



**PASIG** **PERFORMING ARTS**  
SPECIAL INTEREST GROUP



**ORTHOPAEDIC SECTION**  
AMERICAN PHYSICAL THERAPY ASSOCIATION



**PASIG MONTHLY CITATION BLAST: No. 119**

**September 2016**

Dear Performing Arts SIG members:

**Upcoming Conferences!** CSM 2017 will be February 15-17 in San Antonio, TX. At CSM 2017, the PASIG will provide main session programming “A Guide to Upper Extremity Nerve Entrapment Syndromes in Musicians,” by Janice Ying, DPT, OCS, Adriaan Louw, PhD, PT, CSMT, and Erin M. Hayden, PT, DPT, OCS

The 2017 Orthopaedic Section Annual Conference will be San Diego Hyatt Regency Mission Bay April 20-22.

**Dancer Screening Update!** PASIG is attempting to collect relevant information and resources to share with our membership regarding screening the young dancer (adolescent, pre-pro, collegiate). If you are currently participating in research and/or utilizing young dancer screening tools, please contact our Dancer Screening Chair, Mandy Blackmon, at [mandydancePT@gmail.com](mailto:mandydancePT@gmail.com). We will be meeting at CSM 2017 in San Antonio, TX to discuss and collaborate on current resources. Please let Mandy know if you will be at CSM and are interested in attending that committee meeting, as we need to plan for meeting space. Time: 1:00 PM, Thursday, February 16<sup>th</sup>

**Attention all PASIG Members!!** The PASIG Nomination Committee is looking for interested and qualified candidates interested in running for officer positions beginning 2017. There are 3 positions that will be up for election at the end of this year. These include: President (3 year term), Nominating committee member (3 year term), and Secretary (2 year term). Job descriptions of each of these positions are available. If anyone is interested or would like to nominate someone for any of the positions, please e-mail Janice Ying ([JaniceYingDPT@gmail.com](mailto:JaniceYingDPT@gmail.com)).

**Looking for new committee members!** There is room for new committee members, and students are welcome to participate. Please refer to the list below for contact information.

Annette Karim, President	2014-2017	<a href="mailto:neoluvsonlyme@aol.com">neoluvsonlyme@aol.com</a>
Rosie Canizares, Vice President/Education Chair	2016-2019	<a href="mailto:Rcc4@duke.edu">Rcc4@duke.edu</a>
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Laura Reising, Research Chair	2016-2018	<a href="mailto:lbreising@gmail.com">lbreising@gmail.com</a>
Amanda Blackmon, Dancer Screen Chair	2016-2018	<a href="mailto:MandyDancePT@gmail.com">MandyDancePT@gmail.com</a>
Dawn Muci, Public Relations Chair	2016-2018	<a href="mailto:Dawnd76@hotmail.com">Dawnd76@hotmail.com</a>
Mariah Nierman, Fellowship Taskforce Chair	2016-2018	<a href="mailto:Mariah.Nierman@osumc.edu">Mariah.Nierman@osumc.edu</a>
Anna Saunders, Secretary/ Student Scholarship Chair	2015-2017	<a href="mailto:annarosemary@gmail.com">annarosemary@gmail.com</a>
Andrea N. Lasner, Nominating Committee	2015-2018	<a href="mailto:alasner1@jhmi.edu">alasner1@jhmi.edu</a>
Jessica Fulton, Nominating Committee	2016-2019	<a href="mailto:jessicafultondpt@gmail.com">jessicafultondpt@gmail.com</a>
Laurel Abbruzzese, Fellowship Chair Asst.	2016-2018	<a href="mailto:La110@cumc.columbia.edu">La110@cumc.columbia.edu</a>
Elizabeth Chesarek, Membership Chair	2016-2018	<a href="mailto:echesarek@gmail.com">echesarek@gmail.com</a>

