



## PASIG MONTHLY CITATION BLAST: No.23

August 2007

Dear PASIG members:

As summer draws to a close, we're back to a general citation blast, contributed by myself. However, I've changed the format to an annotated one because everyone seems to enjoy it more. As always, each month's citations will be added to EndNote libraries 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.

The PASIG has initiated this monthly posting to inspire your contributions to research in performing arts. As many of you have observed, there is very little evidence-based research specific to the rehabilitation of the performing artist. A great place to start is by submitting a case study or series of case studies on a particular diagnostic area. An excellent example of a case study series about cuboid syndrome is the recently published article: Jennings J, Davies GJ (2005). Treatment of Cuboid Syndrome Secondary to Lateral Ankle Sprains: A Case Series. *J Orthop Sport Phys Ther* 35(7): 409-415. Those of us who treat dancers are very familiar with both cuboid and sesamoid problems. Look for a case study on a sesamoid non-union coming out in the September issue of JOSPT.

Please write to me with your comments and suggestions. Entry contributions to these Citation Blasts or other PA research ideas are always welcome.

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## ICE SKATING

### Biomechanics and Motor Control

Lockwood KL, Gervais PJ, et al. (2006). Landing for success: a biomechanical and perceptual analysis of on-ice jumps in figure skating. Sports Biomech 5(2): 231-41.

Technical evaluation in the sport of figure skating is characterized by a subjective marking system. Figure skating judges are responsible for quickly and accurately discerning the quality of technical elements as well as assigning a score to the overall aesthetic appearance of a performance. Traditionally, overall placement marks are assigned for the entire performance; however, the landing of a jump is widely acknowledged as one of the most critical elements of a skater's program. Therefore, our aims were to identify the biomechanical variables that contribute to technical success in executing landings and to establish whether landings rated as biomechanically optimal are also awarded high technical merit scores by judges. Ten nationally ranked competitive figure skaters were asked to execute on-ice, double and triple revolution jumps and to try to land the jumps void of technical faults within a calibrated space. Data were collected at 60 Hz using standard three-dimensional videography. Data reduction was done using the APAS system (Ariel Dynamics Inc). Concurrently, videotapes were viewed and evaluated by 42 accredited judges to determine the perceived technical quality of the landing performances. Judges were asked to evaluate the landing phase of each jump against a landing criteria document. A comparative criteria model was developed to facilitate an assessment of excellence in landing performances through both empirical and subjective analyses. Results of these analyses were twofold: a biomechanical profile of on-ice landings was obtained, and on-ice jump landing strategies rated by empirical evaluations were in agreement with judge's perceptions of the same performances.

### General

Bruine de Bruin W (2006). Save the last dance II: Unwanted serial position effects in figure skating judgments. Acta Psychol (Amst).

Serial position effects may occur whenever options are judged in sequence, as is the case in figure skating competitions. International figure skating competitions consist of at least two rounds, with serial position being randomized in the first round. Figure skaters with better scores in the first round perform later in the second round. Despite the initial randomization of serial position, figure skaters who perform later in the first round receive better scores in first and in the second round. The findings presented here replicate those of Bruine de Bruin (2005) [Save the last dance for me: unwanted serial position effects in jury evaluations. *Acta Psychologica*, 118, 245-260], using a larger dataset, and addressing potential concerns about Bruine de Bruin's analyses.

### Injury and Rehabilitation

Bradley MA (2006). Prevention and treatment of foot and ankle injuries in figure skaters. Curr Sports Med Rep 5(5): 258-61.

Participation in the sport of figure skating has more than doubled in the past 10 years. The sport has changed with an increased emphasis on free skating, which includes jumps and spins. The actual art of "figure" skating has been eliminated from the sport. With this change, there is an increased volume of foot and ankle injuries in figure skaters. This report outlines common foot and ankle injuries in figure skaters, discusses possible causes, and outlines treatment options.

Dubravic-Simunjak S, Kuipers H, et al. (2006). Injuries in synchronized skating. Int J Sports Med 27(6): 493-9.

