were approved by the National Federation of State High School Associations.

Participants completed self-report questionnaires prior to the season which included their gender, DOB, grade, history of SRC and filled out a SCAT3 scale. Athletic trainers working with each team were responsible for inseason data collection and onset of all SRC and non-SRC injuries through a program called REDCap. ATs and the coaching staff recorded the number of practices and competition athletic exposures for each participant.

AT determined onset, mechanism, injury characteristics and diagnosis of all SRC and non-SRC injuries no later than 72 hours post injury. Any suspected SRC based on the definition provided by the National Athletic Trainers' Association Position Statement: Management of Sport Concussion. Participants were referred to their PCP for further evaluation and treatment when appropriate. Participants recovering from an SRC were allowed to return to full unrestricted participation in accordance with consensus-based guidelines. Unblinded ATs monitored all participants who sustained an SRC and recorded all missed exposures. Injured participants had to be cleared by a licensed medical provider before returning to soccer.

Two thousand seven hundred and sixty-six participants (67% female, age 15±1.2) playing 3050 participant years of soccer participated in this study. Multivariate Cox proportional hazards models were used to examine time-to-SRC between groups, while severity was compared with a

Wilcoxon rank-sum test.

Results: Throughout the trial, 130 participants (5.3% female, 2.2% male) sustained a sport-related concussion. The incidence of SRC was not different between the HG and NoHG groups for males (HR: 2.00 (0.63–6.43) $p=0.242$) and females (HR: 0.86 (0.54–1.36) $p=0.520$). Days lost from SRC were not different ($p=0.583$) between the HG group (13.5 (11.0–018.8) days) and the NoHG group (13.0 (9.0–18.8) days).

Conclusions: Soccer headgear did not reduce the incidence or severity of sport-related concussion in high school soccer players in this study.

Commentary: According to the authors, this study is the first large-scale study to examine the effects of wearing headgear on sport-related concussion in adolescent soccer players. This study has a large sample size of 2766 from 62 male teams and 88 female teams. This study has other strengths such as protocol compliance with >99.5% compliance in both groups. The study also was carried out in game and practice settings unlike most previous studies which were performed in laboratory settings. The study while not focusing on differences between headgear found that players wearing the *Forcefield* headgear had an SRC incidence of 5.4% compared to *Storelli* brand which had an SRC incidence of 2.5%. This study does have limitations, the authors mention a risk for selection bias. Another potential limitation that they mention is that the participants were not instrumented with an accelerometer and there was no video of the concussive events, therefore they cannot comment on whether the headgear reduced impact forces. They also mentioned utilizing a single headgear model in the HG group but were not able to due to the parameters of the study. Something that was not mentioned in the methodology was the training or background of the athletic trainers and coaches for the participants. An interesting point that the authors pointed out is that most previous studies reported that various headbands attenuated the peak force of a soccer ball but did not have any data on head-to-player contact. The current study found that only 35% of sport-related concussions were sustained by head contact with a soccer ball, while head-to-player contact resulted in the most SRCs.