

Abstracts from the Literature

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Watson AHD: What can studying musicians tell us about motor control of the hand? *J Anat* 2006;208:527–542.

Most standard accounts of human anatomy and physiology consider their subject matter from the standpoint of typical rather than outstanding levels of performance. To understand development and maintenance of high skill levels, it is necessary to study elite groups such as professional athletes or musicians. This can lead to the rediscovery of arcane knowledge that has fallen into neglect through a lack of appreciation of its significance. For instance, although the variability of muscles and tendons in the hand and finger was well known in the 19th and early 20th centuries, it is through recent studies of musicians that its practical significance has become better appreciated. Even through a cursory knowledge of the training methods in sports, music, and dance, it is clear that sophisticated motor skills are developed only at the cost of considerable time and effort. Musicians likely spend more time in skill acquisition than almost any other group and offer some unique advantages for the study of motor control. Such intensive training not only modifies cortical maps but may even affect the gross morphology of the nervous system. In certain individuals this process can become maladaptive. Recent studies of musicians suggest that intensive training can develop ambiguities in the cortical

somatosensory representation of the hand that may be associated with the development of focal dystonia. The realization that changes in cortical maps may underlie dystonia has led to developing new approaches to its treatment, which may ultimately benefit musicians and nonmusicians alike.

Björkner E, Sundberg J, Cleveland T, Stone E: Voice source differences between registers in female musical theater singers. *J Voice* 2006; 20(2):187–197.

This study aimed to explore and deepen the knowledge about the voice source characteristics in the female singing voice. Musical theater singing typically requires women to use two vocal registers: lower pitched (chest) and higher pitched (head). The voice source differs in several respects between these two. Knowledge and better descriptions of subglottal pressure (P_s) and the register function in the female singing voice should therefore be valuable in vocal training and therapy. The authors considered voice source and P_s characteristics of the speech pressure signal recorded for a sequence of /pae/ syllables sung at constant pitch and decreasing vocal loudness in each register by seven female musical theater singers. Ten equally spaced P_s values were selected, and the relationships between P_s and several parameters were examined. P_s was typically slightly higher in chest than in head register. As P_s influences the measured glottogram parameters, these were also compared at an approximately identical P_s of 11 cm H₂O. Results showed that for typical tokens, maximum flow declination rate and closed quotient values were significantly greater, whereas peak-to-peak pulse amplitude and therefore the nor-

malized amplitude quotient were significantly lower in chest than in head registers. Register differences are perceptually clearer in loud than in soft phonation. As these singers must use both registers, they would need a refined control of both respiratory and phonatory muscles.

Schlinger M: Feldenkrais Method, Alexander Technique, and yoga—body awareness therapy in performing arts medicine. *Phys Med Rehabil Clin N Am* 2006;17:865–875.

These three terms refer to complex, highly developed bodies of thought and theory. They offer the performing artist ways of perceiving and sensing their movement to deepen understanding and maximize function, while at the same time improving ease and balance. The ultimate goal of all three disciplines is to help the performer connect the artistic process with noninjurious integrity of movement. The author compares and contrasts these three body awareness disciplines in a concise, clear manner, and provides a literature review that comments on the relatively few publications that provide “valid science” about the effectiveness of these disciplines. The Feldenkrais Method is taught to students through specific individual or class instruction in two components: awareness through movement (ATM) and functional integration (FI). The Alexander Technique addresses form and function, posture and movement; the goal is to create ease and freedom with movement or expression. Unlike the Feldenkrais Method, the Alexander Technique depends on touch for treatment and instruction, and practices somatic reorganization, or recognition and discarding of habitual postures or movements that predispose to injury or decreased function. Yoga is

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a classical Hindu school of thought that is centuries old, complex, and essentially a lifestyle leading to enlightenment. The prevalent type of yoga popular and available in the Western world is hatha yoga, the practice of postures or *asanas*. Unlike the practices of Feldenkrais and Alexander, where training is formal and practitioners are regulated, yoga has no formal governance or mandated professional organization.

Brown AC, Wells TJ, Schade ML, Smith DL, Fehling PC: Effects of plyometric training versus traditional weight training on strength, power, and aesthetic jumping ability in female collegiate dancers. *J Dance Med Sci* 2007;11(2):38–44.

