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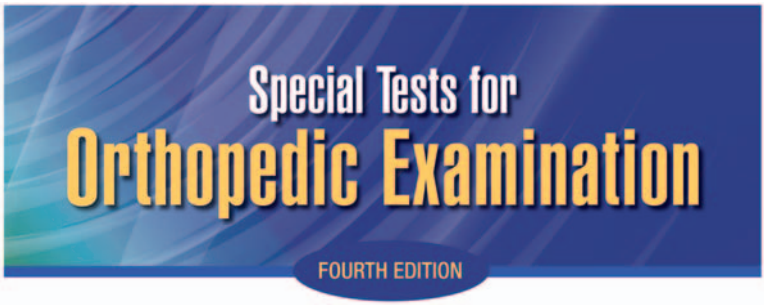
Special Tests for Orthopedic Examination

FOURTH EDITION

Jeff G. Konin
Denise Lebsack
Alison R. Snyder Valier
Jerome A. Isear, Jr.

SLACK Incorporated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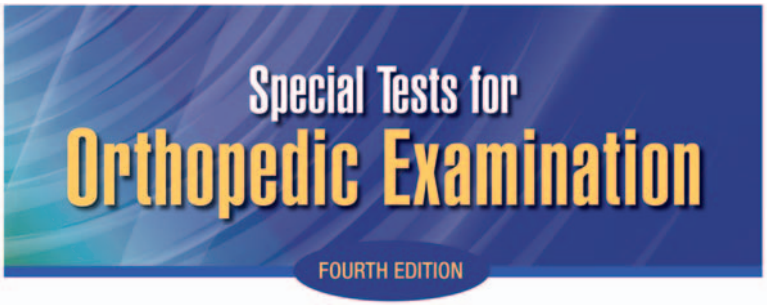

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Dedication

To John Bond,
may your next phase of life bring you
much happiness and success.
—Jeff G. Konin, PhD, ATC, PT, FACSM, FNATA

To my students,
who remind me why I love teaching.
—Denise Lebsack, PhD, ATC

To my family, friends, and colleagues.
You all bring much happiness to my life.
—Alison R. Snyder Valier, PhD, ATC, FNATA

To Mitzie, Brooks, Harrison, and Jackson,
for being such true blessings in my life.
—Jerome A. "Jai" Isear, Jr., MS, PT, LAT, ATC

Contents

Acknowledgments

When the concept of this handy guide to special tests was conceptualized at Seacrets in Ocean City, Maryland, in 1995, none of us ever dreamed we would be writing a fourth edition some 20 years later.

We continue to extend our gratitude to each of you who have remained supportive of the project. Without your continued valuable feedback, we would not be able to successfully launch an improved version. The world of health care is changing in so many ways, and listening to your many ideas contributes to the valuable improvements that we try to make with each updated edition. It is truly wonderful to talk to so many of you who get excited about the way this handbook helped you get through classroom labs and tests, clinical internships, and ultimately your certification exam. The stories that many of you have shared about this book being the most used and most helpful throughout your career is very humbling.

Twenty years working with the same publisher is also quite an accomplishment. Kudos to the people at SLACK Incorporated. We remain indebted to John Bond (Chief Content Editor) and Peter Slack (President) for believing in our ideas and trusting our foresight. To this day, their support and friendship are second to none. Our sincere thanks go to Jennifer Cahill (Senior Project Editor) and April Billick (Managing Editor) for all of their hard work on this project. Most of all, to Brien Cummings (Senior Acquisitions Editor) for jumping on board like a champion and ensuring that we all stayed on task—not an easy thing to do with a transition of authors residing in different geographical time zones. Despite technology and its added benefits, long distance collaboration still poses challenges.

Special thanks go to the contributors who performed the significant legwork in researching the most current peer-reviewed manuscripts for the special tests included in this edition: Kelsey Picha, MS, ATC, and Steph Trigsted, MS, ATC. Under the guidance of Alison Valier, who spearheaded this fourth edition, Kelsey and Steph performed tedious, yet valuable, work contributing to a significant revision in the format of this edition. This time-consuming and detailed process plays a vital role in the recognition of evidence-based practice. In addition, we would like to thank Casey Hill, DPT, and Justin Jacapraro, ATC, CPT, SPT, for their assistance in reviewing the text, figures, and videos. Finally, we would like to

thank Shannon Matheny and Douglas Pizac for graciously posing as examiner and subject for images and videos.

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—Denise Lebsack, PhD, ATC
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About the Authors

Jeff G. Konin, PhD, ATC, PT, FACSM, FNATA is a Professor and the Chair of the Physical Therapy Department at the University of Rhode Island in Kingston, Rhode Island. One of the original authors of this textbook, Dr. Konin is recognized as a Fellow by both the American College of Sports Medicine and the National Athletic Trainers' Association for his contributions.

Dr. Konin has previously held the positions of Director of Athletics at Eastern Connecticut State University, Faculty and Vice Chair of Orthopaedics and Sports Medicine at the University of South Florida (USF), Executive Director of the Sports Medicine and Athletic Related Trauma (SMART) Institute at USF, Director of the Graduate Athletic Training Program at USF, and Health Sciences Faculty and Assistant Athletic Director for Sports Medicine at James Madison University. Dr. Konin is also founding partner in The Rehberg Konin Group, a firm providing consulting in the areas of sport safety and education, and a founding member of Sport Safety International, specializing in the delivery of sport safety educational resources.

Dr. Konin's published work and invited presentations have focused in the area of sports medicine with a particular interest in injury prevention and sport safety. He has shared his expertise at professional conferences throughout the United States, as well as in Australia, New Zealand, Italy, Norway, Romania, England, and Austria. His experiences have included serving on the medical staff for the 1996 Olympic Games and as a medical coordinator for the USA Wheelchair Rugby Paralympic Team.