**Interested in a Performing Arts Fellowship? The American Board of Physical Therapy Residency and Fellowship Education (ABPTFRE) has approved the PASIG Description of Specialist Practice (DSP) for the Performing arts as an area of study.** We are now working with the ABPTFRE to turn the DSP into a Description of Fellowship Practice (DFP). We anticipate the DFP will be available online by June 2016. This means that sites can begin forming fellowships in dance medicine, music medicine, theater medicine, etc. The PASIG will provide the fellowship criteria for accreditation. We may have a meeting on creating a performing arts fellowship at CSM 2017 on Saturday, February 18<sup>th</sup>, from 12:00-1:30 PM. Please contact Mariah Nierman [Mariah.Nierman@osumc.edu](mailto:Mariah.Nierman@osumc.edu) or Laurel Abbruzzese [La110@cumc.columbia.edu](mailto:La110@cumc.columbia.edu) if interested.

**Membership:** Current PASIG members, please remember to update your membership:  
[https://www.orthopt.org/login.php?forward\\_url=/surveys/membership\\_directory.php](https://www.orthopt.org/login.php?forward_url=/surveys/membership_directory.php)

**Social Media:** For fun PT info and related performing artists info...

- 1) Facebook page: (closed) so, if you would like to be a part of the group, email Dawn Doran and let her know you'd like to join. [Dawnd76@hotmail.com](mailto:Dawnd76@hotmail.com)
- 2) follow PASIG on Twitter: @PT4PERFORMERS

**Call for case reports:** If you have a brief, clinically-focused case report on a performing arts PT patient, or a clinical commentary, please contact Annette Karim to submit your writing for the next Orthopaedic Physical Therapy Practice Magazine: [neoluvsonlyme@aol.com](mailto:neoluvsonlyme@aol.com)

**WE NEED MORE CONTRIBUTORS TO OUR MONTHLY CITATION BLASTS!!!!**

Past Monthly citation blasts are available, with citations and EndNote file, listed on the website:

[http://www.orthopt.org/content/special\\_interest\\_groups/performing\\_arts/citations\\_endnotes](http://www.orthopt.org/content/special_interest_groups/performing_arts/citations_endnotes)

**TOPICS THAT HAVE BEEN COVERED RECENTLY INCLUDE:**

*Thoracic Outlet Syndrome and Nerve Entrapment in Instrumental Musicians (current)*

*Plyometric Training in Dancers*

*HVLAT for Lower Extremity Conditions*

*Inguinal Disruption*

*Femoroacetabular Impingement*

*Hand and Wrist Conditions in Gymnasts*

*Factors in Optimal Turnout*

*Achilles Tendinopathy*

*Biomechanics and Posture in Musicians*

*Pilates*

*ACL Injuries in Dancers*

*Patellofemoral Pain and Dance*

*Neural Entrapments Found Among Musicians*

*Stress Fractures of the Foot and Ankle*

*Dry Needling*

*Dynamic Warm Up and Stretching*

*Platelet Rich Plasma Injections*

*Back Pain in Dancers*

**If you are interested in contributing by writing a citation blast or joining the research committee, contact me at: [lbreising@gmail.com](mailto:lbreising@gmail.com).**

Sincerely,

*Laura*

Laura Reising, PT, DPT, MS, OCS  
Research Chair, PASIG Research Committee  
*Allegheny General Hospital, Pittsburgh, PA*  
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## **PERFORMING ARTS CONTINUING EDUCATION, CONFERENCES, AND RESOURCES**

Musician Health Series, Janice Ying, PT, DPT, OCS  
Glendale Adventist Therapy and Wellness Center, Los Angeles area (Eagle Rock), CA  
<http://www.musicianshealthcorner.com/>  
[Healthy Musician Series - Overuse](#)

Orthopaedic Section Independent Study Course. *20.3 Physical Therapy for the Performing Artist.*

Monographs are available for:

- Figure Skating (J. Flug, J. Schneider, E. Greenberg),
- Artistic Gymnastics (A. Hunter-Giordano, Pongetti-Angeletti, S. Voelker, TJ Manal),
- and
- Instrumentalist Musicians (J. Dommerholt, B. Collier).