Synchronized skating is a relatively new competitive sport and data about injuries in this discipline are lacking. Therefore the purpose of this study was to investigate the frequency and pattern of acute and overuse injuries in synchronized skaters. Before and during the World Synchronized Skating Championship 2004, a questionnaire inquiring about the frequency of injuries in this skating discipline was given to 23 participating teams. A total of 514 women and 14 men senior skaters completed the questionnaires (100 % response). Two hundred and eighteen (42.4 %) female and 6 (42.9 %) male skaters had suffered from acute injuries during their synchronized skating career. As some skaters had suffered from more than one injury, the total number of acute injuries in females was 398 and in males 14. In female skaters 19.8 % of acute injuries were head injuries, 7.1 % trunk, 33.2 % upper, and 39.9 % lower extremity injuries. In male skaters 14.3 % were head injuries, 28.6 % upper, and 57.1 % lower extremity injuries, with no report of trunk injuries. Sixty-nine female and 2 male skaters had low back problems and 112 female and 2 male skaters had one or more overuse syndromes during their skating career. Of 155 overuse injuries in female skaters, 102 (65.8 %) occurred during their figure skating career, while 53 injuries (34.2 %) only occurred when they skated in synchronized skating teams. In male skaters, out of 5 overuse injuries, 4 (80 %) occurred in their figure skating career, while 1 (20 %) occurred during their synchronized skating career. Out of the total of 412 injuries, 338 (82 %) occurred during on-ice practice, while 74 (18 %) happened during off-ice training. Ninety-one (26.9 %) acute injuries occurred while practicing individual elements, and 247 (73.1 %) on-ice injuries occurred while practicing different team elements. We conclude that injuries in synchronized skating should be of medical concern due to an increasing number of acute injuries, especially those that go beyond the soft tissue and include head injuries and fractures. We feel that these more significant injuries MAY TO SOME EXTENT BE attributable to the increasing physical demands and technical difficulty required of the teams now participating in a more competitive environment over the last four years.

Knox CL, Comstock RD, et al. (2006). Differences in the risk associated with head injury for pediatric ice skaters, roller skaters, and in-line skaters. *Pediatrics* **118**(2): 549-54.

**OBJECTIVE:** The goals were to describe the epidemiologic features of pediatric skating-related injuries sustained from 1993 to 2003 and to compare ice skating-related injuries with roller skating--and in-line skating-related injuries. **METHODS:** An analysis of pediatric skating-related injury data from the National Electronic Injury Surveillance System of the US Consumer Product Safety Commission was performed. **RESULTS:** An estimated 1 235 467 pediatric skating participants presented to hospital emergency departments with injuries between 1993 and 2003. These children had a mean age of 10.9 years (SD: 3.2 years; range: 1-18 years), and 50.0% were male. The most common mechanism of injury was a fall (83.1%). Ice skaters sustained a greater proportion of head injuries (13.3%), compared with roller skaters (4.4%) and in-line skaters (5.0%). Ice skaters also experienced a greater proportion of concussions (4.3%), compared with roller skaters (0.6%) and in-line skaters (0.8%). The proportion of facial injuries among ice skaters was greater than the proportions among roller skaters and in-line skaters. The majority of roller skating-and in-line skating-related injuries were upper-extremity fractures (53.9% and 59.7%, respectively). Children < or = 6 years of age experienced a greater proportion of head and facial injuries than did older children in each skating activity. **CONCLUSIONS:** The epidemiologic features of pediatric ice skating-related injuries differ from those of roller skating--and in-line skating-related injuries. Children should wear helmets during all recreational skating activities, especially ice skating, because of the risk of serious head injuries. Wrist guards should be worn to protect against the common upper-extremity fractures sustained during skating.



## **GYMNASTICS**

### **Biomechanics and Motor Control**

Asseman, F. B., O. Caron, et al. (2007). Are there specific conditions for which expertise in gymnastics could have an effect on postural control and performance?" Gait Posture.

The first aim of this study was to analyse the effect of elite training, linked to expertise, in gymnastics on postural performance and control. For this purpose, body sway of expert gymnasts was compared to other sportsmen, non-experts and non-gymnasts, in two different postures: bipedal (easy and unspecific to gymnasts) and unipedal (difficult and fairly specific). The second aim was to compare the groups in the same tasks but in a visual condition for which they were not trained, i.e. with eyes closed. Postural performance was assessed by centre of gravity motion, which was computed from centre of pressure motion, estimating postural control. A significant difference between the two groups was observed for postural performance in the unipedal posture and with eyes open only. Regardless of their posture, the groups were similarly affected by removal of vision. Expertise in gymnastics seemed to improve postural performances only in situations for which their practise is related to, i.e. unipedal with eyes open. These reveal the importance of choosing a relevant postural configuration and visual condition according to the people's training or by extension experience.