Denise Lebsack, PhD, ATC has been an Associate Professor of Athletic Training in the School of Exercise & Nutritional Sciences at San Diego State University (SDSU) since 1994. During much of that time she has served as the Athletic Training Program Director, and has coordinated 3 separate Self Study Reports for the Athletic Training Education Program's accreditation. As part of that process and her role as an athletic training educator, Dr. Lebsack has developed a philosophy that seeks to optimize student learning and educational outcomes. Her goal is to provide students with educational tools that aid in the learning process and that instill academic inquiry and understanding. When Dr. Konin first approached her with the original book idea, she

immediately knew it was a project that fit perfectly with her educational philosophy and goals for her students.

In keeping with these goals, Dr. Lebsack was also an author for a 2-disc CD-ROM series on special tests used during the injury evaluation process that incorporated video demonstration and anatomical representation of a positive test result. Her interest in instructional technology led to several published articles evaluating the effectiveness of technology in the classroom. Given her research and experience as an educator, she was invited to be a Guest Editor for the *Journal of Athletic Training*'s Special Issue on "Athletic Training Education" (2002;37[4]). She has also coauthored the textbook *The Athletic Trainer's Guide to Strength and Endurance Training*.

Dr. Lebsack currently spends her time focused on the classroom and engaging students in the learning process. She serves as a faculty advisor for the SDSU student organization Future Athletic Trainers' Society, and actively promotes athletic training education in the community. She has become a big proponent and spokesperson for mental health awareness for both student-athletes and athletic training students. Outside of work, her time is spent enjoying the adventures of raising her 2 teenagers, Annamarie and EJ.

Alison R. Snyder Valier, PhD, ATC, FNATA is a Professor for the Post-Professional Athletic Training Program and Doctor of Athletic Training Program at A. T. Still University (ATSU) in Mesa, Arizona. She also serves as the Assistant Director of Research Support through Research, Grants, and Information Technology Systems, as well as a research faculty in the School of Osteopathic Medicine–Arizona, at ATSU.

Dr. Valier received her BA degree in psychology and physical education from Whitman College (Walla Walla, Washington) and her MS in exercise physiology at the University of Toledo (Toledo, Ohio). In addition, she received her PhD in exercise science from the University of Toledo, where she majored in applied physiology and completed a minor in human anatomy. Dr. Valier completed a Post-Doctoral Research Fellowship in Clinical Outcomes Research, with emphasis on the evaluation of patient-reported outcomes instruments and epidemiology, awarded to her by the National Athletic Trainers' Association Research and Education Foundation (NATA REF). Her fellowship has shaped her teaching and research emphasis, with most of her focus on clinical outcomes assessment, patient-reported outcome

measures, health-related quality of life, sports injury epidemiology, and quality improvement. She presents and publishes on these topics regularly and is a Fellow of the NATA. Over the years, Dr. Valier has served the profession in many ways, including being a member of the NATA Pronouncements Committee, NATA REF Research Committee, and the Rocky Mountain Athletic Trainers' Association (RMATA) Programming Committee. She also serves as the Co-Chair of the Arizona Athletic Trainers' Association Governmental Affairs Committee and served as the Chair of the Free Communication program for the RMATA for several years. Dr. Valier lives in Gilbert, Arizona, with her husband, Sean, and son, Albert.

Preface

The fourth edition of *Special Tests for Orthopedic Examination* was designed to follow our initial goals of providing a simple pocket-sized manual for practical learning purposes. Consistent with previous editions, we updated the content by both removing and adding a few tests. And in keeping with the tradition of enhancing each version, the fourth edition features improvements that we think will be well received. Likely the biggest change that you will notice is the inclusion of a section titled "Evidence" where we have highlighted systematic reviews, meta-analyses, or single articles that have addressed the reliability and/or diagnostic accuracy of the special tests. We've included evidence in this edition as a response to one of the most common requests we received from formal reviews and informal feedback. You will note that some tests have evidence and others do not. Some of the evidence is in support of tests and some is not. The range or spread of some of the diagnostic accuracy values is wide and this may make some readers a little unsure of whether or not to use a particular test. Consistent with previous editions of this text, we don't make the decision on which tests to use for the clinician because there are many considerations that come into play when selecting a test. Further, we purposefully did not exclude tests without evidence to support their effectiveness because clinical discussion has favored their empirical use. Once again, we challenge each of you to come to your own conclusions, and perhaps formulate your own research to support or refute tests with limited or no evidence. While in past editions we have always continued to demonstrate these 3-dimensional tests as best we can in a 2-dimensional format, this edition is accompanied by ancillary material available on the publisher's website depicting videos for each test. The addition of the videos should help clinicians with better understanding the test motion and performing them accurately. It is our hope that you will appreciate this much needed, extremely helpful addition.

Special Tests: A Key Clinical Skill

Webster defines the word "special" as "distinguished by some unusual quality" and "designed for a particular purpose or occasion," and the word "test" as "a critical examination, observation, or evaluation."

In any orthopedic evaluation process, the use of special tests assists to provide critical information leading to, confirming, ruling in,

ruling out, and monitoring the status of a particular diagnostic condition. It is no wonder then that in the day of diagnostic imaging and advanced technological interventions clinicians often resort to the basic skills of manual examination for a sense of comfort during the examination process.

As stated in the previous 3 editions of this text, special tests are merely one part of the evaluation process that also relies heavily on history taking, symptoms, diagnostic findings, and other information from the patient, among many other components. Yet in the algorithmic approach to determining what musculoskeletal and/or neurological structures may or may not have been damaged, key special tests often come in handy.

