



PASIG MONTHLY CITATION BLAST: No.95

July 2014

Dear Performing Arts SIG members:

CSM 2015 is around the corner! (Indianapolis, Indiana, February 4-7, 2015) The PASIG educational programming will be given by Clare Frank DPT, MS, OCS, FAAOMPT on Dynamic Neuromuscular Stabilization in Spinal Rehabilitation & Performance. It will be an exciting and informative class, with very applicable methods of evaluating and treating the performing artist.

Attention PT students! For those of you who have submitted an abstract to present a poster or platform presentation at APTA CSM 2015: We offer a student scholarship through the PASIG for accepted presentations. If you would like information about this student scholarship, please e-mail Amy Humphrey, PT, DPT, OCS, MTC at amymarieis@comcast.net

If you are interested in serving on the PASIG nominating committee, or in any other way, please contact Rosie Canizares at rcc4@duke.edu. Below is a list of our committee members, please feel free to contact any of them if you are interested in serving on their committees.

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Check out the APTA Orthopaedic Section **Facebook Page**—be sure to “like” it and look for future PASIG information posted there:

<https://www.facebook.com/pages/APTA-Orthopaedic-Section/121020534595362>

Research Call to action:

1. We still need writers for the 2014 Citation blasts!!! (Particularly for months after August 2014). These are put together on a monthly basis. Please contact me for more information, at brookerwinder@gmail.com. Go to the website to look at topics that have been covered, add new content or update old citation topics:
http://www.orthopt.org/content/special_interest_groups/performing_arts/citations_endnotes
2. We need case reports and original research papers that focus on clinical applications to the care of performing artists to publish in our quarterly Orthopaedic Practice Magazine, in the PASIG pages. Orthopaedic Practice Magazine is a great way of getting your case reports, original research, and clinical pearls into the hands of our PASIG members. Please contact Annette Karim if you are interested in submitting your writing:
neoluvsonlyme@aol.com
3. If you are seeking research participants, or are seeking a researcher to work with your potential participants, contact both Brooke Winder, Research Chair: Brookerwinder@gmail.com and Amanda Blackmon, Membership Chair: mandy@onetherapy.com
4. We are working on creating a brief dance screen as a resource for the PASIG website. The new contact for dance screening is Sarah Wegner:
Sbw28@drexel.edu

The practice of compiling abstracts has been an easy way for interns and clinicians to provide content for a citation blast as well as prepare for a clinical inservice or case study report. Please consider compiling Performing Arts-related abstracts for a citation blast this year. It's easy to do, and a great way to become involved with PASIG! Just take a look at our Performing Arts Citations and Endnotes, look for what's missing, and email me your contribution or ideas on future citation blasts. (brookeRwinder@gmail.com)

http://www.orthopt.org/content/special_interest_groups/performing_arts/citations_endnotes

Best regards,

Brooke

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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

Orthopaedic Section-American Physical Therapy Association,
Performing Arts SIG
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

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)

Focal Dystonia

Focal Dystonia is a neurological condition that affects approximately 1% of all professional musicians. It is most commonly described as a task-specific movement disorder that affects the sensorimotor cortex. This condition has been long documented among professions involving repetitive movements including writers, musicians and dentists. In more recent history, focal dystonia (commonly referred to as “musicians’ cramp”) has come back into the limelight in the music world due to a prominent concert pianist, Leon Fleischer. Fleischer first started experiencing symptoms in his right hand in the 1960’s and was unable to perform. He later went on to record several recordings and did numerous performances using only his left hand. In 2007, Fleischer released his first two-handed recording after many years of medical and therapeutic treatment.

This condition is often thought to be career-ending. Hopefully with the continuation and progression of research into this area, more effective treatments, including physical therapy, can help talented musicians overcome this debilitating ailment.