### **Injury and Rehabilitation**

Abrams R, Tontz W (2006). Pisotriquetral arthrodesis as an alternative to excision for pisotriquetral instability in high-demand patients: a case report in a gymnast. J Hand Surg [Am] **31**(4): 611-4.

A gymnast developed ulnar wrist pain caused by pisotriquetral instability. Pisotriquetral arthrodesis resulted in pain relief and sufficient functional return to allow her to return to gymnastics. Pisotriquetral arthrodesis is a feasible alternative to pisiform excision worth consideration in high-demand patients with symptomatic pisotriquetral instability or arthrosis.

Chilvers M, Donahue M, et al. (2007). Foot and ankle injuries in elite female gymnasts. Foot Ankle Int **28**(2): 214-8.

**BACKGROUND:** Gymnastics is a competitive and popular sport that is started at an early age, and elite female gymnasts reach their prime in mid-teenage years. The level of intensity of practice and competition, the number of events, and the degree of difficulty of the maneuvers make gymnastics one of the most injury-producing sports. **METHODS:** Over a 3-year period, 14 elite, female gymnasts were seen in one foot and ankle center. The mean age was 17 (range 14 to 21) years. All gymnasts sustained acute or sub-acute injuries to the foot or ankle requiring surgery. The mechanism of injury, the type of injury, operative repair, and followup were recorded. **RESULTS:** There were five Lisfranc fracture-dislocations, and five talocalcaneal, two multiple metatarsal, one medial malleolar, one phalangeal, and one sesamoid fracture. All injuries had operative repair. One gymnast with a Lisfranc injury was able to return to full competition; all others with a Lisfranc injury retired from gymnastics, were lost to followup, or graduated from college. One gymnast with a talar osteochondral injury was not able to return to competition but all other injured gymnasts were able to return to gymnastics at the same level or higher. **CONCLUSION:** Elite female gymnasts can sustain significant injury to the foot and ankle region. In our study, Lisfranc injuries were most likely career-ending.

Cupisti A, D'Alessandro C, et al. (2007). Injury survey in competitive sub-elite rhythmic gymnasts: results from a prospective controlled study. J Sports Med Phys Fitness **47**(2): 203-7.

AIM: The aim of this study was to determine the frequency, anatomical site and types of injury incurred in rhythmic gymnastics. METHODS: An 8-month prospective and controlled injury survey was planned, including 70 club-level competitive rhythmic gymnasts, aged 13-19 years. Information on injury events was recorded weekly in an injury record booklet for any event occurring over that week. Height, weight, anthropometric measurements and time spent in physical activity were recorded at baseline. Data from 72 age-matched non-athletic females served as controls. RESULTS: Forty-nine significant injuries were reported by gymnasts and 34 by controls (70% vs 47%,  $P < 0.005$ , odds ratio 2.28); gymnasts sustained a rate of 1.08 injuries per 1 000 h of training. The most prevalent anatomical sites sustaining injury were the ankle and the foot (38.9%), followed by back (22.2%). Strains and sprains were frequently reported both in gymnasts and in controls. Gymnasts missed an average of 4.1 days of physical activity as compared to 18.9 days for the control females. Alternatively, modification of training sessions occurred more frequently for the gymnast group (32 vs 7 cases for controls). The total school days missed were lower for the injured gymnasts than for the injured controls (27 vs 64 days). CONCLUSION: Competitive, club-level rhythmic gymnastics show a higher prevalence of injuries than non-athletic controls, but considering the high number of hours spent in training sessions, it derives that rhythmic gymnastics is a sport discipline at relatively low risk of severe injuries. These are mainly limited to back and lower limbs, are generally not severe and do not significantly hinder the preparation for the competitions.

Harringe ML, Renstrom P, et al. (2007). Injury incidence, mechanism and diagnosis in top-level teamgym: a prospective study conducted over one season. Scandinavian Journal of Medicine & Science in Sports **17**(2): 115-9.

The aim of this study was to evaluate injury incidence, mechanism and diagnosis in Swedish teamgym. Sixteen male and 26 female gymnasts with international experience were prospectively followed during one season of training and competition. Injuries leading to a modified participation or total absence from gymnastics during 1 week or more were registered. Twenty-seven of the 42 gymnasts sustained 42 injuries. The injury incidence was 2.2/1000 gymnastics hours. No gender differences were found. Sixty-two percent of the injuries were located to the lower extremity, 28.5% to the back and 9.5% to the upper extremity. The most common injury was ankle sprain and the most frequent mechanisms were joint compression and joint rotation. The majority of the injuries occurred in the landing phase of the gymnastics skills and 50% of the injuries were reported at the end of the training session. Eighteen injuries occurred while the gymnasts were in a negative state of mood such as stressed or afraid. Injury prevention programs should be developed with respect to these findings. Special emphasis must be placed on the landing phase of the gymnastics skills as this phase seems to be critical.