It is important to further elaborate on how we as authors chose to include the specials tests within the book, and how we suggest you use the information to be effective as a clinician. The compilation of the tests in this book reflect a number of ways of thinking. First, tests included are ones that the editors have seen commonly documented and described in numerous orthopedic and sports medicine-related textbooks as well as through clinical practice experiences. Since the first edition of this book, there has been advancement in the study of these tests, however, we still have a long way to go. As you explore the selection of special tests, you will find that some tests have been studied and we know more about their ability to rule in and rule out conditions now than before. You will also find that many tests have not been studied. While we don't know about the reliability, validity, or diagnostic accuracy of these unexamined special tests, they are continually published and taught in curricula and used in clinical practice. Inclusion of these tests may not seem to jive with the current agenda of evidenced-based medicine, yet how can one challenge a clinician who regularly uses a particular special test and has accuracy in diagnostic decision making and treatment intervention that is partially a result of the special test and its findings or lack thereof? Given this fact, we will continue to include unexamined special tests in hope that either one day such tests will have demonstrated validity, reliability, and/or diagnostic accuracy or we as individually talented clinicians within our own rights will come to realize the functionality of these test may not be simply classified as "yes, it works" or "no, it doesn't work." After all, part of evidence-based medicine is also to determine the "how's" and "when's". How do swelling, pain, and range of motion limitations influence the effectiveness of a special test? How does the experience of the examining clinician influence the

findings? What about the clinician's hand size, height, setting, and even bedside manner when performing a test? The simple message here is that regardless of how much evidence is reviewed and which way the evidence points, some special tests may or may not work in the hands of different individuals or with different patient presentations. And, the available literature is not exhaustive in considering all of these situations. Once again, in the words of Dr. Joe Gieck, "At first you do what you're taught, and then you do what works."

While it is our belief that each clinician should judge for him- or herself whether there is benefit of using a particular test in a specific clinical circumstance, making informed decisions is important, too. Over the years, different research teams have evaluated many of the tests included in this book, and we feel that it is useful to clinicians to have examples of the available information to help in decision making. Evidence can help inform clinical decisions. So, for the first time, we have included evidence regarding reliability, sensitivity, and specificity of the special tests, where available.

Recall that reliability refers to the reproducibility of the test and is captured with various statistical measures such as the intraclass correlation coefficient, referred to as the ICC, and the Kappa coefficient. Reliability can be computed for multiple scores from one rater, called intrarater reliability, or it can be calculated between more than one rater, called interrater reliability. Reliability values closer to 1 suggest more reliability in the scoring system than values closer to zero. Let's consider the Ober's Test that is used to test for iliotibial band tightness. One study has found that the intrarater reliability of the Ober's Test is .90, which suggests that the test is highly reliable.

Sensitivity and specificity speak to the diagnostic accuracy of measurement or screening tools, including special tests. Sensitivity speaks to our ability to rule out a health condition, such as a ligament tear, whereas specificity helps us rule in a health condition. Values for sensitivity and specificity may be reported differently, but generally are in the range of 0 to 100, with values closer to 100 having greater diagnostic ability than values closer to 0. Let's consider the Anterior Lachman's Test that is used to check for anterior cruciate ligament (ACL) tears. Two recent meta-analyses reported the sensitivity and specificity of the Anterior Lachman's Test. While the reported values from these meta-analyses are slightly different, with sensitivity reported as 81 and 85 and specificity as 81 and 94, the values in either case are, generally speaking, high. The high sensitivity of the Anterior Lachman's Test means that a negative finding could rule out an ACL

tear. The high specificity of the Anterior Lachman's Test means that a positive finding could rule in an ACL tear. While there are other values that help with evaluating the diagnostic accuracy of tests, such as likelihood ratios and positive and negative predictive values, we have focused on sensitivity and specificity because they are commonly reported in diagnostic accuracy studies and tend to be constant across multiple samples and populations. Other indices must be customized for the sample of interest, based on the expected prevalence of the condition of interest within the population from which the sample was drawn.

Because this is not meant to be a research text, but instead a quick resource for clinicians, it will be helpful to describe our process for evidence selection and presentation. We could have conducted our search in many ways. After careful thought and consideration, we focused on an approach to find the best type of summary evidence available. Summary evidence, such as from systematic reviews and meta-analyses, typically is considered to have a high level of evidence and is the type of evidence we sought to include in the book. Initially, we searched major search engines, such as PubMed, for key words that included the test name, body part or body region evaluated, and injury. Other key words included special tests, orthopedic tests, provocative tests, sensitivity, specificity, and reliability. Our searching produced numerous articles from which to draw information. Whenever possible, we have reported evidence from systematic reviews and meta-analyses. However, not all special tests have been studied and of those that have been studied, not all have been part of a systematic review or meta-analysis. So, when we didn't find evidence from a systematic review or meta-analysis, we selected a couple single studies and highlighted their findings. Once articles were identified, we pulled basic information about the studies, including any information on reliability, sensitivity, and specificity, and put it into a table for easy viewing. Even though we have included evidence in this edition, it's important to note that editing this text does not render us authorities of special tests, but rather providers of information. As one knows, peer-reviewed manuscripts can be discussed in forums of professionals who do not agree on the interpretation of the manuscript, the statistic used, and sometimes even the accuracy of the conclusions. Determining whether or not a special test referred to in this book should be used by a clinician or not is beyond the goal of this book. It is our belief that each clinician should judge for him- or herself as to whether or not a particular test is found to be useful in

certain circumstances within his or her own orthopedic assessment, and we have presented evidence to help in making that judgment.

It is also important to consider where a special test falls in the overall concept of evidence-based practice. Most medical and health care professionals believe that in addition to the actual research-based findings related to a special test, technique, or intervention, there are other important factors that exist that assist in determining what actually constitutes as "good" overall evidence. Specifically, the experience and expertise of an individual clinician, and the perceived and actual value as reported by the patient, both play an integrated role in establishing a final determination. Thus, to reiterate, it is difficult with many of these special tests to simply conclude whether one "works" or "doesn't work."

