PAUL SALAMH, PT, DPT, PhD[1] • JEREMY LEWIS, PhD, FCSP[2-4]

# It Is Time to Put Special Tests for Rotator Cuff–Related Shoulder Pain out to Pasture

Clinicians use orthopaedic physical examination tests to inform diagnosis and support decision making. Each region of the body has a unique set of orthopaedic physical examination tests ("special tests"). In this Viewpoint, we focus on tests used to assess rotator cuff–related shoulder pain (RCRSP) (an umbrella term that includes subacromial impingement syndrome, rotator cuff tendinopathy, bursa pathology, and atraumatic partial- and full-thickness rotator cuff tears).[11] Patients with RCRSP typically present with a painful and weak shoulder, most commonly in external rotation and/or abduction.

There are more than 70 shoulder special tests[5] in clinical use that have been developed to identify labral, rotator cuff, acromioclavicular, and biceps tendon pathology, instability, subacromial impingement, and scapular dyskinesis. It is unclear why the tests are afforded "special" status.[8] The aim of this Viewpoint is to outline the current use and validity of shoulder orthopaedic tests used in the diagnosis of RCRSP. We provide recommendations for how clinicians might consider using shoulder orthopaedic tests for RCRSP in practice.

Before reading any further, please take a few moments to reflect on your answers to the following questions. With respect to RCRSP:

1. When using clinical tests for RCRSP, are clinicians capable of identifying the structure(s) causing the symptoms?
2. Do imaging findings—such as a thickened bursa, acromial spurs, rotator cuff tendon degeneration and tears, long head of biceps tendinosis, type II superior labrum anterior and posterior (SLAP) tears, and acromioclavicular joint degeneration—explain the cause of symptoms?
3. When surgeons perform acromioplasties, biceps tenodesis, type II SLAP repairs, or rotator cuff tendon surgery for nontraumatic tears, can they be certain they are operating on the tissues causing the symptoms?

**SYNOPSIS:** "Special tests" for rotator cuff–related shoulder pain (RCRSP) have passed their sell-by date. In this Viewpoint, we outline fundamental flaws in the validity of these tests and their proposed ability to accurately identify a pathoanatomical source of pain. The potential harm of these special tests comes in conjunction with imaging findings that are utilized to inform a structural diagnosis or recommend invasive procedures. We offer recommendations for performing a clinical interview and physical examination for people with RCRSP that does not include shoulder orthopaedic tests. *J Orthop Sports Phys Ther 2020;50(5):222-225. doi:10.2519/jospt.2020.0606*

**KEY WORDS:** *diagnostic accuracy, orthopaedic tests, rotator cuff, shoulder pain, shoulder special tests*

## Convergent Validity

A valid test is one that tests what it claims to test. The most common way to investigate the validity of shoulder orthopaedic tests is to compare the results of the orthopaedic test to a method (often called the gold standard or reference standard) accepted to be good at detecting the pathology associated with or causing the symptoms. Common reference standards for the shoulder are radiographs, magnetic resonance imaging, diagnostic ultrasound, and direct observation during arthroscopy. If a test is valid to implicate a specific shoulder structure, then the test should be positive when the reference test demonstrates the pathology, and negative when the reference test is reported as normal.

## Reference Standards: All That Glitters Is Not Gold

Validating shoulder orthopaedic tests to identify structures as causing symptoms is difficult, because imaging regularly detects abnormalities of the rotator cuff and bursa, acromial shape, the glenoid labrum, and other shoulder structures in people without shoulder symptoms. In 123 people with unilateral shoulder pain who had bilateral magnetic resonance imaging, there were as many abnormalities in the symptomatic shoulder as there were in the pain-free shoulder. Only