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Altenmuller E, Jabusch HC. Focal dystonia in musicians: phenomenology, pathophysiology and triggering factors. *Eur J Neurol.* Jul 2010;17 Suppl 1:31-36.
BACKGROUND: Musician's dystonia is a task-specific movement disorder that manifests itself as a loss of voluntary motor control in extensively trained movements. In many cases, the disorder terminates the careers of affected musicians. Approximately, 1% of all professional musicians are affected. The pathophysiology of the disorder is still unclear. Findings include: (i) reduced inhibition in different levels of the central nervous system, (ii) maladaptive plasticity, e.g. in the somatosensory cortex and in the basal ganglia and (iii)

alterations in sensorimotor processing. *METHODS*: Review of the literature. *RESULTS*: Epidemiological data demonstrated a higher risk for those musicians who play instruments requiring maximal fine-motor skills. For instruments where workload differs across hands, focal dystonia appears more often in the more intensely used hand. In psychological studies, musicians with dystonia had more perfectionist tendencies than healthy musicians. These findings strengthen the assumption that behavioural factors may be involved in the etiology of musician's dystonia. Hereditary factors may play a greater role than previously assumed. *CONCLUSIONS*: We propose a heuristic model that may explain the relatively high incidence of focal dystonia in musicians. This model assumes the coactions between a predominantly genetically determined predisposition and intrinsic and extrinsic triggering factors.

Aranguiz R, Chana-Cuevas P, Albuquerque D, Leon M. Focal dystonia in musicians. *Neurologia*. Jan-Feb 2011;26(1):45-52.

INTRODUCTION: A special group of focal dystonia is that known as occupational, which include dystonic disorders triggered by repetitive motor activity, closely associated with the professional activity of a specific task that the affected person performs. In this sense, musicians are a population particularly vulnerable to this disorder, which is presented during the execution of highly trained movements. *OBJECTIVE*: This article reviews the pathophysiology of focal dystonia and its therapeutic implications. *DEVELOPMENT*: The pathophysiological basis of focal dystonia in the musician is still not well established. However, due to the contribution of neurophysiological studies and functional neuroimaging, there is growing evidence of anomalies in the processing of sensory information, sensory-motor integration, cortical and subcortical inhibitory processes, which underline this disease. Clinically, it is characterised by the appearance of involuntary muscle contractions, and is associated with loss of motor control while practicing music. It is a gradual appearance and sometimes there may be a history of musculoskeletal injuries or non-physiological postures preceding the appearance of the symptoms. The neurological examination is usually normal, although subtle dystonic postures can develop spontaneously or with movements that involve the affected segments. The dystonia remains focal and is not generalised. *CONCLUSIONS*: Treatment is based on using multiple strategies for the management of the dystonia, with variable results. Although a specific therapy has not been defined, there are general principles that are combined in each situation looking for results. This includes, among others, pharmacological interventions, management with botulinum toxin, and sensory re-training techniques.

Byl NN, Nagajaran S, McKenzie AL. Effect of sensory discrimination training on structure and function in patients with focal hand dystonia: a case series. *Arch Phys Med Rehabil.* Oct 2003;84(10):1505-1514.

OBJECTIVE: To measure the effects of sensorimotor training based on the principles of neuroplasticity for patients with focal hand dystonia.

DESIGN:

Case series of 3 subjects with focal hand dystonia of the left hand, compared with age-matched normative controls. **SETTING:** Outpatient clinic. **PARTICIPANTS:** Three consecutive clinic patients-musicians with focal hand dystonia-who described a history of repetitive practice and performance (2 women; ages, 23 y and 35 y; 1 man; age, 24 y).

