Abstracts from the Literature

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Rodríguez-Lozano FJ, Sáez-Yuguero MR, Bermejo-Fenoll A: Prevalence of temporomandibular disorder-related findings in violinists compared with control subjects. *Oral Surg Oral Med Oral Path Oral Radiol Endod* 2010; 109:e15–e19.

To determine if there is an association between violin playing and the presence or development of temporomandibular disorders (TMD), the authors recruited a random sample of 41 Spanish symphony violinists and 50 matched nonmusician controls. Each subject had no history of TMD antecedents and had not undergone orthodontia. Each was studied through a questionnaire and a clinical examination which included panoramic radiological imaging. The violinists had significantly greater pain during maximum mouth opening, parafunctional habits such as nail-biting, and occurrence of TMJ sounds (determined by stethoscope auscultation) during movement than did the control group. Regarding gender, TMD signs were more prevalent in women violinists, although only pain in maximum opening approached statistical significance. Radiographic findings were normal in both groups. The investigators did not observe a relationship between the weekly hours of violin practice or the years of professional experience and the presence of TMD signs or symptoms. Most of the musicians were unaware of the relationship between violin playing and TMD.

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Saxon KG, Berry SL: Vocal exercise physiology: same principles, new paradigms. *J Singing* 2009; 66(1):51–57.

Physical conditioning of the heart, lungs, and skeletal muscles during prescribed exercise can have a profound effect on performance levels of anyone, including vocal performers. In a singer, the object and measure of training is sound production. Beyond exercises for more global cardiovascular conditioning comes training for the muscles of the vocal mechanism. Improvement in physical fitness or condition leads to increased performance capacity, especially of the cardiovascular and musculoskeletal systems. Since these systems are essential for voice production, performance quality, and endurance, training and maintaining them are important for vocalists. Training for vocal performance should incorporate the four basic principles of overload, specificity, individuality, and reversibility, and the authors discuss each of these principles at some length. The actual exercise prescription in the voice studio has the goal of reaching some level of performance by a specific time. It starts with the knowledge of skill level and level of training as well as the interval since the last performance. The prescription includes recommendations on the frequency, duration, intensity, and progression of exercise. Exercise paradigms have application in the voice studio as well as the gym. For example, the periodization training method involves five phases: anatomic adaptation, maximum strength, conversion (to singing-specific actions), maintenance, and transition before starting the next cycle. The vocal coach has a number of variables he/she can manipulate to achieve the goals of periodization training. They include the order of exercise, number of sets, rest periods between sets and exercises, periods of rest during workouts, and forms of resistance used. Finding the optimal mix of variables for a given individual is critical for best training results, whether in the voice studio or the gym.

Moreno-Torres A, Rosset-Llobet J, Pujol J, Fàbregas S, Gonzalez-de-Suso J-M: Work-related pain in extrinsic finger extensor musculature of instrumentalists is associated with intracellular pH compartmentation during exercise. *PLos ONE* 2010; 5(2):e9091. doi:10.1371/journal.pone.0009091. Available at: www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0009091. Accessed Apr 24, 2010.

Although nonspecific pain in the upper limb muscles of workers engaged in mild repetitive tasks is a common occupational health problem, we know little about the associated structural and biochemical changes. This study compared the muscle energy metabolism of the finger extensor musculature in instrumentalists suffering from work-related pain with that of healthy control instrumentalists. The authors hypothesized that the affected muscles would show alterations related to an impaired energy metabolism. They used noninvasive radiophosphorus magnetic resonance spectroscopy (^{31}P-MRS) in 11 affected and 8 control musicians to find deviations from the expected metabolic response to exercise in phosphocreatine (PCr), inorganic phosphate (Pi), Pi/PCr ratio, and intracellular pH kinetics. A constant low-level aerobic exercise provided the stimulus for measurement. A reduced finger extensor exercise tolerance was observed in instrumentalists with myalgia, an intracellular pH compartmentation in the form of neutral and acid components, as detected by Pi peak splitting in ^{31}P-MRS spectra, and a

strong association of this pattern with myalgia. These findings confirm the working hypothesis. The pH compartmentation is consistent with simultaneous energy production by oxidative metabolism and glycolysis involving fibers or specific muscles. The activation of glycolysis is interpreted as abnormal and may reflect a deficit in energy production by oxidative pathways in the affected muscle. Two possible explanations for this would be the partial and/or local reduction of blood supply and the reduction of the muscle oxidative capacity itself.