McCormack RG, McLean N, et al. (2006). Thoraco-lumbar flexion-distraction injury in a competitive gymnast: a case report. Clin J Sport Med **16**(4): 369-71.

## MUSIC

### Biomechanics and Motor Control

Bangert M, Peschel T, et al. (2006). Shared networks for auditory and motor processing in professional pianists: evidence from fMRI conjunction. Neuroimage **30**(3): 917-26.

To investigate cortical auditory and motor coupling in professional musicians, we compared the functional magnetic resonance imaging (fMRI) activity of seven pianists to seven non-musicians utilizing a passive task paradigm established in a previous learning study. The

tasks involved either passively listening to short piano melodies or pressing keys on a mute MRI-compliant piano keyboard. Both groups were matched with respect to age and gender, and did not exhibit any overt performance differences in the keypressing task. The professional pianists showed increased activity compared to the non-musicians in a distributed cortical network during both the acoustic and the mute motion-related task. A conjunction analysis revealed a distinct musicianship-specific network being co-activated during either task type, indicating areas involved in auditory-sensorimotor integration. This network is comprised of dorsolateral and inferior frontal cortex (including Broca's area), the superior temporal gyrus (Wernicke's area), the supramarginal gyrus, and supplementary motor and premotor areas.

Charness ME, Schlaug G (2004). Brain mapping in musicians with focal task-specific dystonia. Adv Neurol **94**: 231-8.

### **Injury and Rehabilitation**

Bragge P, Bialocerkowski A, et al. (2006). A systematic review of prevalence and risk factors associated with playing-related musculoskeletal disorders in pianists. Occup Med (Lond) **56**(1): 28-38.

**BACKGROUND:** Playing-related musculoskeletal disorders (PRMDs) are a recognized problem amongst instrumental musicians. Although pianists are prominent in data regarding prevalence of PRMDs, there is poor understanding of piano-specific risk factors associated with PRMDs. **AIM:** To synthesize published literature on the prevalence of and risk factors associated with PRMDs in pianists. **METHODS:** Thirty-eight databases were searched. Eligible studies were those investigating prevalence of or risk factors associated with PRMDs in pianists, using an appropriate methodology according to a hierarchy of evidence. Information regarding study population, operational definition of PRMD, risk factors investigated, statistical tests used and outcomes was extracted and narratively synthesized for all eligible papers above an arbitrarily chosen quality score. **RESULTS:** The literature search identified 482 citations. Fifty-two papers were ranked in a hierarchy of evidence; 12 were eligible for evaluation using a quality assessment tool. Common methodological limitations included sampling/measurement biases, inadequate reporting of reliability/validity of outcome measures, lack of operational definition of PRMD and no statistical significance testing. Prevalence rates for PRMDs in pianists varied widely (26-93%). Four authors demonstrated statistically significant risk factors; however, no authors combined a clear operational definition of PRMD with statistically established risk factors. There was no consensus between authors regarding risk factors. **CONCLUSIONS:** Current evidence does not provide sufficient information regarding prevalence of and risk factors associated with PRMDs in pianists. Future studies should provide an operational definition of PRMD, use valid, reliable measurement tools, utilize a prospective cohort study design and perform appropriate statistical tests.

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.

Chitkara A, Meyer T, et al. (2006). Singer's dystonia: first report of a variant of spasmodic dysphonia. Ann Otol Rhinol Laryngol **115**(2): 89-92.

**OBJECTIVES:** We discuss the phonatory characteristics of a previously undescribed focal laryngeal dystonia present in the singing voice. **METHODS:** We performed a retrospective chart review of 5 patients with singer's dystonia at a neurolaryngology referral center. **RESULTS:** Four patients reviewed demonstrated phonatory characteristics consistent with adductor spasmodic dysphonia present in their singing voice. One patient demonstrated abductor spasmodic dysphonia in the singing voice. Each patient initially exhibited normal connected speech in conversational voicing. The treatment protocol and outcome are discussed, including the use of botulinum toxin. **CONCLUSIONS:** Singer's dystonia is a previously undescribed neurologic disorder that should be understood by those who treat voice performers and voice disorders.