[1]Krannert School of Physical Therapy, University of Indianapolis, Indianapolis, IN. [2]School of Health and Social Work, University of Hertfordshire, Hatfield, United Kingdom. [3]Central London Community Healthcare National Health Services Trust, London, United Kingdom. [4]Department of Physical Therapy and Rehabilitation Science, Qatar University, Doha, Qatar. The authors received no funding for any portion of this article. Dr Lewis teaches and lectures internationally on the assessment and management of musculoskeletal conditions involving the shoulder. The other author certifies that he has no affiliations with or financial involvement in any organization or entity with a direct financial interest in the subject matter or materials discussed in the article. Address correspondence to Dr Paul A. Salamh, Krannert School of Physical Therapy, University of Indianapolis, 1400 East Hanna Avenue, Indianapolis, IN 46227. E-mail: salamhp@uindy.edu 

full-thickness supraspinatus tears and glenohumeral osteoarthritis had a 10% higher incidence in symptomatic shoulders.[1] Magnetic resonance imaging and ultrasound are probably poor gold standard reference comparisons for shoulder tests. Therefore, at best, it is impossible to determine the validity of shoulder orthopaedic tests for RCRSP.

## Isolating Specific Shoulder Structures: We Are Kidding Ourselves

Special tests designed to identify RCRSP[11] rely heavily on the assumption that a specific structure can be isolated, and that the pain reproduced with a positive finding originates from the structure being tested. For example, it is assumed that the empty-can test will isolate the supraspinatus muscle and tendon, and that the patient's shoulder pain, if reproduced by the test, must implicate the supraspinatus.

Anatomical dissection and histological investigations[4] highlight the interwoven nature of the rotator cuff tendons and their intimate relationship with capsule, ligament, and bursa tissue. How could any clinician expect to isolate an individual rotator cuff muscle and tendon from a group of related and interwoven structures using a shoulder test? To further support this argument, it is clear that the empty- and full-can tests cannot isolate the supraspinatus: during the empty-can test, 9 shoulder muscles were active; during the full-can test, 8 other muscles were active.[2] These issues pose a strong challenge to clinical reasoning to determine the exact source of symptoms based on the patient's report of pain during a special test.

## If Not the Supraspinatus Tendon, Where Is the Pain Coming From?

Associating the experience of pain during shoulder examination with a specific structure lacks credibility. During the inflammatory process, interleukin-1$\beta$ is released and may contribute to hyperalgesia.[7] The empty-can test compresses and stretches highly innervated bursa tissue that, in people diagnosed with RCRSP, has high concentrations of substance P and proinflammatory cytokines.[7] We appreciate that the experience of pain, an output of the brain, is much more complex and may be experienced without nociception,[6] further challenging the validity of shoulder orthopaedic tests. The empty-can test, and many others, might simply be irritating already sensitive tissue.

## If Special Tests Are Not All That Special, Why Do Clinicians Still Use Them?

The current evidence challenges the clinical utility of shoulder orthopaedic tests for RCRSP and questions their widespread clinical use. There is clearly an elephant in the assessment room. We propose 3 reasons for this.

**Simplicity** Contemporary musculoskeletal practice is seemingly obsessed with finding a structural explanation for symptoms. There is great allure in taking a complex and multifaceted examination process and distilling it into a simple yes/no question that may be answered by a special test result.[10] A systematic review and meta-analysis of the literature examining shoulder tests could not recommend a single test to clinicians.[9] Out of 11 best-practice recommendations for care in musculoskeletal pain,[12] none included orthopaedic physical examination (special) tests.

**Teaching Old Clinicians New Tricks** Due to time constraints and access to research, clinicians may practice as they were trained to and may be unaware of contemporary clinical challenges, taking comfort in an "it's what we have always done" approach. Health-related research may take decades to be incorporated into practice, and by the time it has been adopted, precious little benefit may reach the intended recipient.[3]

**Teaching New Clinicians Old Tricks** Students are commonly taught special tests during undergraduate or postgraduate training. If attaining a level of competency is an academic expectation, students have no choice but to learn, apply, and rationalize as they are taught. Students and junior clinicians will observe practicing clinicians use and clinically reason the findings of shoulder special tests in clinical practice. For myriad reasons, it is likely that new clinicians will wish to emulate this clinical practice.