Wyon M, Guinan D, Hawkey A: Whole-body vibration training increases vertical jump height in a dance population. *J Strength Cond Res* 2010; 24(3): 866–870.

Whole-body vibration (WBV) training has gained popularity in the field of strength and conditioning because of its potential as an additional training strategy. It is a simple, low-impact method of exercise that has been shown to increase muscular strength, power, and flexibility, likely through stimulation of neuromuscular pathways and muscle spindles. The aim of the present study was to examine the effect of a 6-week vibration intervention on vertical jump performance in moderately trained undergraduate female dance students. Participants were randomly assigned to an intervention or control group. The intervention group was exposed to WBV at 35 Hz for 5 minutes twice a week, whereas the control group was exposed to similar isometric contraction stress. Results indicated that, after a 6-week intervention, vertical jump height increased significantly in the intervention group compared to the control group. Authors concluded that WBV was able to increase and maintain dancers' vertical jump height with very little intervention time (5 min twice a week). They recommend that dancers incorporate vibration training into their weekly schedules not only to improve their lower body power indices but also to serve as a preventative measure in maintaining bone mineral density.

Scontrini A, Conte A, Defazio G, et al: Somatosensory temporal discrimination in patients with primary focal dystonia. *J Neurol Neurosurg Psychiatr* 2009; 8:1315–1319.

Although dystonia is primarily characterized by motor disorders, some patients also show sensory symptoms. For instance, patients with hand dystonia may have an impairment of graphesthesia, kinesthesia, and stereognosis, while blepharospasm patients may complain of dry eyes. Often these sensory symptoms are subclinical. This investigation determined whether somatosensory temporal discrimination would reliably detect subclinical sensory impairment in patients with various forms of primary focal dystonia. The somatosensory temporal discrimination threshold (STDT) was tested in 82 patients with cranial, laryngeal, cervical, and hand dystonia. Results were compared with those for 81 healthy subjects and 26 patients with hemifacial spasm, a nondystonic disorder. STDT was tested by delivering paired stimuli starting with an interstimulus interval of 0 followed by an increasing interstimulus interval. Results showed STDT to be abnormal in all the different forms of primary focal dystonia in all three body regions (eye, neck, and hand), regardless of the distribution and severity of motor symptoms. There was high diagnostic sensitivity and specificity for the STDT abnormalities. These finding suggest that sensory abnormalities definitely play a role in the pathophysiology of dystonia and possibly also in spreading of dystonic symptoms in primary dystonia. The results provide definitive evidence that STDT abnormalities are a generalized feature of patients with primary focal dystonia and are a valid tool for screening subclinical sensory abnormalities.

Roers F, Mürbe D, Sundberg J: Predicted singers' vocal fold lengths and voice classification—a study of X-ray morphological measures. *J Voice* 2009; 23(4):408–413.

Vocal fold length is a parameter of great significance to the pitch range and timbre of a voice. It is particularly relevant to singers because it can be assumed to be one of the main factors behind voice classification. Data on vocal fold lengths of singers with different classifications are rare in the literature. Using x-rays made on 132 students admitted to the singing education program of a German university from 1959 to 1991, the authors performed a retrospective study to investigate if there were consistent anatomical differences between singers of different voice classifications. From measuring vocal fold length on x-rays of 29 students, the results showed a strong correlation with the anterior-posterior diameter of the subglottis and trachea as well as with the distance from the anterior contour of the thyroid cartilage to the anterior contour of the spine. These relations were used in an attempt to predict the 132 singers' vocal fold lengths. The results revealed a clear covariation between predicted vocal fold length and voice classification. Anterior-posterior subglottic-tracheal diameter yielded mean vocal fold lengths of 14.9, 16.0, 16.6, 18.4, 19.5, and 20.9 mm for sopranos, mezzo-sopranos, altos, tenors, baritones, and basses, respectively. The data support the assumption that there are consistent anatomical laryngeal differences between singers of different voice classifications, which are of relevance to pitch range and timbre.

