



## PASIG MONTHLY CITATION BLAST: No.26

November - December 2007

Dear PASIG members:

This is a combined November – December Blast as the Thanksgiving, Chanukah, and Christmas holidays make it such a crowded time.

The PASIG would like to announce the winners of the student scholarship. Recent graduates, Kendra Hollman PT, DPT and Danelle Dickson PT, DPT will be awarded the scholarship at the PASIG Business meeting. Their research is titled "Reliability and validity of ankle range of motion measurements in dancers". I will compile a schedule of PA-related platform and poster presentations in the January Blast, including Kendra and Danelle's presentation.

Dates and times for PASIG members to note:

- Combined Sections Meeting in Nashville, February 7 – 9<sup>th</sup>, 2008.
- PASIG and Orthopaedic Section CSM activities include:

### Friday, February 8

7 – 8 am PASIG Business Meeting

8 – 11 am PASIG PROGRAMMING

*"Evaluation and Treatment of Cervicothoracic Pain and Dysfunction - Freeing the Performing Artist to Reach New Heights".*

8:00 – 8:45 Evidence based evaluation and treatment of neck pain in the performing artist. Josh Cleland PhD, PT, FAAOMPT

8:45 – 9:00 Case Example.

9:00 – 9:45 Evidence based evaluation of cervical radiculopathy. Sara Piva

- PhD, PT  
9:45 – 10:00 Case Example: A dancer with serratus anterior insufficiency.  
Kendra Hollman PT  
10:00 – 10:15 T3/T4 syndrome in performing artists. Sue Stralka MS PT  
10:15 – 10:35 Medical interventions for cervical/thoracic pain (meds, imaging,  
interventional pain management, etc). Bhaskar Aditya Mukherji  
MD  
10:35–11:00 Panel Discussion. All Speakers  
  
5 – 7 pm Orthopaedic Section Business Meeting/Reception

Saturday, February 9th

- 1 – 3 pm Orthopedic Section Platform Presentations  
  
3 – 5 pm Orthopedic Section Platform Presentations

This month's Citation BLAST continues our special topic series. "*Embouchure*", was contributed by former PASIG president, Jeffrey T. Stenback PT, OCS (Orthopedic Rehabilitation Specialists, Inc, Miami, FL). The special topic format is an annotated bibliography of articles on the selected topic, with focus on recent literature (1997 – 2007). This month's citations will be added to the Music EndNote library available on the PASIG webpage for our members to access and download. (Information about EndNote referencing software can be found at <http://www.endnote.com>, including a 30-day free trial). If you'd like to suggest a topic or create one, please let me know.

Please write to me with your comments and suggestions. If you're seeking a research mentor, looking for a sounding board about a research idea, want some editorial suggestions on a manuscript, let me know and I'll try to connect you with the right researcher. Entry contributions to these Citation Blasts or other PA research ideas are always welcome.

Regards,  
Shaw

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## Embouchure

**Embouchure.** *noun.* The position and use of the lips, tongue and teeth in playing a wind instrument.

The proper embouchure allows the instrumentalist to play the instrument at its full range with a full, clear tone and without strain or damage to one's muscles. Embouchure disorders include focal dystonia and overuse syndrome. For those of us treating musicians, a better understanding of the embouchure and its relationship to the TMJ and cervical spine assists in the treatment of wind instrumentalists. Occasionally, a

referral to a speech pathologist familiar with instrumentalists is useful. The literature is limited on this topic. Therefore, several references are more than 10 years old and some are actually in foreign languages (noted after reference). Hopefully this citation list will provide insight on this topic.

Jeffrey T. Stenback PT, OCS

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Barbenel JC, Kenny P, et al. (1988). Mouthpiece forces produced while playing the trumpet. *J Biomech* 21(5):417-24.

A transducer for measuring the force applied to the trumpet mouthpiece during performance is described. The device allowed the players to perform on their own instrument and in their usual manner. The results of tests on 60 subjects showed that during playing the force between the mouthpiece and instrument increased with increasing loudness and ascending pitch but that there was no significant correlation between mouthpiece force and proficiency or style. The maximum force that the players could tolerate was greater for high proficiency players than for medium.