Engquist K, Orbaek P, et al. (2004). Musculoskeletal pain and impact on performance in orchestra musicians and actors. Medical Problems of Performing Artists **19**(2): 55-61.

We studied the prevalence of musculoskeletal pain and its impact on performance in orchestra musicians and in a reference group of actors, who share the mental stress in a performance situation, but without having the physical work load from an instrument. Swedish musicians (n = 103) from symphony and chamber orchestras and actors (n = 106) participated in a cross-sectional questionnaire study. Musculoskeletal pain was assessed by a further developed Standardized Nordic Questionnaire. The impact of pain on performance (pain affecting playing capacity, decreased playing time, and change of technique) and trouble-related sick leave also was assessed. Pain intensity was assessed by visual analogue scales. Musculoskeletal pain in the neck and shoulders was the most frequently reported problem, with similar prevalence among musicians and actors, around 25% for present pain and 20% for chronic pain (1-year prevalence). Around 10% of the musicians and 5% of the actors reported pain in the hands. Oral pain was reported by 12% of the musicians and 18% of the actors. The number of affected body regions and the intensity of pain were similar in the study groups. The musicians had an increased risk for pain affecting playing capacity. For the neck, the prevalence odds ratio (POR) was 3.0 (95% confidence interval 1.2-7.2; adjusted for age and gender). String instrumentalists had higher risk estimates than nonstring instrumentalists. A gender difference was not observed. Pain in the oral region affecting playing capacity was less common in musicians, with a prevalence odds ratio of 0.4 (95% confidence interval 0.1-0.8). Even though the prevalence of musculoskeletal pain was similar in the two groups of performing artists, the consequences for the work situation were more serious among musicians.

### **Related**


Al-Qahtani NH (2005). Foetal response to music and voice. Aust N Z J Obstet Gynaecol **45**(5): 414-7.

**OBJECTIVE:** To examine whether prenatal exposure to music and voice alters foetal behaviour and whether foetal response to music differs from human voice. **SUBJECTS AND METHODS:** A prospective observational study was conducted in 20 normal term pregnant mothers. Ten fetuses were exposed to music and voice for 15 s at different sound pressure levels to find out the optimal setting for the auditory stimulation. Music, voice and sham were played to another 10 fetuses via a headphone on the maternal abdomen. The sound pressure level was 105 db and 94 db for music and voice, respectively. Computerised assessment of foetal heart rate and activity were recorded. 90 actocardiograms were obtained for the whole group. One way anova followed by posthoc (Student-Newman-Keuls method) analysis was used to find if there is significant difference in foetal response to music and voice versus sham. **RESULTS:** Fetuses responded with heart rate acceleration and motor response to both music and voice. This was statistically significant compared to sham. There was no significant difference between the foetal heart

rate acceleration to music and voice. **CONCLUSION:** Prenatal exposure to music and voice alters the foetal behaviour. No difference was detected in foetal response to music and voice.

Arnon S, Shapsa A, et al. (2006). Live music is beneficial to preterm infants in the neonatal intensive care unit environment. Birth **33**(2): 131-6.

**BACKGROUND:** Music stimulation has been shown to provide significant benefits to preterm infants. We hypothesized that live music therapy was more beneficial than recorded music and might improve physiological and behavioral parameters of stable preterm infants in the neonatal intensive care unit. **METHODS:** Thirty-one stable infants randomly received live music, recorded music, and no music therapy over 3 consecutive days. A control of the environment noise level was imposed. Each therapy was delivered for 30 minutes. Inclusion criteria were postconceptional age  $\geq$  32 weeks, weight  $\geq$  1,500 g, hearing confirmed by distortion product otoacoustic emissions (DPOAEs), and no active illness or documentation of hyperresponsiveness to the music. Heart rate, respiratory rate, oxygen saturation, and a behavioral assessment were recorded, every 5 minutes, before, during, and after therapy, allowing 30 minutes for each interval. The infant's state was given a numerical score as follows: 1, deep sleep; 2, light sleep; 3, drowsy; 4, quiet awake or alert; 5, actively awake and aroused; 6, highly aroused, upset, or crying; and 7, prolonged respiratory pause  $>$  8 seconds. The volume range of both music therapies was from 55 to 70 dB. Parents and medical personnel completed a brief questionnaire indicating the effect of the three therapies. **RESULTS:** Live music therapy had no significant effect on physiological and behavioral parameters during the 30-minute therapy; however, at the 30-minute interval after the therapy ended, it significantly reduced heart rate (150  $\pm$  3.3 beats/min before therapy vs 127  $\pm$  6.5 beats/min after therapy) and improved the behavioral score (3.1  $\pm$  0.8 before therapy vs 1.3  $\pm$  0.6 after therapy,  $p < 0.001$ ). Recorded music and no music therapies had no significant effect on any of the tested parameters during all intervals. Both medical personnel and parents preferred live music therapy to recorded music and no music therapies; however, parents considered live music therapy significantly more effective than the other therapies. **CONCLUSIONS:** Compared with recorded music or no music therapy, live music therapy is associated with a reduced heart rate and a deeper sleep at 30 minutes after therapy in stable preterm infants. Both recorded and no music therapies had no significant effect on the tested physiological and behavioral parameters.