## Evolving the Approach to Diagnosing Shoulder Problems

We argue that academic institutions and practicing clinicians should stop teaching and using shoulder special tests related to RCRSP. The tests have passed their sell-by date. We are grateful to the clinicians and researchers who, aiming to help their colleagues and patients, have attempted to develop clinical tests to identify the structure(s) associated with RCRSP. Given the current evidence, and until we have a reference system that can accurately detect the tissues associated with the experience of pain, clinicians and educators need to put special tests out to pasture. The tests should no longer be used to inform patients of the source of their symptoms in surgical and nonsurgical practice. Continuing to rely on special test results and imaging to inform recommendations for invasive procedures, such as injections or surgery in nontraumatic presentations, is arguably not acceptable practice.

Special tests for RCRSP do not help clinicians identify the shoulder structure causing the symptoms, and may discourage looking beyond a macropathoanatomical explanation for symptoms. It is feasible to conduct a clinical interview and physical examination without including shoulder orthopaedic (special) tests to hypothesize that RCRSP is the likely reason for symptoms (**TABLE**). If shoulder orthopaedic tests related to RCRSP are used, then interpretation should only relate to reproduction of symptoms, with no definitive emphasis on the specific structures associated with the symptoms.

Given the current evidence surrounding RCRSP, what is our answer to the

**TABLE** Examination Elements for Rotator Cuff–Related Shoulder Pain

| Examination Component | Specific Element |
|---|---|
| Conduct comprehensive interview with the patient | • Identify changes in loading history that may support the clinical hypothesis of RCRSP<br>• Identify the impact of the symptoms on the individual, his or her beliefs and expectations, and the valued activities the patient wishes to return to<br>• Identify relevant psychosocial factors, lifestyle factors, current activity levels, medications (prescribed, over the counter), and supplements |
| Screen for serious pathology/red flags | • Consider comorbidities, risk factors (specifically age, diabetes, and overhead activities), and red flags |
| Use functional disability questionnaires | • General functional disability questionnaires<br>• Shoulder-specific questionnaires<br>• Psychosocial questionnaires |
| Assess impairments | • Conduct neurological screening, if appropriate<br>• Exclude referred pain as much as possible<br>• Conduct bilateral assessment<br>• Assess range of motion (active and passive)<br>• Assess strength, repetitions to pain and/or fatigue<br>• Assess response to changes in load on the muscle-tendon units<br>• Assess lower-limb and trunk range of movement and function<br>• Appreciate that nociception is not necessary for the experience of pain |
| Provide patient with education and advice regarding the condition and management options | • Engage in shared decision making that incorporates harms, benefits, and the requirements of management options for the main management alternatives (no intervention, rehabilitation, injections, and surgery)<br>• Aim to encourage low-risk, high-value, evidence-informed care both for the individual and the sustainability of health care provision |
| If the management decision is nonsurgical, then provide care based on findings of the examination addressing physical activity and function | • Prescribe a graduated rehabilitation progression for at least 3 months, with activity modification as indicated, with the aim to exceed the patient's functional expectations<br>• Include all functional activities in rehabilitation: open-chain and closed-chain, precision, and "chaotic" activities<br>• Address lifestyle issues: smoking, nutrition, sleep, stress<br>• Appreciate that there is no cure and that attention to lifestyle, together with a range of whole-body exercises and activities, should be maintained and, if possible, incrementally increased, with no end date<br>• If not achieving desired outcomes, or if the condition worsens, consider other management options—but only after harms and potential benefits have been discussed and understood |

*Abbreviation: RCRSP, rotator cuff–related shoulder pain.*

3 questions posed earlier in this Viewpoint? A resounding "no" on all 3 counts.