Brattström V, Odenrick L, et al. (1989). Dentofacial morphology in children playing musical wind instruments: a longitudinal study. *Eur J Orthod* 11(2):179-85.

Playing wind instruments requires increased ventilation and increased orofacial muscle activity. The aim of the present investigation was to study the longitudinal effects on the dentofacial morphology of increased ventilation and orofacial muscle activity associated with playing wind instruments. Lateral cephalograms and dental casts obtained from wind instrument players at the ages of 6, 9, 12, and 15 years were studied and compared to control groups. In addition information was obtained as to how many hours per day they practised their instruments. Significant differences between the musicians and controls were found. The musicians had a decreased anterior facial height and wider dental arches. The findings are interpreted as being due to increased orofacial muscle activity and increased intra-oral pressure resulting from wind instrument playing.

Cheshire WP (2006). Trigeminal neuralgia in wind musicians. *Headache* 46(9):1458-60.

The author reports 3 patients with trigeminal neuralgia whose pain was triggered by musical performance. Use of the muscles of embouchure activated the trigger zone when playing the clarinet, saxophone, flute, piccolo, trombone, or whistling. In each case, the location of the trigger zone was perioral, regardless of which division of the trigeminal nerve emanated pain. Trigeminal neuralgia is a particularly disabling affliction when it occurs in wind musicians.

Cossette I (2002). Respiratory mechanics in professional flautists. *Rev Mal Respir* 19(2 Pt1):197-206. (French)

Oesophageal, gastric, mouth, transdiaphragmatic, transpulmonary pressures, diaphragmatic EMG, sound and chest wall excursion were measured directly in 3 professional flautists whilst playing their instruments to determine: - what respiratory muscles and percent vital capacity were being used; - how mouth pressure, embouchure resistance, embouchure aperture, airflow and velocity affect sound loudness and frequency. Lung volume was estimated from transpulmonary pressure during playing and the static deflation pressure-volume curve was measured separately; flow was calculated from delta volume/delta time; embouchure resistance was calculated from mouth pressure/flow; velocity was calculated using Bernoulli's equation and mouth pressure. Staccati and sustained tones at different frequency and intensity were performed. Sound loudness was mainly related to airflow whilst sound frequency was determined by velocity. Flow and velocity were independently controlled by mouth pressure and embouchure aperture. Mean mouth pressures varied little

from individual to another (6-11 cm H<sub>2</sub>O) but the flautists used between 72-83% of their vital capacity suggesting inspiratory muscle activity while playing. However, rib cage and abdominal motion were different for each subject. Although different flautists use different strategies to control mouth pressure, their individual mastery of the instrument permits control of airflow and velocity to produce the desired intensity and frequency of sound.

Frucht SJ, Fahn S, et al. (2001). The natural history of embouchure dystonia. *Mov Disord* 16(5):899-906.

Focal task-specific dystonias are unusual disorders of motor control, often affecting individuals who perform complex repetitive movements. Musicians are especially prone to develop these disorders because of their training regimens and intense practice schedules. Task-specific dystonia occurring in keyboard or string instrumentalists usually affects the hand. In contrast, there have been few descriptions of musicians with task-specific dystonia affecting the muscles of the face and jaw. We report detailed clinical observations of 26 professional brass and woodwind players afflicted with focal task-specific dystonia of the embouchure (the pattern of lip, jaw, and tongue muscles used to control the flow of air into a mouthpiece). This is the largest and most comprehensively studied series of such patients. Patients developed embouchure dystonia in the fourth decade, and initial symptoms were usually limited to one range of notes or style of playing. Once present, dystonia progressed without remission and responded poorly to oral medications and botulinum toxin injection. Patients with embouchure dystonia could be separated by the pattern of their abnormal movements into several groups, including embouchure tremor, involuntary lip movements, and jaw closure. Dystonia not infrequently spread to other oral tasks, often producing significant disability. Effective treatments are needed for this challenging and unusual disorder.

Hirata Y, Schulz M, et al. (2004). Sensory mapping of lip representation in brass musicians with embouchure dystonia. *Neuroreport* 15(5):815-8.