In summary, the fourth edition was needed and brings some new features for the reader. We've enjoyed putting it together! As always, we remind you that special tests are merely a piece of the puzzle that assist in the evaluation process. While you piece your puzzles together, we hope that this new edition will provide you with a handy tool for problem solving.

—Jeff G. Konin, PhD, ATC, PT, FACSM, FNATA
—Denise Lebsack, PhD, ATC
—Alison R. Snyder Valier, PhD, ATC, FNATA
—Jerome A. "Jai" Isear, Jr., MS, PT, LAT, ATC

Foreword

It is a special honor for me to write the Foreword to this book for several reasons. First, I have known Dr. Konin for many years professionally, and he has assembled an experienced group of authors who have considerable expertise in the examination of patients with musculoskeletal complaints. Their scholarship and integrity is without reproach.

The second reason is that as an author of this Foreword I am joining distinguished names like Craig Denegar, PhD, PT, ATC, FNATA; Jim Andrews, MD; and Mark Miller, MD! Very flattering.

The third reason is that the physical examination in orthopedic surgery has for a long time been a favorite field of interest for me. What stimulated me to be interested in this topic was that many of the physical examination tests that I was taught as a medical student, as an orthopedic resident, and as a sports medicine fellow simply did not seem to be helpful in clinical practice. For example, like many people I was taught that a Speed's Test was diagnostic of biceps tendon problems, but many of the patients who had a positive test were found to have no biceps tendon pathology at all when an arthroscopy was performed. Many had other pathologies that would explain their "biceps pain." It is now appreciated that anterior shoulder pain can be due to stiffness, arthritis, rotator cuff syndromes, or any number of other pathologies. When scientifically studied, the literature demonstrates that the Speed's Test has largely low sensitivity or specificity for biceps disorders. I still use a Speed's Test just for fun but do not hang my hat on any diagnosis using that test alone. The authors correctly state and demonstrate again in this book that a correct diagnosis starts with a careful history and thorough examination, but one must know how to do the examination first.

Which brings me to what is wonderful about the new format of this book. The authors have not lost the main goal of having a handy guide that defines a specific test and that shows one how to perform the test. It is a great book for the pocket or white coat to refer to at short notice. This applies to every joint from the fingertips to the toes including the spine. As a result, this book still has appeal for anyone who does musculoskeletal medicine, whether novice or experienced in the field.

The second wonderful thing about this book is that the authors updated it with new tests and removed some proven not to be helpful. It is not a static but a dynamic book in that regard. There are new

figures in this book and new information; it is not just a rehash of old information. The most important addition in this edition of the book is the inclusion of scientific information about the clinical usefulness of the tests. When teaching students, residents, or anyone else about musculoskeletal exams, I tell them there are 3 levels. The first is to learn what the name of the test is and how to do it. The next is to know the meaning of the test and what is a positive test and what is a negative test. The third level is to know how to interpret the test and how accurate it is in helping to make the diagnosis. This third level is what is exciting about this book because it helps anyone doing these examinations understand why the result may or may not establish a diagnosis. Some tests are great for making a diagnosis and some stink. As the authors say, it is up to each individual to use the tests and to get an impression of what works and what does not work. This book reinforces those impressions with hard data to give the examiner a guide as to whether to trust a test or not.

The musculoskeletal examination is a dynamic skill that does not stay static; our appreciation of what works and what does not work also changes as more examination tests are described and as more tests are studied scientifically. This book now does it all: how to perform and to understand the musculoskeletal examination for the beginner, the "expert," and everyone in between.

—Edward G. McFarland, MD
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Section 1

Temporomandibular

Guide to Figures


denotes patient's movement


denotes examiner's movement


denotes tapping

denotes palpation

X denotes stabilization

Konin JG, Lebsack D, Snyder Valier AR, Isear JA Jr.
Special Tests for Orthopedic Examination, Fourth Edition (pp 1-6).

Chvostek's Sign

Test Positioning

The subject can either sit or stand.

Action

The examiner taps over the masseter muscle and parotid gland (Figure T1-1).

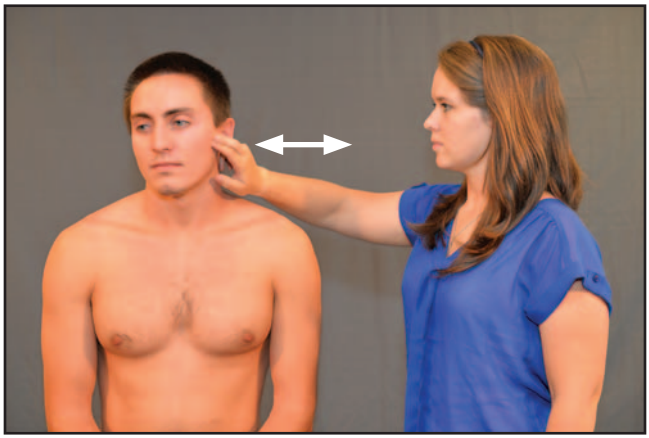

Figure T1-1.

Positive Finding

Twitching of the facial muscles, especially the masseter, indicates positive findings for facial nerve pathology.

Special Considerations/Comments

Twitching of the facial muscles may also be a result of low calcium levels in the blood. A positive finding of this nature has also been referred to as a Weiss Sign.

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Loading Test

Test Positioning

The subject sits upright in a chair.

Action

The examiner places a cotton roll between the molars on the uninvolved side and instructs the subject to bite down forcefully.

Positive Finding

The reporting of pain on the involved side by the subject indicates a positive finding, which may be reflective of an anteriorly dislocated disk.

Special Considerations/Comments

The subject may be instructed to chew on the cotton as opposed to forcefully biting down. A positive finding for pain may suggest any number of temporomandibular pathologies.

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PALPATION TEST

TEST POSITIONING

The subject sits upright in a chair.