Contact: Orthopaedic Section at: [www.orthopt.org](http://www.orthopt.org)

Orthopaedic Section-American Physical Therapy Association,  
Performing Arts SIG

[http://www.orthopt.org/content/special\\_interest\\_groups/performing\\_arts](http://www.orthopt.org/content/special_interest_groups/performing_arts)

Performing Arts Citations and Endnotes

[http://www.orthopt.org/content/special\\_interest\\_groups/performing\\_arts/citations\\_endnotes](http://www.orthopt.org/content/special_interest_groups/performing_arts/citations_endnotes)

ADAM Center

<http://www.adamcenter.net/>

Publications:

<http://www.adamcenter.net/#!vstc0=publications>

Conference abstracts:

<http://www.adamcenter.net/#!vstc0=conferences>

Dance USA

<http://www.danceusa.org/>

Research resources:

<http://www.danceusa.org/researchresources>

Professional Dancer Annual Post-Hire Health Screen:

<http://www.danceusa.org/dancerhealth>

Dancer Wellness Project

<http://www.dancerwellnessproject.com/>

Becoming an affiliate:

<http://www.dancerwellnessproject.com/Information/BecomeAffiliate.aspx>

Harkness Center for Dance Injuries, Hospital for Joint Diseases

<http://hjd.med.nyu.edu/harkness/>

Continuing education:

<http://hjd.med.nyu.edu/harkness/education/healthcare-professionals/continuing-education-courses-cme-and-ceu>

Resource papers:

<http://hjd.med.nyu.edu/harkness/dance-medicine-resources/resource-papers-and-forms>

Links:

<http://hjd.med.nyu.edu/harkness/dance-medicine-resources/links>

Informative list of common dance injuries:

<http://hjd.med.nyu.edu/harkness/patients/common-dance-injuries>

Research publications:

<http://hjd.med.nyu.edu/harkness/research/research-publications>

International Association for Dance Medicine and Science (IADMS)

<http://www.iadms.org/>

Resource papers:

<http://www.iadms.org/displaycommon.cfm?an=1&subarticlenbr=186>

Links:

<http://www.iadms.org/displaycommon.cfm?an=5>

Medicine, arts medicine, and arts education organization links:

<http://www.iadms.org/displaycommon.cfm?an=1&subarticlenbr=5>

Publications:

<http://www.iadms.org/displaycommon.cfm?an=3>

Performing Arts Medicine Association (PAMA)

<http://www.artsmed.org/>

<http://www.artsmed.org/symposium.html>

Interactive bibliography site:

<http://www.artsmed.org/bibliography.html>

Related links:

<http://www.artsmed.org/relatedlinks.html>

Member publications:

<http://artsmed.org/publications.html>

***(Educators, researchers, and clinicians, please continue to email your conference and continuing education information to include in future blasts.***

## **Thoracic Outlet Syndrome and Nerve Entrapment in Instrumental Musicians**

Musicians are at high risk of work-related musculoskeletal disorders of the upper extremity due to long hours of practice and ergonomics. One of the more common complaints is an upper extremity peripheral nerve compression that afflicts 20% to 30% of instrumental musicians. Evidence emphasizes a thorough examination of the cervical spine and bilateral upper extremities and electrodiagnostic studies are highly recommended for proper diagnosis. Management includes conservative care—i.e., dynamic stabilization for joint hypermobility, neuromuscular reeducation for posture and positioning, technical retraining, nerve mobilization, patient education on self-care, and modification of playing schedules—and when conservative care fails, surgical intervention can be considered. Per Lederman 2003, with proper diagnosis and management, nerve entrapment syndromes have a high success rate for return to pain-free playing.