INTERVENTION: Subjects were asked to stop performing the tasks that caused the abnormal movements, to participate in a wellness program (aerobics, postural exercises, stress free hand use), and to carry out supervised, attended, individualized, repetitive sensorimotor training activities at least once week for 12 weeks and reinforced daily at home. **MAIN OUTCOME MEASURES:** Standard tests documenting somatosensory hand representation, target-specific hand control, and clinical function. **RESULTS:** On the affected side, the 3 subjects improved an average of 86.8% on somatosensory hand representation, 117% on target-specific performance, 23.9% on fine motor skills, 22.7% on sensory discrimination, 31.9% on musculoskeletal skills, and 32.3% on independence. All 3 subjects improved 10% or more on 90% of the subtests with 20% improvement on 50% of the subtests. **CONCLUSION:** Individuals with focal hand dystonia who have a history of repetitive hand use can improve cortical somatosensory responses and clinical motor function after individualized sensorimotor training consistent with the principles of neural adaptation.

Chamagne P. Functional dystonia in musicians: rehabilitation. *Hand Clin.* May 2003;19(2):309-316.

For functional dystonia in musicians, rehabilitation should be principally psychomotor, including psychotherapy based on analysis of the personality and a global physical education of the corporal scheme--it is a compartmental reeducation. From the time of onset, it is of great importance to the musician that the mechanism at the origin of the problem be understood and analyzed. For the therapist, the principal goal is to identify the multiple compensations that mask the real dysfunction. When the musician and the therapist agree on the real cause of the dystonia, it becomes evident that an anatomopathologic explanation using simple vocabulary is as efficacious in the treatment as is the physical therapy. Beginning to rectify abnormal postures and reeducation

of the impaired motions then can begin with a whole range of techniques, using specific exercises, stretching, and removable orthoses.

Cheng FP, Grossbach M, Altenmuller EO. Altered sensory feedbacks in pianist's dystonia: the altered auditory feedback paradigm and the glove effect. *Front Hum Neurosci.* 2013;7:868.

Background: This study investigates the effect of altered auditory feedback (AAF) in musician's dystonia (MD) and discusses whether AAF can be considered as a sensory trick in MD. Furthermore, the effect of AAF is compared with altered tactile feedback, which can serve as a sensory trick in several other forms of focal dystonia. Methods: The method is based on scale analysis (Jabusch et al., 2004). Experiment 1 employs synchronization paradigm: 12 MD patients and 25 healthy pianists had to repeatedly play C-major scales in synchrony with a metronome on a MIDI-piano with three auditory feedback conditions: (1) normal feedback; (2) no feedback; (3) constant delayed feedback. Experiment 2 employs synchronization-continuation paradigm: 12 MD patients and 12 healthy pianists had to repeatedly play C-major scales in two phases: first in synchrony with a metronome, secondly continue the established tempo without the metronome. There are four experimental conditions, among them three are the same AAF as in Experiment 1 and 1 is related to altered tactile sensory input. The coefficient of variation of inter-onset intervals of the key depressions was calculated to evaluate fine motor control. Results: In both experiments, the healthy controls and the patients behaved very similarly. There is no difference in the regularity of playing between the two groups under any condition, and neither did AAF nor did altered tactile feedback have a beneficial effect on patients' fine motor control. Conclusions: The results of the two experiments suggest that in the context of our experimental designs, AAF and altered tactile feedback play a minor role in motor coordination in patients with musicians' dystonia. We propose that altered auditory and tactile feedback do not serve as effective sensory tricks and may not temporarily reduce the symptoms of patients suffering from MD in this experimental context.

de Lisle R, Speedy DB, Thompson JM. Rehabilitation of a cellist whose vibrato was affected by focal dystonia. *Med Probl Perform Art.* Dec 2012;27(4):227-230.

Focal dystonia can result in a variety of technical problems in the performing musician, most often affecting control of finger movement, and embouchure. Less common is the effect of focal dystonia on the vibrato of string players. The professional cellist in our study presented with difficulty controlling her vibrato, which fluctuated both in speed and amplitude, causing an inconsistency of sound. This study investigated whether instrumental retraining could alleviate her condition. We report the novel finding that instrumental

retraining can significantly improve the symptoms of a dystonic vibrato in a cellist.