ACTION

The examiner faces the subject and places his or her fifth digits in the subject's ears. The subject is instructed to repeatedly open and close the mouth while the examiner applies pressure in an anterior direction using the pads of the fifth digits (Figures T1-2A and T1-2B).

Figure T1-2A.

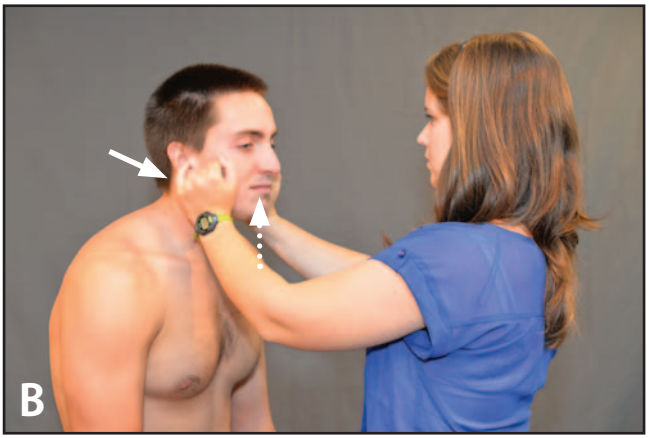

Figure T1-2B.

Positive Finding

The subject's reporting of pain or discomfort during the opening and closing of the mouth when pressure is applied indicates a positive test. This may be a result of inflammation to the synovium of the temporomandibular joint (TMJ).

Special Considerations/Comments

The subjective reporting of pain can be a result of any pathology to the TMJ.

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Please see videos on the accompanying website at
www.healio.com/books/specialtestsvideos

Section 2

Cervical Spine

Guide to Figures

denotes patient's movement
denotes examiner's movement
denotes tapping
denotes palpation
denotes stabilization

Konin JG, Lebsack D, Snyder Valier AR, Isear JA Jr.
Special Tests for Orthopedic Examination, Fourth Edition (pp 7-19).

Vertebral Artery Test

Test Positioning

The subject lies supine, and the examiner sits with both hands supporting the subject's head.

Action

Slowly extend, rotate, and laterally flex the subject's cervical spine to each side. Then observe the subject for dizziness, blurred vision, nystagmus, slurred speech, or loss of consciousness (Figure CS2-1). Each position should be held for approximately 30 seconds.

Figure CS2-1.

Positive Finding

Dizziness, blurred vision, nystagmus, slurred speech, or loss of consciousness are indicative of partial or complete occlusion of the vertebral artery.

Special Considerations/Comments

The aforementioned signs and symptoms should be considered contraindications for treatments such as traction and joint mobilizations.

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Licht PB, Christensen HW, Høilund-Carlsen PF. Carotid artery blood flow during premanipulative testing. *J Manipulative Physiol Ther.* 2002;25(9):568-572.

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Westaway MD, Stratford P, Symons B. False-negative extension/rotation pre-manipulative screening test on a patient with an atretic and hypoplastic vertebral artery. *Man Ther.* 2003;8(2):120-127.

Zaina C, Grant R, Johnson C, Dansie B, Taylor J, Spyropolous P. The effect of cervical rotation on blood flow in the contralateral vertebral artery. *Man Ther.* 2003;8(2):103-109.

Foraminal Compression Test (Spurling)

Test Positioning

With the subject seated comfortably, the examiner rests the volar surface of both hands on top of the subject's head (Figure CS2-2A).

Figure CS2-2A.

Action

The examiner applies a downward pressure while the subject laterally flexes the head. The test is repeated with the subject laterally flexing to the opposite side. Lateral flexion may be performed both actively and passively (Figure CS2-2B).

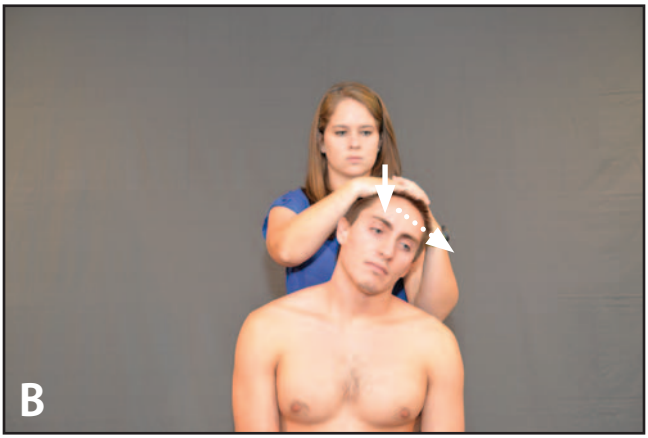

Figure CS2-2B.

Positive Finding

During the application of compression, a reporting of pain into the upper extremity toward the same side that the head is laterally flexed is positive. This indicates pressure on a nerve root, which can be correlated by the dermatomal distribution of the pain.

Special Considerations/Comments

Precautions (and possibly avoidance) should be taken with compression of the vertebral area with a subject who has been diagnosed with conditions such as osteoarthritis, rheumatoid arthritis, osteoporosis, and spinal stenosis. The examiner should perform the vertebral artery test as a screen prior to administering this special test.

Evidence

	Rubinstein et al (2007)	Shabat et al (2011)
Study design	Systematic review	Cross-sectional
Conditions evaluated	Cervical radiculopathy	Cervical radiculopathy
Study number	4	
Sample size		257
Reliability	Not evaluated	Not evaluated
Sensitivity	50 to 100	95
Specificity	86 to 100	94

References

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Shah KC, Rajshekhar V. Reliability of diagnosis of soft cervical disc prolapse using Spurling's test. *Br J Neurosurg.* 2005;18(5):480-483.

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Foraminal Distraction Test

Test Positioning

With the subject seated, the examiner places one hand under the subject's chin and the other hand around the occiput (Figure CS2-3).