## **DANCE**

### **Biomechanics and Motor Control**

Brown S, Martinez MJ, et al. (2006). The neural basis of human dance. Cereb Cortex **16**(8):1157-67.

Human dance was investigated with positron emission tomography to identify its systems-level organization. Three core aspects of dance were examined: entrainment, meter and patterned movement. Amateur dancers performed small-scale, cyclically repeated tango steps on an inclined surface to the beat of tango music, without visual guidance. Entrainment of dance steps to music, compared to self-pacing of movement, was supported by anterior cerebellar vermis. Movement to a regular, metric rhythm, compared to movement to an irregular rhythm, implicated the right putamen in the voluntary control of metric motion. Spatial navigation of leg movement during dance, when controlling for muscle contraction, activated the medial superior parietal lobule, reflecting proprioceptive and somatosensory contributions to spatial cognition in dance. Finally, additional cortical,



subcortical and cerebellar regions were active at the systems level. Consistent with recent work on simpler, rhythmic, motor-sensory behaviors, these data reveal the interacting network of brain areas active during spatially patterned, bipedal, rhythmic movements that are integrated in dance.

Sacco K, Cauda F, et al. (2006). Motor imagery of walking following training in locomotor attention. The effect of "the tango lesson". *Neuroimage* **32**(3): 1441-9.

The hypothesis of this study is that focusing attention on walking motor schemes could modify sensorimotor activation of the brain. Indeed, gait is a learned automated process, mostly regulated by subcortical and spinal structures. We examined the functional changes in the activity of the cerebral areas involved in locomotor imagery tasks, before and after one week of training consisting of physical and mental practice. The aim of the training was to focus the subject's conscious attention on the movements involved in walking. In our training, subjects were asked to perform basic tango steps, which require specific ways of walking; each tango lesson ended with motor imagery training of the performed steps. The results show that training determines an expansion of active bilateral motor areas during locomotor imagery. This finding, together with a reduction of visuospatial activation in the posterior right brain, suggests a decreased role of visual imagery processes in the post-training period in favor of motor-kinesthetic ones.

### **General**

Castelo-Branco C, Reina F, et al. (2006). Influence of high-intensity training and of dietetic and anthropometric factors on menstrual cycle disorders in ballet dancers. *Gynecol Endocrinol* **22**(1): 31-5.

Background. Intensity of exercise and low energy consumption, specific type and amount of training, early age at initiation, previous menstrual dysfunctions, low body mass index (BMI) or percentage body fat, pathological feeding habits and psychological stress have been suggested as potential factors accountable for menstrual irregularities in female athletes. Aim. To evaluate the influence of intensive training and of dietetic and anthropometric factors on menstrual cycles in female ballet dancers. Method. A case-control study, in which a structured interview and physical examination were carried out in two groups of teenagers aged between 12 and 18 years. The study included a total of 115 adolescent girls distributed in two groups: dancers (group B, n = 38) and girls of the same age not engaged in any sports activity (group C, n = 77). Results. Early starting high-intensity training delayed the onset of menarche ( $p < 0.001$ ). Dancers had a higher prevalence of oligomenorrhea and amenorrhea than control girls ( $p = 0.004$ ). Additionally, the dancers had lower scores in anthropometric variables: breast circumference 80 cm vs. 86.6 cm for controls ( $p = 0.0001$ ), low weight in 18% of dancers vs. 2.6% of controls ( $p = 0.0001$ ), and low height in 18% of dancers vs. 9% of controls ( $p = 0.016$ ). In addition, in dancers, low BMI was observed in 21% compared with 13% of controls ( $p = 0.0001$ ). Finally, 32% of the dancers were on a weight-control diet while this percentage decreased to 12% for the girls in control group (odds ratio = 3.49, 95% confidence interval = 1.31-9.25). Conclusions. In ballet dancers, high-intensity training was associated with late onset of menarche, menstrual disorders, lower weight and height development, and abnormal feeding behaviors.