Until now, no investigation has been performed on the benefits of plyometric training for dancers. This study compared the effects of plyometric training and traditional weight training on aesthetic jumping ability, lower-body strength, and power in female collegiate dancers. Twelve dancers were randomly and equally divided into plyometric and traditional weight-training groups; 6 others served as a control cohort. The plyometric group performed 3 sets of 8 repetitions of 4 different lower-body plyometric exercises twice a week. The weight-training group performed 3 sets of 6 to 8 repetitions of 4 lower-body isotonic exercises twice a week. The control group did no strength training. All subjects were tested prior to and following the 6-wk training period. Testing consisted of assessments of jumping skill and lower-body strength and power. Aesthetic jumping was assessed by an evaluation from dance faculty members at the subjects' college, evaluating ballon, jump height, ability to point the feet in the air, and overall jumping ability. There were no differences in the descriptive measures of jumping ability, strength, or power among the groups at the start of the study. The plyometric group significantly increased leg press strength, standing vertical jump height, and aesthetic jump height. The weight-training group significantly increased leg press strength, leg curl strength, mean anaerobic power, aesthetic jump

height, and aesthetic ability to point the feet in the air. No significant changes were seen in the control group. The results indicate that either plyometric training or traditional lower-body weight-training can be useful in improving variables applicable to dance. They also support the notion that short-term dance training alone may not be sufficient to elicit improvements in these variables.

Jabusch H-C, Altenmüller E: Focal dystonia in musicians: from phenomenology to therapy. *Adv Cognit Psychol* 2006;2(2-3):207–220.

Musician's dystonia is a task-specific loss of voluntary motor control in extensively trained movements and affects about 1% of all professional instrumentalists; its pathophysiology is still unclear. Findings include reduced inhibition in various central nervous system levels, maladaptive plasticity in basal ganglia and somatosensory cortex, and alterations in sensorimotor processing. Those who play instruments requiring maximal fine motor skills are at higher risk, and the process usually occurs in the more intensely used hand. Both behavioral and hereditary factors may be involved in the etiology of this dystonia. The authors report on 144 patients followed an average of 8.4 years, treated with oral or injectable drugs, pedagogical retraining, ergonomic changes, and/or unmonitored technical exercises. The outcome was assessed by patients' subjective rating of cumulative treatment response and response to individual therapies. Symptoms were alleviated in 54% overall: 33% with oral medication, 49% with botulinum toxin injections, 50% with retraining, 63% with ergonomic changes, and 56% with technical exercises. Only 15% of patients with embouchure dystonia reported improvement.

Barrichelo VMO, Behlau M: Perceptual identification and acoustic measures of the resonant voice based on "Lessac's Y-Buzz"—a preliminary study with actors. *J Voice* 2007;21(1):46–53.

The Y-Buzz is one of the sounds that are part of Arthur Lessac's Tonal NRG

approach, and it is developed through kinesthetic training. The sound is a combination of the consonant Y and the long vowel /i/. By exploring the Y-Buzz, it is possible to establish the vibratory foundation for bone-conducted tone in the singing and speaking voice. This study aimed to verify whether the resonant voice based on the Y-Buzz can be perceived by listeners as resonant and different from habitual voice and to compare them to determine whether this sound exploration improves vocal production. Nine young actors received a session of Y-Buzz training. Before training, they were asked to sustain the vowel /i/ at comfortable frequency and habitual loudness. After training, they were requested to sustain the Y-Buzz they had learned at a comfortable frequency and habitual loudness. Three speech-language pathologists trained in voice developed an auditory perceptive analysis. The voice samples also were acoustically compared through the hoarseness diagram and other acoustic measures. The Y-Buzz trials were identified as resonant voice in 74% of comparisons. Their acoustic measures showed a statistically significant decrease of irregularity and shimmer. The hoarseness diagram demonstrated how the resonant voice moved toward the normality for irregularity and noise components. The results showed that the resonant voice based on the Y-Buzz can be identified as resonant and different from normal voicing in the same subject, and it apparently implies a better vocal production demonstrating a significant decrease of shimmer and irregularity.

Khalsa SBS, Cope S: Effects of a yoga lifestyle intervention on performance-related characteristics of musicians: a preliminary study. *Med Sci Monit* 2006;12(8):CR 325–331.