Figure CS2-3.

Action

The examiner slowly distracts the subject's head from the trunk while the subject remains in a relaxed position.

Positive Finding

The finding is positive when existing complaints of pain decrease or disappear during the distraction. This indicates that a nerve root compression may exist while the subject sustains normal posture and/or positioning.

Special Considerations/Comments

Distraction of the cervical area for the assessment of a nerve root impingement should not be performed on a subject who has vertebral instability. Any increase in pain may indicate muscular and/or ligamentous damage. The examiner should perform the Vertebral Artery Test as a screen prior to administering this special test.

Evidence

	Wainner and Gill (2000)	Rubinstein et al (2007)
Study design	Literature review	Systematic review
Conditions evaluated	Cervical radiculopathy	Cervical radiculopathy
Study number	2	2
Reliability	Kappa = .5	Not evaluated
Sensitivity	40	44
Specificity	100	90 to 97

References

Kruse-Lösler B, Meyer U, Flören C, Joos U. Influence of distraction rates on the temporomandibular joint position and cartilage morphology in a rabbit model of mandibular lengthening. *J Oral Maxillofac Surg.* 2001;59(12):1452-1459.

Rathore S. Use of McKenzie cervical protocol in the treatment of radicular neck pain in a machine operator. *J Can Chiropr Assoc.* 2003;47(4):291-297.

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Wainner RS, Fritz JM, Irrgang JJ, Boninger ML, Delitto A, Allison S. Reliability and diagnostic accuracy of the clinical examination and patient self-report measures for cervical radiculopathy. *Spine (Phila Pa 1976).* 2003;28(1):52-62.

Wainner RS, Gill H. Diagnosis and nonoperative management of cervical radiculopathy. *J Orthop Sports Phys Ther.* 2000;30(12):728-744.

Valsalva's Maneuver

Test Positioning

The subject is seated. The examiner stands next to the subject.

Action

The examiner asks the subject to take a deep breath and hold while bearing down, as if having a bowel movement.

Positive Finding

Increased pain due to increased intrathecal pressure, which may be secondary to a space-occupying lesion, herniated disk, tumor, or osteophyte in the cervical canal, is a positive finding. Pain may be localized or referred to the corresponding dermatome.

Special Considerations/Comments

The increased pressure may alter venous function and cause dizziness or unconsciousness. The examiner should be prepared to steady the subject.

Evidence

	Wainner et al (2003)
Study design	Diagnostic accuracy
Conditions evaluated	Cervical radiculopathy
Sample size	82
Reliability	Kappa = .69
Sensitivity	22
Specificity	94

References

Childs JD. One on one. The impact of the Valsalva maneuver during resistance exercise. *Strength Cond J.* 1999;21(2):54-55.

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Metzger BL, Therrien B. Effect of position on cardiovascular response during the Valsalva maneuver. *Nurs Res.* 1990;39(4):198-202.

Naliboff BD, Gilmore SL, Rosenthal MJ. Acute autonomic responses to postural change, Valsalva maneuver, and paced breathing in older type II diabetic men. *J Am Geriatr Soc.* 1993;41(6):648-653.

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O'Connor P, Sforzo GA, Frye P. Effect of breathing instruction on blood pressure responses during isometric exercise. *Phys Ther.* 1989;69(9):757-761.

Pierce MJ, Weesner CL, Anderson AR, Albohm MJ. Pneumomediastinum in a female track and field athlete: a case report. *J Athl Train.* 1998;33(2):168-170.

Rubinstein SM, Pool JJ, van Tulder MW, Riphagen II, de Vet HC. A systematic review of the diagnostic accuracy of provocative tests of the neck for diagnosing cervical radiculopathy. *Eur Spine J.* 2007;16(3):307-319.

Tentolouris N, Tsapogas P, Papazachos G, Katsilambros N. Corrected QT interval during the Valsalva maneuver in diabetic subjects. *Diabetes.* 2000;49(5):168.

Therrien B. Position modifies carotid artery blood flow velocity during straining. *Res Nurs Health.* 1990;13(2):69-76.

Wainner RS, Fritz JM, Irrgang JJ, Boninger ML, Delitto A, Allison S. Reliability and diagnostic accuracy of the clinical examination and patient self-report measures for cervical radiculopathy. *Spine (Phila Pa 1976).* 2003;28(1):52-62.

Swallowing Test

Test Positioning

The subject is seated. The examiner stands next to the subject.

Action

The examiner asks the subject to swallow.

Positive Finding

Increased pain or difficulty swallowing (dysphagia) caused by anterior cervical spine obstructions, such as vertebral subluxations, osteophyte protrusion, soft tissue swelling, or tumors in the anterior cervical spine region, is a positive finding.

Special Considerations/Comments

Be certain the subject's head is neutral because swallowing becomes more difficult with the neck extended.

References

Hinds NP, Wiles CM. Assessment of swallowing and referral to speech and language therapists in acute stroke. *QJM*. 1998;91(12):829-835.

Ilbay K, Evliyaoglu C, Etus V, Ozkarakas H, Ceylan S. Abnormal bony protuberance of anterior atlas causing dysphagia. A rare congenital anomaly. *Spinal Cord*. 2004;42(2):129-131.

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Wu MC, Chang YC, Wang TG, Lin LC. Evaluating swallowing dysfunction using a 100-ml water swallowing test. *Dysphagia*. 2004;19(1):43-47.

Tinel's Sign

Test Positioning

The subject can sit or lie supine.

Action

The examiner gently taps the cervical area near Erb's point, which can be found anterior to the transverse process of C6, approximately 2 cm superior to the location of the clavicle (Figure CS2-4).