Chartrand D, Chatfield SJ (2005). A critical review of the prevalence of secondary amenorrhea in ballet dancers. *J Dance Med Sci* **9**(3-4): 74-80.

The literature was evaluated in an effort to explain the apparently high prevalence and wide range of secondary amenorrhea reported for ballet dancers. In the general population the prevalence of secondary amenorrhea is between 2% to 5%. In the ballet community the

prevalence of amenorrhea is 6% to 73%. Seven of the 22 articles assessed present a prevalence of secondary amenorrhea greater than 30% for ballet dancers. Due to lack of reported information within these studies, a better understanding of the data cannot be gained. Existing reports were found deficient in the following areas: activity level, caloric intake, menstrual log, specific subject information (rank, expertise, and individual and group data), standard definition of secondary amenorrhea, methods of data collection, lack of prospective studies, and recordings of hormonal contraceptives. To enable an evaluation and explanation of the prevalence of secondary amenorrhea in ballet dancers, new research should be undertaken to include all these variables in order to provide a more complete understanding.

Guidetti L, Emerenziani GP, et al. (2007). Effect of warm up on energy cost and energy sources of a ballet dance exercise. *Eur J Appl Physiol* **99**(3): 275-81.

To evaluate the effect of warm up on energy cost and energy sources of a ballet dance exercise, 12 adolescent talented female dancers performed a ballet exercise (30 s of tours piques en dedans on pointe) without and following a warm up. Warm up consisted in a light running followed by a period of stretching and two ballet exercises. The overall energy requirement of dance exercise ( $VO(2eq)$ ) was obtained by adding the amount of  $VO(2)$  during exercise above resting (aerobic source or  $VO(2ex)$ ) to the  $VO(2)$  up to the fast component of recovery (anaerobic alactic source or  $VO(2al)$ ) and to the energy equivalent of peak blood lactate accumulation (anaerobic lactic source or  $VO(2IA)$ ) of recovery.  $VO(2eq)$  of exercise preceded by warm up amounted to  $37 \pm 3$  ml  $kg^{-1}$ .  $VO(2al)$  represented the higher fraction ( $50 \pm 6\%$ ) of  $VO(2eq)$ , the remaining fractions were:  $39 \pm 5\%$  for  $VO(2ex)$  and  $11 \pm 3\%$  for  $VO(2IA)$ .  $VO(2eq)$  of exercise without warm up amounted to  $38 \pm 3$  ml  $kg^{-1}$ . This value was made up of:  $26 \pm 6\%$  by  $VO(2ex)$ ,  $56 \pm 6\%$  by  $VO(2al)$  and  $18 \pm 3\%$  by  $VO(2IA)$ . Between exercise conditions, significant differences were found in  $VO(2ex)$  ( $P < 0.01$ ),  $VO(2IA)$  ( $P < 0.01$ ), and  $VO(2al)$  ( $P < 0.05$ ). The metabolic power requirement, 1.6 times higher than subject's  $VO_{2max}$  indicates a very demanding exercise. The anaerobic alactic source was the most utilized. It can be concluded that, when dance exercise was preceded by warm up, the anaerobic sources contribution decreased whereas the aerobic energy source increased.

Matthews BL, Bennell KL, et al. (2006). The influence of dance training on growth and maturation of young females: a mixed longitudinal study. *Ann Hum Biol* **33**(3): 342-56.

**BACKGROUND:** The effects of systematic sports training during childhood and adolescence on subsequent growth and sexual maturation remains in dispute. **AIM:** The study aimed to determine whether moderate-high volumes of dance training adversely influence linear growth and sexual maturation of young girls progressing through puberty. **SUBJECTS AND METHODS:** This 3-year mixed longitudinal study comprised 82 novice dancers and 61 controls, aged 8-11 years at baseline, who were assessed bi-annually for 3 consecutive years. A biological maturational age was determined by estimating attainment of age at peak height velocity (PHV). Body dimensions were measured by anthropometry, and exercise levels, nutritional intake and age at menarche by questionnaires. **RESULTS:** Controls had significantly greater unadjusted height velocity than dancers 1 year before PHV, however there was no difference between groups in age of attainment of PHV. When controlling for maturation, lean mass, fat mass and extracurricular sport (excluding dancing), there were no group differences in absolute growth or velocity of growth in height, sitting height or leg length. Within the dancers there were no effects of years of dancing (>6.5 years) or weekly dance hours (>7 h per week) on growth velocities. No association was found between age at menarche and years or hours of dance training. **CONCLUSION:** Results suggest that moderate-high levels of dance training do not affect linear growth and

maturation. Thus, girls should not be discouraged from dance participation on the basis of potential growth delays.