*Laura Reising, PT, DPT, OCS  
Allegheny General Hospital  
Pittsburgh, PA*

## **Amadio PC. Management of nerve compression syndrome in musicians. *Hand Clin.* 2003 May;19(2):279-86, vi-vii.**

ABSTRACT: Nerve compression syndromes are common in the general population, and they are also common in musicians. As many as 30% of musicians who have a recognized musculoskeletal disorder are diagnosed with a nerve compression syndrome. Thus, it is important to consider the diagnosis of nerve compression syndromes in all musicians who present with musculoskeletal complaints. Proper management of these problems is essential if one is to avoid significant morbidity.

## **Campbell RM. Thoracic outlet syndrome in musicians: an approach to treatment. *Work.* 1966;7(2):115-9. doi: 10.3233/WOR-1996-7206.**

ABSTRACT: Thoracic outlet syndrome (TOS) can affect the skill of instrumental musicians. This paper details the way in which symptomatic TOS affects the musician and describes two cases of symptomatic TOS in a drummer and a violinist. Evaluation tools and treatment techniques are described.

**Hoppmann RA. Instrumental musicians' hazards. *Occup Med.* 2001 Oct-Dec;16(4):619-31, iv-v.**

ABSTRACT: In the last two decades, injuries to instrumental musicians have been well documented. Major categories of performance-related injuries include musculoskeletal overuse, nerve entrapment/thoracic outlet syndrome, and focal dystonia. Other areas of concern to instrumentalists include hypermobility, osteoarthritis, fibromyalgia, and hearing loss. This chapter reviews the epidemiology, risk factors, physical exam, treatment, and prevention of common problems of instrumentalists. Emphasis is placed on the team approach of treatment and prevention and the need for close collaboration of the various health professionals, music educators, and performers. Additional resources are presented for those interested in pursuing performing arts medicine in greater detail.

**Jepsen JR. Posterior interosseous neuropathy in the distal radial tunnel in a contrabassoon musician. *Med Probl Perform Art.* 2014;29(1):23-6.**

OBJECTIVE: Bassoonists seem to have a high recorded prevalence of performance-related upper limb symptoms. Yet, the background for their symptoms has not been established. This study aimed to diagnose and treat the pathology that caused severe upper limb symptoms in a bassoon/contrabassoon musician in order to allow him to continue his professional career in a symphony orchestra.

METHODS: A detailed neurological bedside examination was undertaken and targeted physiotherapy offered.

RESULTS: The physical examination demonstrated weakness, atrophy, and nerve trunk soreness, indicating an affliction of the posterior interosseous nerve (radial tunnel syndrome) or its muscular branches. The risk factors during bassoon playing are comparable to those reported from industrial exposures. The patient was able to resume playing after treatment by nerve mobilisation.

**Kennedy RH, Hutcherson KJ, Kain JB, Phillips AL, Halle JS, Greathouse DG. Median and ulnar neuropathies in university guitarists. *J Orthop Sports Phys Ther.* 2006;36(2):101-11.**

STUDY DESIGN: Descriptive study.

OBJECTIVES: To determine the presence of median and ulnar neuropathies in both upper extremities of university guitarists.

BACKGROUND: Peripheral nerve entrapment syndromes of the upper extremities are well documented in musicians. Guitarists and plucked-string musicians are at risk for entrapment neuropathies in the upper extremities and are prone to mild neurologic deficits.

METHODS AND MEASURES: Twenty-four volunteer male and female guitarists (age range, 18-26 years) were recruited from the Belmont

University School of Music and the Vanderbilt University Blair School of Music. Individuals were excluded if they were pregnant or had a history of recent upper extremity or neck injury. Subjects completed a history form, were interviewed, and underwent a physical examination. Nerve conduction status of the median and ulnar nerves of both upper extremities was obtained by performing motor, sensory, and F-wave (central) nerve conduction studies. Descriptive statistics of the nerve conduction study variables were computed using Microsoft Excel.