Previous research suggests that yoga and meditation practices are effective in stress management, alleviating anxiety and musculoskeletal problems, and improving both mood and cognitive and physical performance. Musicians' lives often include high levels of stress, performance anxiety, and playing-

related musculoskeletal conditions. To determine if yoga and meditation could be useful practices for this group, the authors enrolled 18 professional musicians who were attending an elite summer fellowship program. Ten participated in a regular yoga/meditation program during the term of the fellowship, while 8 served as controls. All completed five baseline questionnaires evaluating performance-related musculoskeletal conditions, performance anxiety, and mood and flow experiences; the test cohort also completed these at the program's end. The yoga participants showed some improvements relative to control subjects on most measures, with the greatest improvement being in performance anxiety. All 10 participants felt that yoga practice improved their stamina, concentration, and enjoyment of music performance. The approaches used in the intervention are likely to have benefit for improving performance characteristics, as well as alleviating problems faced by professional musicians.

Seither-Preisler A, Johnson L, Krumbholz K, Nobbe A, Patterson R, Seither S, Lütkenhöner B: Tone sequences with conflicting pitch and timbre changes are heard differently by musicians and nonmusicians. *J Exp Psychol Hum Percept Perform* 2007; 33(3):743–751.

Since processing of musical pitch involves both subcortical and auditory cortical levels, fundamental pitch sensations might be subject to learning-induced neural plasticity. The authors focused on the role of musical competence in recognizing fundamental fre-

quencies (F0). Groups of nonmusicians, musical amateurs, and professional musicians twice took an auditory ambiguity test (AAT). The AAT was composed of different tone pairs, presented in both within-pair orders, in which overtone spectra rising in pitch were associated with missing F0 falling in pitch, and vice versa. The F0 interval ranged from 2 to 9 semitones. The participants were instructed to decide whether the perceived pitch went up or down; no information was provided on the ambiguity of the stimuli. The majority of professionals classified the pitch changes according to F0, even at the smallest interval. By contrast, most nonmusicians classified according to the overtone spectra, except in the case of the largest interval. Amateurs ranged in between in response. A plausible explanation for the systematic group differences is that musical practice systematically shifted the perceptual focus from spectral toward the missing F0 pitch, although alternative explanations such as different genetic dispositions of musicians and nonmusicians cannot be ruled out. Thus, the ability to hear the missing F0 increases considerably with musical training. This finding suggests that even elementary auditory skills undergo plastic changes throughout life.

Kilicarslan A, Isildak M, Guven GS, Oz SG, Hasbay A, Karabulut E, Sozen T: The influence of ballet training on bone mass in Turkish ballet dancers. *Endocrinologist* 2007;17(2):85–88.

Ballerinas are known to be at risk for osteoporosis because of poor nutrition and the adverse effect of heavy exercise

on their menstrual cycles. The authors wished to examine the risk factors for osteoporosis in Turkish ballet dancers to determine whether regular exercise affects bone metabolism. Twenty-two dancers and 20 female controls of comparable age and body mass index were examined in a comparative cross-sectional study. All completed a questionnaire regarding risk factors for osteoporosis. Questions included daily calcium intake, smoking, consumption of coffee and alcohol, exercise, and a menstrual history. Bone mineral density (BMD) was measured by x-ray absorptiometry in the femoral neck and trochanter, lumbar spine, and forearm. For the calcaneus, BMD was measured with the Sahara Clinical Bone Sonometer. Bone mass expressed as BMD was the outcome measure. Dancers averaged 27.2 hrs/week of exercise; 19 of the 22 had normal menses. Daily calcium intake and sex steroid levels were similar in both groups. BMD scores in the lumbar spine and upper femur were significantly ($p < 0.001$) higher in the dancers. There was no significant difference in forearm BMD scores. Both right and left calcaneal BMD scores were significantly higher than those of controls. Among the dancers, calcaneal BMD scores of the supporting (dominant) foot were significantly higher than for the nondominant foot. Results indicate that daily calcium intake and consumption of tobacco and alcohol were not determinants of BMD in eumenorrheic ballerinas. Since exercise seemed to enhance BMD in weight-bearing bones, the authors concluded that it is at least locally “bone saving” in ballet dancers under normoestrogenic conditions.