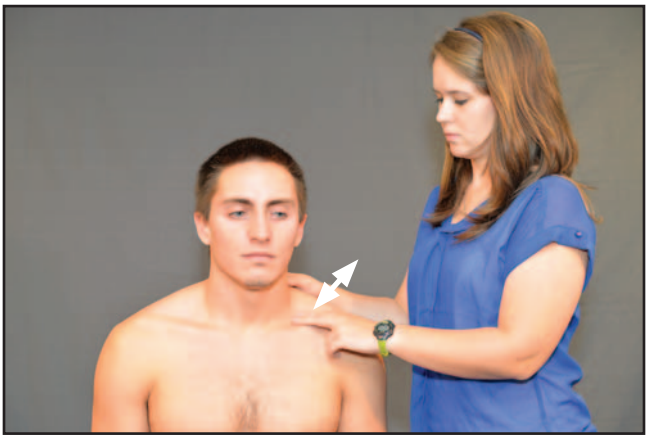

Figure CS2-4.

Positive Finding

A subjective reporting of a change in sensation to the upper extremity on the ipsilateral side resulting in increased pain or absent/diminished sensation is a positive finding, indicating brachial plexus pathology.

Special Considerations/Comments

This area is believed to be where the proximal portion of the brachial plexus is most superficial. A positive finding should be combined with a complete cervical nerve root assessment prior to any involved pathology to the brachial plexus.

References

Howard M, Lee C, Dellon AL. Documentation of brachial plexus compression (in the thoracic inlet) utilizing provocative neurosensory and muscular testing. *J Reconstr Microsurg*. 2003;19(5):303-312.

Ide M, Ide J, Yamaga M, Takagi K. Symptoms and signs of irritation of the brachial plexus in whiplash injuries. *J Bone Joint Surg Br*. 2001;83(2):226-229.

Please see videos on the accompanying website at
www.healio.com/books/specialtestsvideos

Section 3

Shoulder

Guide to Figures

denotes patient's movement
denotes examiner's movement
denotes tapping
denotes palpation
denotes stabilization

Konin JG, Lebsack D, Snyder Valier AR, Isear JA Jr.
Special Tests for Orthopedic Examination, Fourth Edition (pp 21-100).

Empty Can (Supraspinatus) Test

Test Positioning

The subject stands with both shoulders abducted to 90 degrees, horizontally adducted 30 degrees, and internally rotated so the subject's thumbs face the floor (Figure S3-1).

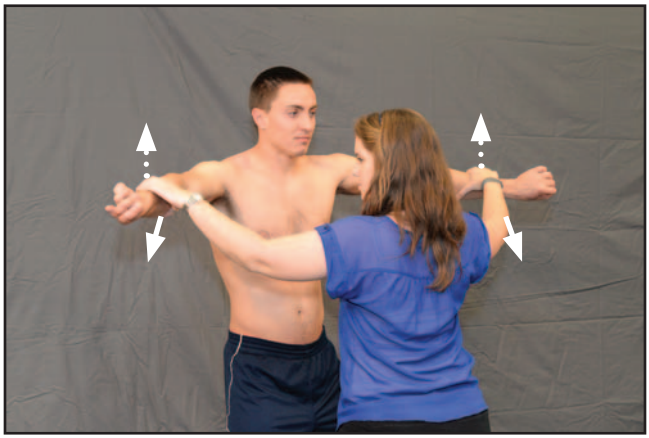

Figure S3-1.

Action

The examiner resists the subject's attempts to actively forward elevate both shoulders.

Positive Finding

Involvement of the supraspinatus muscle and/or tendon is suspected with noted weakness and/or a report of pain.

Special Considerations/Comments

Although the Empty Can Test is commonly performed with the subject standing, the test may also be performed with the subject seated. Weakness of the supraspinatus muscle may be a result of suprascapular nerve involvement. Reported pain may be indicative of tendinitis and/or impingement.

Evidence

	Hegedus et al (2008)	Hegedus (2012)
Study design	Systematic review	Systematic review
Conditions evaluated	Mixed conditions (eg, impingement syndrome and rotator cuff pathology)	Mixed conditions (eg, supraspinatus pathology, subacromial impingement, rotator cuff pathology)
Study number	1	13
Reliability	Not evaluated	Not evaluated
Sensitivity	44 to 53	19 to 99
Specificity	82 to 90	30 to 100

References

Hegedus EJ. 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(14):964-978.

Hegedus EJ, Goode A, Campbell S, et al. Physical examination tests of the shoulder: a systematic review with meta-analysis of individual tests. *Br J Sports Med.* 2008;42(2):80-92; discussion 92.

Holtby R, Razmjou H. Validity of the supraspinatus test as a single clinical test in diagnosing patients with rotator cuff pathology. *J Orthop Sports Phys Ther.* 2004;34(4):194-200.

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Rowlands LK, Wertsch JJ, Primack SJ, Spreitzer AM, Roberts MM. Kinesiology of the empty can test. *Am J Phys Med Rehabil.* 1995;74(4):302-304.

YERGASON TEST

TEST POSITIONING

The subject sits with the elbow flexed to 90 degrees and stabilized against the thorax. The forearm is in a pronated position. The examiner places one hand along the subject's forearm and the other hand on the proximal portion of the subject's humerus, near the bicipital groove (Figure S3-2A).

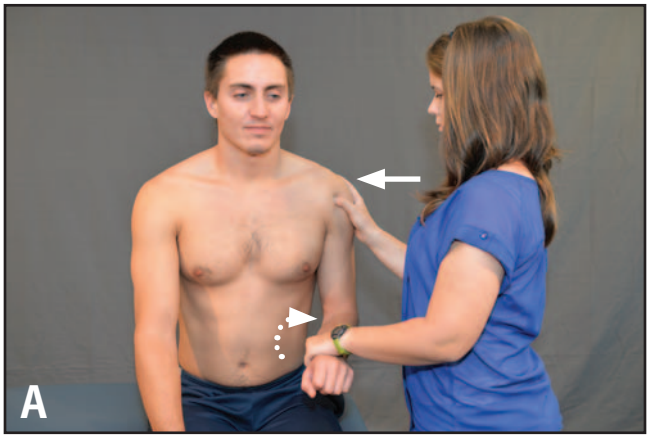

Figure S3-2A.