**RESULTS:** Six subjects had positive findings on provocative testing of the median and ulnar nerves. Otherwise, these guitarists had normal upper extremity neural and musculoskeletal function based on the history and physical examinations. When comparing the subjects' nerve conduction study values with a chart of normal nerve conduction studies values, 2 subjects had prolonged distal motor latencies (DMLs) of the left median nerve of 4.3 and 4.7 milliseconds (normal, < 4.2 milliseconds). Prolonged DMLs are compatible with median neuropathy at or distal to the wrist. Otherwise, all electrophysiological variables were within normal limits for motor, sensory, and F-wave (central) values. However, comparison studies of median and ulnar motor latencies in the same hand demonstrated prolonged differences of greater than 1.0 milliseconds that affected the median nerve in 2 additional subjects, and identified contralateral limb involvement in a subject with a prolonged distal latency. The other 20 subjects demonstrated normal comparison studies of the median and ulnar nerves in both upper extremities.

**CONCLUSIONS:** In this descriptive study of a population of 24 university guitarists, 4 musicians (17%) were found to have electrophysiologic evidence of median neuropathy at or distal to the wrist or carpal tunnel syndrome. Ulnar nerve electrophysiological function was within normal limits for all subjects examined.

**Lederman RJ. Thoracic outlet syndromes: review of the controversies and a report of 17 instrumental musicians. *Med Probl Perform Art.* 1987;2:87-91.**

**ABSTRACT:** The author's purpose is to review the major areas of controversy surrounding the diagnosis of this entity. He concludes the review with his own approach based on observations of 17 instrumental musicians who have been diagnosed as having thoracic outlet syndrome.

**Lederman RJ. Peripheral nerve disorders in instrumentalists. *Ann Neurol.* 1989;26(5):640-6.**

**ABSTRACT:** I evaluated 226 instrumentalists for playing-related symptoms. There were 103 players (46%) of string instruments, 7 keyboard instrumentalists (32%), 44 players (19%) of wind instruments, and 6 percussionists (3%). The mean age was 32 years; 58% were women. Sixty-five patients (29%) had a peripheral nerve disorder; 27 had symptoms of



thoracic outlet syndrome; 12 had median neuropathies (carpal tunnel syndrome in 9); 9 had ulnar neuropathies; 6 had cervical radiculopathy; 5 had digital neuropathies; 3 had cranial neuropathies; and 3 had other peripheral nerve disorders. Treatment consisted of modification of playing schedules and technique, plus physical and occupational therapy in 51 and surgical procedures in 9 patients; 5 were not treated. Follow-up at 1 to 8 years showed 74% had a satisfactory result, 14% had slight or minimal improvement, and 12% had no improvement. At the time of writing, all but 4 patients remained in the music profession. It is concluded that playing-related symptoms among instrumentalists are frequently neurological in origin and that the large majority can be helped by conservative or, on occasion, surgical means.

**Lederman RJ. Neuromuscular problems in musicians. *Neurologist*. 2002;8(3):163-74.**

**BACKGROUND:** Musicians are an occupational (or avocational) group that may on occasion have highly specific health care problems apparently caused by or adversely affecting instrumental performance. Neurologists have been intimately involved in the development of a burgeoning interest in these disorders and, because of the nature of the most common symptoms, neurologists can expect to be called upon to evaluate such patients.

**REVIEW SUMMARY:** In this review, the most common playing-related disorders are discussed. These include the regional pain syndromes, primarily involving the neck and upper extremity, the focal neuropathies, again predominantly involving the upper extremity, and the focal dystonias or occupational cramps, which typically affect the hand or the cranial-innervated muscles involved in the embouchure (the relationship of the facial musculature to the mouthpiece of the instrument). Risk factors contributing to the development of these disorders are reviewed, the diagnostic approach is described, and the management of these playing-related problems is summarized. Aspects in which the instrumental musician may differ from other patients commonly seen by the neurologist, particularly with respect to the types of problems seen, methods of evaluation, and therapeutic strategies, are emphasized.