Embouchure dystonia is a focal task-specific disorder involving abnormal non-coordinated movements and involuntary muscle contraction around the mouth. In professional brass players it is often so disabling that patients have to limit or give up their occupation. We examined the somatosensory homuncular representation and measured gap detection sensitivity of the lips in eight former professional musicians affected by embouchure dystonia and eight control subjects. Relative to controls, the patients' digit, and especially the thumb, representations were shifted in a lateral direction towards the lip representational zone. Patients' upper lips showed decreased sensitivity compared to their lower lips ( $p < 0.01$ ). This asymmetry result was absent in controls. Abnormal somatosensory reorganization may contribute to the disorder.

Krivin M, Conforth S (1975). An embouchure aid for clarinet and saxophone players. *J Am Dent Assoc* 90(6):1277-81.

An embouchure aid was constructed as a means of bringing relief to the many clarinet and saxophone players who suffer chronic lip irritation as the result of playing their instruments. The device, a removable vinyl plastic matrix to be worn while playing, was designed to fit over the mandibular anterior teeth, thus relieving the pressure of the incisal edges of the teeth against the mucous membrane inside the lower lip. Tested in daily use by clarinet and saxophone players for a one-year period, the matrix proved immediately effective in eliminating lip irritation. Its unique design and construction gives it the additional advantages of being highly durable, as well as technically simple to fabricate and easy to fit.

Lockwood AH (1989). Medical problems of musicians. *N Engl J Med* 26;320(4):221-7. [Comment in: *N Engl J Med* (1989) 6;321(1):51-3.]

Surveys of performing musicians indicate that almost half of them experience playing-related medical problems, some of which threaten or end their careers. Overuse injuries

involving the muscle-tendon unit are the most common problem, with symptoms ranging from mild pain while the musician is playing to pain severe enough to preclude any use of the affected hand. String players are the most commonly affected, and percussionists the least. The most important predisposing characteristic is the use of repetitive movements during long hours of practice, but awkward body positions mandated by the shape and weight of the instrument, the technical difficulty of the repertoire, and unfamiliar instruments may also play a part. Women are more commonly affected than men. Rest is the cornerstone of therapy. Neural impingement syndromes affecting the median or ulnar nerves or the thoracic outlet affect many musicians. Focal dystonias may involve part or all of a hand or the muscles forming the embouchure (the position of the lips in wind players). These are very resistant to therapy and may terminate or drastically alter a career. Stress, especially performance anxiety, may impede performance. Beta-adrenergic blocking agents prevent the symptoms of performance anxiety and are frequently used by musicians without medical supervision. Recognition of the unique problems of musician-patients has led to the formation of successful specialty clinics in a number of cities.

Methfessel G (1990). Myofunction in players of wind instruments. *Dtsch Zahnarztl Z* 45(7 Spec No):S48-50. (German)

Within the framework of a longitudinal study, tongue function was examined for maximum pressure, force/time ratio and motility with the aid of a force, pressure and impulse transducer in 181 pupils playing wind instruments and 120 control persons. The methods designed for this purpose provided a reproduction of tongue performance during the act of blowing a wind instrument. The results of this study show statistically significant differences between persons who play wind instruments and those who do not and players of other types of instruments. The data derived from these results permit statements about the degree of muscular malfunction among players of wind instruments. Furthermore, they are helpful in the assessment of therapeutic success or failure.

Ogino H (1990). The influence of playing the clarinet on the dentomaxillofacial morphology and function. *Ou Daigaku Shigakushi* 17(2):131-54. (Japanese)