Dolberg R, Hinkley LB, Honma S, et al. Amplitude and timing of somatosensory cortex activity in task-specific focal hand dystonia. *Clin Neurophysiol.* Dec 2011;122(12):2441-2451.

OBJECTIVE: Task-specific focal hand dystonia (tspFHD) is a movement disorder diagnosed in individuals performing repetitive hand behaviors. The extent to which processing anomalies in primary sensory cortex extend to other regions or across the two hemispheres is presently unclear. **METHODS:** In response to low/high rate and novel tactile stimuli on the affected and unaffected hands, magnetoencephalography (MEG) was used to elaborate activity timing and amplitude in the primary somatosensory (S1) and secondary somatosensory/parietal ventral (S2/PV) cortices. MEG and clinical performance measures were collected from 13 patients and matched controls. **RESULTS:** Compared to controls, subjects with tspFHD had increased response amplitude in S2/PV bilaterally in response to high rate and novel stimuli. Subjects with tspFHD also showed increased response latency (low rate, novel) of the affected digits in contralateral S1. For high rate, subjects with tspFHD showed increased response latency in ipsilateral S1 and S2/PV bilaterally. Activation differences correlated with functional sensory deficits (predicting a latency shift in S1), motor speed and muscle strength. **CONCLUSIONS:** There are objective differences in the amplitude and timing of activity for both hands across contralateral and ipsilateral somatosensory cortex in patients with tspFHD. **SIGNIFICANCE:** Knowledge of cortical processing abnormalities across S1 and S2/PV in dystonia should be applied towards the development of learning-based sensorimotor interventions

Granert O, Peller M, Jabusch HC, Altenmüller E, Siebner HR. Sensorimotor skills and focal dystonia are linked to putaminal grey-matter volume in pianists. *J Neurol Neurosurg Psychiatry.* Nov 2011;82(11):1225-1231.

BACKGROUND: Focal hand dystonia has been associated with morphometric changes and distorted somatotopic representations in the putamen. **OBJECTIVE:** The authors used voxel-based morphometry (VBM) to identify regions in the putamen where grey-matter volume is associated with musician's dystonia (MD) or the skill level of piano playing in professional pianists. **METHODS:** In 11 pianists with MD affecting the right hand and 12 healthy pianists without dystonia, the authors performed high-resolution T1-weighted MRI of the brain. The authors also measured the temporal variability of key strokes during scale playing with the right hand to characterise the individual skill level of piano playing. Statistical comparisons of the normalised and smoothed grey-matter maps were performed to test for dystonia and performance-related structural changes in the putamen. **RESULTS:** During scale playing, the timing of consecutive

key strokes was more variable in MD patients than in non-dystonic pianists. Regional grey-matter volume in the middle part of left and right putamen increased with timing variability during piano playing in pianists with and without MD. Between-group comparisons revealed that MD patients had a larger grey-matter volume in the right middle putamen compared with healthy musicians. CONCLUSION: In highly trained pianists with and without MD, the volume of the associative motor territory in the middle putamen reflects both the skill level of piano playing and the presence of dystonia. While a smaller volume is associated with better timing skills, a relative expansion is correlated with the presence of focal task-specific hand dystonia.

Kadota H, Nakajima Y, Miyazaki M, et al. An fMRI study of musicians with focal dystonia during tapping tasks. *J Neurol*. Jul 2010;257(7):1092-1098.

Musician's dystonia is a type of task specific dystonia for which the pathophysiology is not clear. In this study, we performed functional magnetic resonance imaging to investigate the motor-related brain activity associated with musician's dystonia. We compared brain activities measured from subjects with focal hand dystonia and normal (control) musicians during right-hand, left-hand, and both-hands tapping tasks. We found activations in the thalamus and the basal ganglia during the tapping tasks in the control group but not in the dystonia group. For both groups, we detected significant activations in the contralateral sensorimotor areas, including the premotor area and cerebellum, during each tapping task. Moreover, direct comparison between the dystonia and control groups showed that the dystonia group had greater activity in the ipsilateral premotor area during the right-hand tapping task and less activity in the left cerebellum during the both-hands tapping task. Thus, the dystonic musicians showed irregular activation patterns in the motor-association system. We suggest that irregular neural activity patterns in dystonic subjects reflect dystonic neural malfunction and consequent compensatory activity to maintain appropriate voluntary movements.