**CONCLUSIONS:** Many unanswered questions remain in each of these areas. Neurologists and neuroscientists are in an excellent position to help fill the voids in our knowledge base. It is hoped that the reader will be stimulated to participate

**Lederman RJ. Neuromuscular and musculoskeletal problems in instrumental musicians. *Muscle Nerve*. 2003;27(5):549-61.**

**ABSTRACT:** Over the past 20 years, there has been increasing interest in the medical problems of performing artists. In this review, the major playing-related disorders seen in instrumental musicians are discussed. Among the

1353 instrumentalists personally evaluated, the major diagnoses included musculoskeletal disorders in 64%, peripheral nerve problems in 20%, and focal dystonia in 8%. Of these instrumentalists, 60% were women, although men were the majority in the group with focal dystonia. The average age at the time of evaluation was 37 years for men and 30 years for women. Among musculoskeletal disorders, regional muscle pain syndromes, particularly of the upper limb, upper trunk, and neck, were most common. Specific entities such as tendinitis and ligament sprain were less common. Frequent peripheral nerve disorders included thoracic outlet syndrome, ulnar neuropathy at the elbow, and carpal tunnel syndrome. Each instrument group showed a characteristic distribution of symptoms and signs that appeared to be directly related to the static and dynamic stresses inherent in the playing of the instrument. Electrodiagnostic studies are an important part of the evaluation of these disorders, particularly nerve entrapment syndromes. With carefully designed treatment, the majority of instrumental musicians can return to full and pain-free playing. Nerve entrapment syndromes have the highest treatment success rate, followed by musculoskeletal pain syndromes. Despite some recent innovative approaches, focal dystonia remains largely resistant to therapy.

**Lederman RJ. Focal peripheral neuropathies in instrumental musicians. *Phys Med Rehabil Clin N Am.* 2006;17(4):761-79.**

**ABSTRACT:** Instrumental musicians often seek medical consultation for symptoms suggestive of nerve entrapment. About 20% of those seen in the author's performing artists' clinic were diagnosed with a focal neuropathy. In general, neuropathies that are most common in the overall population tend also to be most common among musicians, although some expectations exist, including, for example, localized peri-oral sensory syndromes associated with playing a brass instrument, and, possibly, ulnar neuropathies related to the playing position of bowed string players. The diagnosis is made, as always, by careful clinical assessment, including observation of the instrumentalist playing, with ancillary procedures such as nerve conduction studies and needle electromyography adding to the accuracy of the diagnosis. Treatment is similar to that used in nonmusicians, but certain factors, including the musician's requirement for extraordinary neuromuscular dexterity, may influence the therapeutic decisions. Very limited long-term outcome results are available, and additional studies in musicians would be helpful in determining the most appropriate therapeutic approaches. Virtually no longitudinal studies have been performed to look at methods for preventing these disorders.

**Paarup HM, Baelum J, Manniche C, Holm JW, Wedderkopp N. Occurrence and co-existence of localized musculoskeletal symptoms and findings in work-attending orchestra musicians: an exploratory cross-sectional study. *BMC Res Notes*. 2012;5:541. doi: [10.1186/1756-0500-5-541](https://doi.org/10.1186/1756-0500-5-541)**

**BACKGROUND:** Due to ergonomic exposure musicians are at risk of work-related musculoskeletal disorders in the neck, back, and upper extremities. The literature confirms musculoskeletal problems in these anatomic regions among orchestra musicians.

**METHODS:** An explorative cross-sectional study among 441 musicians from six Danish symphony orchestras; 216 underwent a clinical examination constructed for the purpose. Prior to the examination the musicians rated their maximally perceived trouble within the last week on a scheme blinded to the examiner. Accessibility to the clinical examination differed between orchestras. The aims were to assess the prevalence of 1) perceived symptoms within the previous week in the neck, back and limbs and of 2) clinical findings in the neck, back, and upper extremities, and 3) to investigate the co-existence of the perceived symptoms and clinical findings.