Shah S: Determining a young dancer's readiness for dancing on pointe. *Curr Sports Med Rep* 2009; 8(6):295–299.

Much of ballet's appeal stems from the ballerina's seemingly effortless ability to defy gravity by dancing *en pointe* (trans., "on the tips of the toes"). To become an elite or professional ballerina, students must transition from dancing in flexible ballet slippers to dancing in specially designed pointe shoes. Few studies specifically address when a dancer is ready to go on pointe. The primary concern is related to a potential negative effect on the growth plates of the foot bones, especially the first digit (where most of the weight is borne while on pointe). Health care

professionals can make a reasonable determination of readiness based on anatomic, training, and performance requirements thought to be critical for a successful transition to pointe training. The factors to be considered include age, anatomy, strength, flexibility, postural control, training, technique, and placement. A table presents points to ask and observe in the dancer's history and physical examination. Following a discussion of each of the above factors, the authors conclude that the decision is multifactorial. The young dancer should have adequate physical capacity and mental maturity to begin this practice, rather than requiring a specific age or number of years of training. The dancer should have adequate foot and ankle flexibility to achieve full pointe, sufficient training to achieve proper foot placement, strength to achieve postural control and balance, proprioception, technique, mastery of movement, alignment, the ability to learn and perform choreography, and the ability to listen to and apply corrections. Health care providers should understand the rigors of pointe work and use the information in the table when evaluating a dancer for pointe readiness.

Kolinsky R, Lidji P, Peretz I, et al: Processing interactions between phonology and melody: vowels sing but consonants speak. *Cognition* 2009; 112: 1–20.

This investigation studied the brain's processing of the phonological and melodic dimensions of consonant-vowel bisyllabic nonwords sung on two-tone melodic intervals. Authors wished to learn whether the two dimensions are processed in an integrated or an independent way. Responses of the musically untrained test subjects had to be based on pitch contour, on nonword identity, or a combination of pitch and nonword. Results showed that consonants were processed more independently from melodic information than vowels are. This difference was neither related to the sonority of the phoneme nor to the acoustical correlates between vowel quality and pitch height. Thus, vowels seem to merge, or at least to interact with pitch intervals during song processing, but consonants do not. The linguistic function of vowels might be closer to the functions of pitch in music than the linguistic function of consonants. Vowels and pitch intervals may share an important syntactic and grammatical role within speech and musical systems, respectively. In contrast, consonants seem to have a more lexical function. The present results imply that neither the speech nor the musical system is homogeneously modular, and that there are stronger processing interactions between vocalic and melodic variations than between consonantal and melodic variations.

Lidji P, Jolicœur P, Kolinsky R, et al: Early integration of vowel and pitch processing: a mismatch negativity study. *Clin Neurophysiol* 2010; 121(4): 533-541. doi:10.1016/j.clinph.2009.12.018. Available at: www.mcgill.ca/files/spl/Lidji2009.pdf. Accessed Apr 24, 2010.

Several studies have explored the processing specificity of music and speech, but only a few have addressed the processing autonomy of the fundamental components of music and speech, namely, pitch and phonemes. The authors examined the additivity of the mismatch negativity (MMN) indexing the early interactions between vowels and pitches when sung. Event-related EEG potentials (ERPs) were recorded while participants heard frequent sung vowels and rare stimuli deviating in pitch only, in vowel only, or in both pitch and vowel. The participants' task was to watch a silent movie while ignoring the sounds. All three types of deviants elicited both an MMN and a P3a ERP component. The observed MMNs were of similar amplitude for the three types of deviants and the P3a was larger for double deviants. The MMNs to deviance in vowel and deviance in pitch were not additive. The authors concluded that the under-additivity of the MMN responses suggests that vowel and pitch differences are processed by interacting neural networks and are processed as integrated units. The results show for the first time that the integration between these two dimensions occurs as early as the MMN latency range and may be independent of conscious attention allocation and of participants' strategies. Music processing specificity thus rests on more complex dimensions of music and speech.