ACTION

The examiner resists the subject's attempt to actively supinate the forearm and externally rotate the humerus (Figure S3-2B).

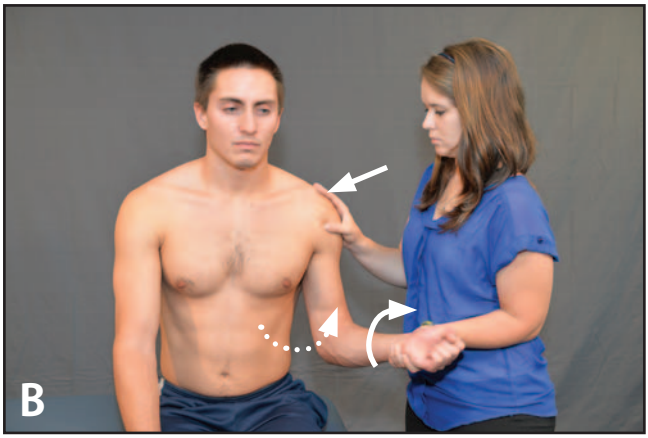

Figure S3-2B.

Positive Finding

Pain that is reported to exist in the area of the bicipital groove is a positive finding that may indicate bicipital tendinitis.

Special Considerations/Comments

This is a difficult test to perform. One may be just as accurate to assess bicipital tendinitis by simply palpating the long head of the biceps tendon in the bicipital groove.

Evidence

	Hegedus et al (2008)	Hegedus (2012)
Study design	Systematic review	Meta-analysis
Conditions evaluated	Labral pathology	Biceps tendinopathy
Study number	4	3
Sample size		246
Reliability	Not evaluated	Not evaluated
Sensitivity	12 to 43	12.4
Specificity	79 to 98	95.3

References

Caliş M, Akgün K, Birtane M, Karacan I, Caliş H, Tüzün F. Diagnostic values of clinical diagnostic tests in subacromial impingement syndrome. *Ann Rheum Dis*. 2000;59(1):44-47.

Guanche CA, Jones DC. Clinical testing for tears of the glenoid labrum. *Arthroscopy*. 2003;19(5):517-523.

Hegedus EJ. 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(14):964-978.

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Yergason RM. Supination sign. *J Bone Joint Surg Am*. 1931;13:160.

Speed's Test

Test Positioning

The subject is seated or standing. The involved shoulder is flexed to 90 degrees, the elbow is fully extended, and the forearm is supinated. The examiner places one hand along the volar aspect of the subject's forearm and the other hand on the proximal aspect of the subject's humerus near the area of the bicipital groove (Figure S3-3).

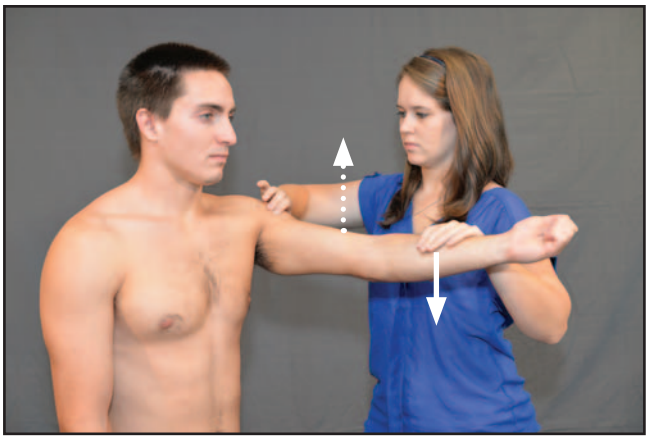

Figure S3-3.

Action

The examiner resists the subject's attempt to actively flex the humerus forward.

Positive Finding

Tenderness and/or pain in the bicipital groove is a positive finding that may suggest bicipital tendinitis.

Special Considerations/Comments

The examiner should carefully watch that the forearm is supinated and that the subject does not use accessory muscles to mask any existing weakness. Although this test is primarily used

to evaluate the biceps tendon, Speed's Test has also been used to evaluate superior labrum anterior to posterior (SLAP) lesions and subacromial impingement.

Evidence

	Hegedus et al (2008)	Hegedus (2012)
Study design	Meta-analysis	Meta-analysis
Conditions evaluated	Labral pathology (eg, SLAP tear)	Labral pathology (eg, biceps tendinopathy)
Study number	4	4
Sample size		327
Reliability	Not evaluated	Not evaluated
Sensitivity	32	20
Specificity	61	78

References

Caliş M, Akgün K, Birtane M, Karacan I, Caliş H, Tüzün F. Diagnostic values of clinical diagnostic tests in subacromial impingement syndrome. *Ann Rheum Dis*. 2000;59(1):44-47.

Clarnette RG, Miniaci A. Clinical exam of the shoulder. *Med Sci Sports Exerc*. 1998;30(4 Suppl):S1-S6.

Guanche CA, Jones DC. Clinical testing for tears of the glenoid labrum. *Arthroscopy*. 2003;19(5):517-523.

Hegedus EJ. 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(14):964-978.

Hegedus EJ, Goode A, Campbell S, et al. Physical examination tests of the shoulder: a systematic review with meta-analysis of individual tests. *Br J Sports Med*. 2008;42(2):80-92; discussion 92.

Mason JM. Shoulder injury: water polo 584. *Med Sci Sports Exerc*. 1997;29(5):101.

Russ DW. In-season management of shoulder pain in a collegiate swimmer: a team approach. *J Orthop Sports Phys Ther*. 1998;27(5):371-376.