**RESULTS:** Symptoms and findings were most common in the neck, back, and shoulders. Due to a poor co-existence between self-reported symptoms and clinical findings musicians experiencing bodily trouble could not be identified through this clinical examination. Free accessibility to the examination was of major importance to participation.

**CONCLUSIONS:** In compliance with the purpose, perceived symptoms within the previous week and present clinical findings were assessed. Although both symptoms and findings were most frequent in the neck, back, and shoulders the co-existence of anatomically localized symptoms and findings was generally quite poor in this study. Discrepancy between symptoms and findings might be caused by the participants currently attending work and therefore being relatively healthy, and the fluctuating nature of musculoskeletal problems. Furthermore from a comparison of different measuring units - self-reported symptoms being period prevalence rates and clinical findings point prevalence rates; a bias which may also be inherent in similar studies combining self-reported questionnaire data and clinical findings.

**Pascarelli EF, Hsu YP. Understanding work-related upper extremity disorders: clinical findings in 485 computer users, musicians, and others. *J Occup Rehabil*. 2001;11(1):1-21.**

**ABSTRACT:** Four hundred eighty five patients whose chief complaints were work related pain and other symptoms received a comprehensive upper-body clinical evaluation to determine the extent of their illness. The group had a mean age of 38.5 years. Sixty-three percent of patients were females. Seventy percent were computer users, 28% were musicians, and 2% were others engaged in repetitive work. The time between the onset of symptoms

and our initial visit ranged from 2 weeks to over 17 years. A majority sought care within 30 months with the greatest number of them seeking care before 12 months. Fifty nine percent of subjects were still working when seen despite increasing pain and symptoms such as weakness, numbness, tingling, and stiffness. Following a history, a physical assessment utilizing commonly employed clinical tests were performed including evaluation of joint range of motion, hyperlaxity, muscle tenderness, pain, strength, and imbalance. Neurologic tests included Tinel's sign performed in wrist, elbow, tricipital sulcus, and neck and tests for thoracic out syndrome (TOS). Specific tests such as Finkelstein's test for deQuervain's tenosynovitis, Phalen's test for carpal tunnel syndrome and grip strengths were included in the examination protocol. Significant findings included postural misalignment with protracted shoulders (78%), head forward position (71%), neurogenic TOS (70%), cervical radiculopathy (0.03%), evidence of sympathetic dysfunction (20%), and complex regional pain syndrome (RSD) (0.6%). Hyperlaxity of fingers and elbows was found in over 50%, carpal tunnel syndrome in 8%, radial tunnel syndrome in 7%, cubital tunnel in 64%, shoulder impingement in 13%, medial epicondylitis in 60%, lateral epicondylitis in 33%, and peripheral muscle weakness in 70%. We conclude that despite initial presentation distally, work-related upper-extremity disorders are a diffuse neuromuscular illness with significant proximal upper-body findings that affect distal function. While neurogenic TOS remains a controversial diagnosis, the substantial number of patients with positive clinical findings in this study lends weight to the concept that posture related neurogenic TOS is a key factor in the cascading series of physical events that characterize this illness. A comprehensive upper-body examination produces findings that cannot be obtained through laboratory tests and surveys alone and lays the ground work for generating hypotheses about the etiology of work related upper-extremity disorders that can be tested in controlled investigations.