The purpose of this experiment is to understand the influence of playing the clarinet on the dentomaxillofacial morphology and function. The 12 subjects, selected at random (all adults, 4 men and 8 women) had played the clarinet for more than 10 years. The subjects had anamnesis, oral photo pictures, facial photo pictures, cast model, lateral cephalograms (lateral cephalo) and frontal cephalograms (frontal cephalo) taken when they were in centric occlusion and playing the clarinet. The results were as follows: 1. The facial profile and occlusal relation depend on the subjects. (2 mandibular retrognathism. 4 prognathism and 6 crowding.) 2. No characteristic skeletal pattern was found compared with controls in angle measurement but subjects had a tendency to have large facial height in linear measurement of lateral cephalo. And in denture pattern the lower incisors were linguoclination. 3. Concerning the lateral cephalo, we noticed that the angle of the clarinet in relation to the body axis increased in accordance with the prognathism and decreased with the retrognathism. 4. The subjects don't have identical midline, comparing lower midline to dentofacial midline, when playing, the angle of clarinet to the body was eccentric according to maxillary incisors in frontal cephalo. 5. Anterior and posterior length was short in mandibular arch, analyzing the cast model. 6. The pressure on mouthpiece increased in accordance with the prognathism and decreased with retrognathism. 7. The results of the EMG analysis indicated that the muscle activity of oral sphincter was described as 1). upper lip, 2). lower lip, 3). commissure of lips and differences were found depending on the parts being studied and the sound played on the clarinet. In conclusion, the skeletal and denture problem influence the holding position of the clarinet, embouchure and the way of playing it. In case of mandibular prognathism, when playing, the subjects pressed on their teeth with the clarinet. So B instrument won't do for prognathism because lower incisors are pushed inward as a result.

Papsin BC, Maaske LA, et al (1996). Orbicularis oris muscle injury in brass players. *Laryngoscope* 106(6):757-60,

The embouchure of the brass player is critical to tone production and largely depends on the integrity of the orbicularis oris muscle. Injury to this muscle can cripple the professional musician by causing fatigue, pain, and tonal deterioration. Ten brass players presented with muscular defects in the orbicularis oris muscle. Examination identified areas of abnormality within the muscle and electromyography (EMG) ruled out a neurologic deficit. All patients underwent exploration under neuroleptic anesthesia, and 9 patients underwent repair. The technique is described. The repaired patients reported improvement after the operation and all resumed playing at their premorbid level. The 10th patient was found to have thinning of the entire orbicularis oris muscle (presumably congenital) and was not able to be repaired. There were no complications of the procedure and no recurrences.

Schorr-Lesnack B, Teirstein AS, et al. (1985). Pulmonary function in singers and wind-instrument players. *Chest* 88(2):201-5.

Previous studies suggest that pulmonary function of singers and wind-instrument players may be better than normal control subjects due to breath-control training; however, prior studies were poorly controlled or limited in scope. In the present study, we compare 34 singers and 48 wind instrumentalists with a control group of 31 string or percussion instrumentalists using a pulmonary questionnaire, measurements of inspiratory and expiratory pressures, and spirometry. We found no significant difference between groups in maximum voluntary ventilation, forced expiratory volume in one second (FEV1), forced vital capacity (FVC), mean forced expiratory flow during the middle half of the FVC, the FEV1/FVC, peak expiratory pressure, or peak inspiratory pressure, independently or when corrected for age, sex, height, weight, years performing, smoking, presence or absence of cough, or sputum production. Smoking correlated negatively with measurements of pulmonary function in all groups. There was evidence of a heightened awareness of health among singers, who exercised more and smoked less than their colleagues. The differences in health habits may account in part for the myth of improved pulmonary volumes among singers.

Yeo DK, Pham TP, et al. (2002). Specific orofacial problems experienced by musicians. *Aust Dent J* 47(1):2-11.

Patients who play musical instruments (especially wind and stringed instruments) and vocalists are prone to particular types of orofacial problems. Some problems are caused by playing and some are the result of dental treatment. This paper proposes to give an insight into these problems and practical guidance to general practice dentists. METHOD: Information in this paper is gathered from studies published in dental, music and occupational health journals, and from discussions with career musicians and music teachers. RESULTS: Orthodontic problems, soft tissue trauma, focal dystonia, denture retention, herpes labialis, dry mouth and temporomandibular joint (TMJ) disorders were identified as orofacial problems of career musicians. Options available for prevention and palliative treatment as well as instrument selection are suggested to overcome these problems. Conclusions: Career musicians express reluctance to attend dentists who are not sensitive to their specific needs. General practitioner dentists who understand how the instruments impact on the orofacial structures and are aware of potential problems faced by musicians are able to offer preventive advice and supportive treatment to these patients, especially those in the early stages of their career.