### **Injury and Rehabilitation**

Nihal A, Rose DJ, et al. (2005). Arthroscopic treatment of anterior ankle impingement syndrome in dancers. *Foot Ankle Int* **26**(11): 908-12.

**BACKGROUND:** The purpose of this study was to evaluate the results of arthroscopic treatment of anterior bony and soft-tissue impingement of the ankle in elite dancers.

**METHODS:** The study is a case series retrospectively reviewed. In the period between 1990 and 1999, 11 elite dancers (12 ankles) had ankle arthroscopy after a diagnosis of anterior ankle impingement that markedly interfered with their dancing. Initial nonoperative treatment failed in all subjects. Previous ankle trauma was noted in all subjects. There were seven women and four men (average age 28 years). Tibiotalar exostoses were radiographically noted in six ankles. Standard anteromedial and anterolateral arthroscopic portals and instrumentation were used for resection of bone spurs and debridement of impinging soft tissues. Patients were nonweightbearing for 5 days after surgery and had postoperative physiotherapy. **RESULTS:** Nine dancers returned to full dance activity at an average of 7 weeks after surgery. One patient did not return to dance performance because of concurrent unrelated orthopaedic problems, but he resumed work as a dance teacher; he developed a recurrent anterior tibial spur that was successfully resected at a second arthroscopy 9 years later. Another dancer developed postoperative scar-tissue impingement and stiffness; she had a repeat arthroscopy 4 months after the initial procedure and subsequently returned to dance performance. All patients eventually had marked postoperative improvement in pain relief and dance performance. **CONCLUSIONS:** Arthroscopic debridement is an effective method for the treatment of bony and soft-tissue anterior ankle impingement syndrome in dancers and has minimal morbidity.

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## **ARE YOU PAYING ATTENTION?**

### **Many of you have been asking about those dancing honey bees!**

Brockmann A, Robinson GE (2007). Central projections of sensory systems involved in honey bee dance language communication. *Brain Behav Evol* **70**(2): 125-136.

Honey bee dance language is a unique and complex form of animal communication used to inform nest mates in the colony about the specific location of food sources or new nest sites. Five different sensory systems have been implicated in acquiring and communicating the information necessary for dance language communication. We present results from neuronal tracer studies identifying the central projections from four of the five. Sensory neurons of the dorsal rim area of the compound eyes, involved in acquiring sun-compass based information, project to the dorsal-most part of the medulla. Sensory neurons of the neck hair plates, required to transpose sun-compass based information to gravity-based information in the dark hive, project to the dorsal labial neuromere of the subesophageal ganglion. Sensory neurons from the antennal joint hair sensilla and the Johnston's organ, which perceive information on dance direction and distance from mechanostimuli generated by abdomen wagging and wing vibration, project to the deutocerebral dorsal lobe and the subesophageal ganglion, and the posterior protocerebrum, respectively. We found no 'dance-specific' projections relative to those previously described for drone and queen honey bees and other insect species that do not exhibit dance communication. We suggest that the evolution of dance language communication was likely based on the modification of

central neural pathways associated with path integration, the capability to calculate distance, and directional information during flight.

Menzel R, Greggers U, et al. (2005). Honey bees navigate according to a map-like spatial memory. *Proc Natl Acad Sci U S A* **102**(8): 3040-5.

By using harmonic radar, we report the complete flight paths of displaced bees. Test bees forage at a feeder or are recruited by a waggle dance indicating the feeder. The flights are recorded after the bees are captured when leaving the hive or the feeder and are released at an unexpected release site. A sequence of behavioral routines become apparent: (i) initial straight flights in which they fly the course that they were on when captured (foraging bees) or that they learned during dance communication (recruited bees); (ii) slow search flights with frequent changes of direction in which they attempt to "get their bearings"; and (iii) straight and rapid flights directed either to the hive or first to the feeding station and then to the hive. These straight homing flights start at locations all around the hive and at distances far out of the visual catchment area around the hive or the feeding station. Two essential criteria of a map-like spatial memory are met by these results: bees can set course at any arbitrary location in their familiar area, and they can choose between at least two goals. This finding suggests a rich, map-like organization of spatial memory in navigating honey bees.

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