**Rosenbaum AJ, Vanderzanden J, Morse AS, Uhl RL. Injuries complicating musical practice and performance: the hand surgeon's approach to the musician-patient. *J Hand Surg Am.* 2012 Jun;37(6):1269-72; quiz 1272. doi: 10.1016/j.jhssa.2012.01.018. Epub 2012 Mar 3.**

**Rozmaryn LM. Upper extremity disorders in performing artists. *Md Med J.* 1993 Mar;42(3):255-60.**

ABSTRACT: Studies in the past decade have shown that a significant proportion of instrumentalists report musculoskeletal problems severely affecting their musical performance. Musicians endure daily intensive use of their upper extremities, frequently placing them in bizarre positions. Their training schedules are rigorous and long term Predisposing factors to, and treatment for, overuse syndromes, tendinitis, and tendon trauma commonly encountered by musical performers are discussed at length. Nerve entrapment has also surfaced as a major problem in musicians, and the

means of evaluation and treatment and the role of surgery are put forth. Techniques for studying and analyzing the difficulties faced by instrumentalists are summarized.

**Shaffer SW, Kareerat NR, Gordon LB, Santillo DR, Moore JH, Greathouse DG. Median and ulnar neuropathies in the U.S. Army Medical Command Band members. *Med Probl Perform Art.* 2013;28(4):188-94.**

**PURPOSE:** Musicians have been reported as having a high prevalence of upper-extremity musculoskeletal disorders, including carpal tunnel syndrome. The purpose of this study was to determine the presence of median and ulnar neuropathies in U.S. Army Medical Command (MEDCOM) Band members at Fort Sam Houston, Texas.

**METHODS:** Thirty-five MEDCOM Band members (30 males, 5 females) volunteered to participate. There were 33 right-handed musicians, and the mean length of time in the MEDCOM Band was 12.2 yrs (range, 1-30 yrs). Subjects completed a history form, were interviewed, and underwent a physical examination of the cervical spine and bilateral upper extremities. Nerve conduction studies of the bilateral median and ulnar nerves were performed. Electrophysiological variables served as the reference standard for median and ulnar neuropathy and included distal sensory latencies, distal motor latencies, amplitudes, conduction velocities, and comparison study latencies.

**RESULTS:** Ten of the 35 subjects (29%) presented with abnormal electrophysiologic values suggestive of an upper extremity mononeuropathy. Nine of the subjects had abnormal median nerve electrophysiologic values at or distal to the wrist; 2 had bilateral abnormal values. One had an abnormal ulnar nerve electrophysiologic assessment at the elbow. Nine of these 10 subjects had clinical examination findings consistent with the electrophysiological findings.

**CONCLUSIONS:** The prevalence of mononeuropathies in this sample of band members is similar to that found in previous research involving civilian musicians (20-36%) and far exceeds that reported in the general population. Prospective research investigating screening, examination items, and injury prevention measures in musicians appears to be warranted.

**Toledo SD, Nadler SF, Norris RN, Akuthota V, Drake DF, Chou LH. Sports and performing arts medicine. 5. Issues relating to musicians. *Arch Phys Med Rehabil.* 2004;85(3 Suppl 1):S72-4.**

**ABSTRACT:** This self-directed learning module discusses classic topics and highlights new advances in this topic area. This article, which discusses upper-limb injuries in musicians, is a section of the study guide on sports and performing arts medicine in the Self-Directed Physiatric Education Program for practitioners and trainees in physical medicine and rehabilitation. This article uses case vignettes to elaborate on issues relating to musicians.

**Wilson RJ, Watson JT, Lee DH. Nerve entrapment syndromes in musicians. *Clin Anat.* 2014;27(6):861-5. doi: 10.1002/ca.22377. Epub 2014 Mar 18.**

ABSTRACT: Nerve entrapment syndromes are common in instrumental musicians. Carpal tunnel syndrome, ulnar neuropathy at the elbow, and thoracic outlet syndrome appear to be the most common. While electrodiagnostic studies may confirm the diagnosis of nerve entrapment, they may be falsely normal in musicians. Non-operative treatment with instrument and technique modification may help. Involvement with the musician's teacher to implement appropriate treatment is recommended. Outcomes for both non-operative and operative treatment for various nerve entrapment syndromes have yielded mostly good to excellent results, similar to the general population.