## Key Points

- Shoulder "special tests" cannot identify the structure causing RCRSP symptoms.
- The so-called special tests should only be considered as pain-provocation tests. If the individual has reproduced his or her symptoms during a physiological movement, activity, or functional task, then symptoms produced during the special tests do not add additional information.
- Using special tests to inform individuals of the specific source of their symptoms, and then recommending surgical or nonsurgical intervention for that structure, is arguably not best, or even acceptable, practice.
- A comprehensive clinical interview and physical examination can be used to inform a working hypothesis to implicate RCRSP without the need for special tests. ◉

## STUDY DETAILS

**AUTHOR CONTRIBUTIONS:** Dr Salamh conceived the original idea for this Viewpoint, and both authors contributed to the manuscript.

**DATA SHARING:** There are no data in this manuscript.

**PATIENT AND PUBLIC INVOLVEMENT:** There was no patient or public involvement in the development of this Viewpoint.

ACKNOWLEDGMENTS: *The authors would like to thank Dr Clare Ardern for her expertise and guidance in the final stages of this manuscript.*

## REFERENCES

1. Barreto RPG, Braman JP, Ludewig PM, Ribeiro LP, Camargo PR. Bilateral magnetic resonance imaging findings in individuals with unilateral shoulder pain. *J Shoulder Elbow Surg*. 2019;28:1699-1706. https://doi.org/10.1016/j.jse.2019.04.001
2. Boettcher CE, Ginn KA, Cathers I. The 'empty can' and 'full can' tests do not selectively activate supraspinatus. *J Sci Med Sport*. 2009;12:435-439. https://doi.org/10.1016/j.jsams.2008.09.005. Epub 2008 Dec 2.
3. Brownson RC, Kreuter MW, Arrington BA, True WR. Translating scientific discoveries into public health action: how can schools of public health move us forward? *Public Health Rep*. 2006;121:97-103. https://doi.org/10.1177/003335490612100118
4. Clark JM, Harryman DT, 2nd. Tendons, ligaments, and capsule of the rotator cuff. Gross and microscopic anatomy. *J Bone Joint Surg Am*. 1992;74:713-725.
5. Cook CE, Hegedus EJ. *Orthopedic Physical*

*Examination Tests: An Evidence-Based Approach*. 2nd ed. Upper Saddle River, NJ: Pearson/Prentice Hall; 2012.
6. Dean BJ, Gwilym SE, Carr AJ. Why does my shoulder hurt? A review of the neuroanatomical and biochemical basis of shoulder pain. *Br J Sports Med*. 2013;47:1095-1104. https://doi.org/10.1136/bjsports-2012-091492
7. Gotoh M, Hamada K, Yamakawa H, et al. Interleukin-1-induced subacromial synovitis and shoulder pain in rotator cuff diseases. *Rheumatology (Oxford)*. 2001;40:995-1001. https://doi.org/10.1093/rheumatology/40.9.995
8. Hegedus EJ, Cook C, Lewis J, Wright A, Park JY. Combining orthopedic special tests to improve diagnosis of shoulder pathology. *Phys Ther Sport*. 2015;16:87-92. https://doi.org/10.1016/j.ptsp.2014.08.001
9. Hegedus EJ, Goode AP, Cook CE, et al. Which physical examination tests provide clinicians with the most value when examining the shoulder? Update of a systematic review with meta-analysis of individual tests. *Br J Sports Med*. 2012;46:964-978. https://doi.org/10.1136/bjsports-2012-091066
10. Hegedus EJ, Wright AA, Cook C. Orthopaedic special tests and diagnostic accuracy studies: house wine served in very cheap containers. *Br J Sports Med*. 2017;51:1578-1579. https://doi.org/10.1136/bjsports-2017-097633
11. Lewis J. Rotator cuff related shoulder pain: assessment, management and uncertainties. *Man Ther*. 2016;23:57-68. https://doi.org/10.1016/j.math.2016.03.009
12. Lin I, Wiles L, Waller R, et al. What does best practice care for musculoskeletal pain look like? Eleven consistent recommendations from high-quality clinical practice guidelines: systematic review. *Br J Sports Med*. 2020;54:79-86. https://doi.org/10.1136/bjsports-2018-099878