McKenzie AL, Goldman S, Barrango C, Shrimme M, Wong T, Byl N. Differences in physical characteristics and response to rehabilitation for patients with hand dystonia: musicians' cramp compared to writers' cramp. *J Hand Ther*. Apr-Jun 2009;22(2):172-181; quiz 182.

STUDY DESIGN: Pre-Post, Mixed Factorial Trial. INTRODUCTION: Focal hand dystonia is a challenging movement disorder to rehabilitate in musicians and writers. PURPOSE OF THE STUDY: To compare the neuromusculoskeletal characteristics of those with writers' cramp (WC) and musicians' cramp (MC), and evaluate responsiveness to learning-based sensorimotor training. METHODS: Twenty-seven individuals (14

musicians, 13 writers) participated in 8 weeks of supervised therapy supplemented with a home program. Between-group differences on measures of musculoskeletal (physical), sensory, and motor performance were evaluated at baseline and post-intervention. RESULTS: Subjects with MC had a higher level of functional independence and better range of motion, but less strength in the affected upper limb than those of subjects with WC. Subjects with MC demonstrated greater accuracy on graphesthesia, kinesthesia, and localization at baseline. No between-group differences in motor performance were noted at baseline or post-intervention. Following individually adapted learning-based sensorimotor training, both groups improved in musculoskeletal (physical) parameters, sensory processing, and motor control; however, improvements on certain subtests differed by group. At follow-up, differences in posture, ROM, strength, graphesthesia, and kinesthesia persisted between the groups. CONCLUSIONS: Subjects with WC have different physical and performance risk factors compared with those of subjects with MC. Intervention paradigms are efficacious, but variable responses to rehabilitation occur.

Rosenkranz K, Butler K, Williamon A, Rothwell JC. Regaining motor control in musician's dystonia by restoring sensorimotor organization. *J Neurosci*. Nov 18 2009;29(46):14627-14636.

Professional musicians are an excellent model of long-term motor learning effects on structure and function of the sensorimotor system. However, intensive motor skill training has been associated with task-specific deficiency in hand motor control, which has a higher prevalence among musicians (musician's dystonia) than in the general population. Using a transcranial magnetic stimulation paradigm, we previously found an expanded spatial integration of proprioceptive input into the hand motor cortex [sensorimotor organization (SMO)] in healthy musicians. In musician's dystonia, however, this expansion was even larger. Whereas motor skills of musicians are likely to be supported by a spatially expanded SMO, we hypothesized that in musician's dystonia this might have developed too far and now disrupts rather than assists task-specific motor control. If so, motor control should be regained by reversing the excessive reorganization in musician's dystonia. Here, we test this hypothesis and show that a 15 min intervention with proprioceptive input (proprioceptive training) restored SMO in pianists with musician's dystonia to the pattern seen in healthy pianists. Crucially, task-specific motor control improved significantly and objectively as measured with a MIDI (musical instrument digital interface) piano, and the amount of behavioral improvement was significantly correlated to the degree of sensorimotor reorganization. In healthy pianists and nonmusicians, the SMO and motor performance remained essentially

unchanged. These findings suggest that the differentiation of SMO in the handmotor cortex and the degree of motor control of intensively practiced tasks are significantly linked and finely balanced. Proprioceptive training restored this balance in musician's dystonia to the behaviorally beneficial level of healthy musicians.

Remember, PASIG membership is free to all orthopaedic section members.

https://www.orthopt.org/sig_pa_join.php

Please remember to update your orthopaedic section profile, thank you!

https://www.orthopt.org/login.php?forward_url=/surveys/membership_directory.php