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ASSOCIATION OF SPINOPELVIC ALIGNMENT, LOWER EXTREMITY ALIGNMENT, HAMSTRING TIGHTNESS, LOWER EXTREMITY RANGE OF MOTION WITH LANDING PATTERNS IN BALLET DANCERS, FOLK DANCERS AND FOOTBALL PLAYERS

¹Neslihan Aksu, ¹Vefa Atansay, ²Busra Akgonul, ¹Ayhan Nedim Kara, ³Azmi Hamzaoglu. ¹Demiroğlu Bilim University Medical Faculty Florence Nightingale Hospital Orthopedics and Traumatology Department, Istanbul, Turkey; ²Sisli Florence Nightingale Hospital Physical Therapy and Rehabilitation Department, Istanbul, Turkey; ³Istanbul Florence Nightingale Hospital Orthopaedic and Spine Center, Istanbul, Turkey

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Background Dancers are exposed to ACL injuries less than other athletes despite jumping more than other athletes.

Objective To reveal the differences between professional dancers and athletes by posture analysis (coronal and sagittal balances) using EOS X-ray-imaging system and landing patterns after jumps using Kinovea video analysis.

Design Comparative study.

Setting Professional folk and ballet dance groups and Premier League football players.

Patients (or Participants) Volunteered 8 professional folk dancers, 8 professional ballet dancers and 8 premiere league football players.

Interventions (or Assessment of Risk Factors) Hamstring tightness, increased pelvic incidence and thoracic kyphosis angles and decreased ROM are the risk factors for ACL injury during landing.

Main Outcome Measurements Hip, knee and ankle mean ROMs, SLR (straight leg raise) and frontal mechanical axis angle were significantly different between dancers group and athletes group ($p < 0.05$). The mean P incidence angle and mean thoracic kyphosis angle in football players were significantly higher than dancer groups ($p < 0.05$).

Results Folk dancers use heel, ballet dancers use forefoot and football players use midfoot landings at initial ground contact. Compared to dancers, football players have less trunk, hip, knee flexion degrees at initial ground contact on landing.

Conclusions Hamstring tightness, decreased lower extremity ROMs, trunk flexion, hip flexion, knee flexion during landing may increase ACL injury risk in football players. Optimal hamstring flexibility is very important for preventing injuries in football player, and it also helps athletes improve football-specific skills, such as sprinting, jumping, agility and kicking. These results support the rationale that muscle flexibility ought to be part of the specific training of football players.

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EFFECTS OF HAMSTRING FLEXIBILITY AND INCREASED RANGE OF MOTION SINCE CHILDHOOD ON SPINAL AND PELVIC SAGITTAL BALANCE AND LOWER EXTREMITY ALIGNMENT: AN EOS X-RAY-IMAGING SYSTEM ANALYSIS IN DANCERS AND FOOTBALL PLAYERS

¹Neslihan Aksu, ¹Vefa Atansay, ²Busra Akgonul, ¹Ayhan Nedim Kara, ³Azmi Hamzaoglu. ¹Demiroğlu Bilim University Medical Faculty Florence Nightingale Hospital Orthopedics and Traumatology Department, Istanbul, Turkey; ²Sisli Florence Nightingale Hospital Physical Therapy and Rehabilitation Department, Istanbul, Turkey; ³Istanbul Florence Nightingale Hospital Orthopaedic and Spine Center, Istanbul, Turkey

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Background Posture is one of the important factors for body balance. For example, elderly's increased thoracic kyphosis causes them to fall due to sagittal balance disturbance. At the same time, increased valgus axis on lower extremity increases risk of ACL injury during landing. We aimed to research posture changes that may increase the risk of injuries in dancers and athletes and its relationship with SLR and year of sports/dance.

Objective We intend to reveal the postural differences between professional dancers and athletes by assessment of spinopelvic alignment and lower extremity alignment using EOS X-ray-imaging system. We examined SLR (Straight Leg Raise test), and lower extremity ROMs.

Design Prospective comparative study.

Patients (or Participants) 16 professional dancers and 16 Premier League football players.

Interventions (or Assessment of Risk Factors) Increased hamstring tightness increases pelvic incidence and thoracic kyphosis and also increases spinal sagittal balance in positive way that becomes important risk factor of injuries.

Main Outcome Measurements Dancers' lower extremity (hip, knee, ankle) ROMs are significantly higher than athletes ($p < 0.05$). The mean Pelvic incidence angle and mean thoracic kyphosis angle in football players higher ($p < 0.043$, $P < 0.01$), mean SLR were significantly lower ($p = 0.0001$) than dancer groups. Dancers' right and left lower extremity valgus axis values were statistically much higher than in football players ($p = 0.015$, $p = 0.006$).

Results We observed positive statistical differences between SLR and year of work values ($r = 0.704$ $p = 0.0001$) for dancers and athletes. We observed negative statistical differences between thoracic kyphosis and year of work values ($r = -0.415$, $p = 0.018$) for dancers and athletes.

Conclusions In comparison of dance and football training that started in early ages, dance training causes increased ROMs and hamstring flexibility, decreased pelvic incidence and thoracic kyphosis. Therefore, it supports upright and balanced spine and decreases the risk of injuries.

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RETURN TO DANCE FOLLOWING ARTHROSCOPIC KNEE SURGERIES: WHAT ARE THE DIFFERENCES BETWEEN RETURN TO SPORT AND RETURN TO DANCE

¹Neslihan Aksu, ¹Vefa Atansay, ²Busra Akgonul, ¹Bugra Ayaz, ¹Ayhan Nedim Kara, ³Azmi Hamzaoglu. ¹Demiroğlu Bilim University Medical Faculty Florence Nightingale Hospital Orthopedics and Traumatology Department, Istanbul, Turkey; ²Sisli Florence Nightingale Hospital Physical Therapy and Rehabilitation Department, Istanbul, Turkey; ³Istanbul Florence Nightingale Hospital Orthopaedic and Spine Center, Istanbul, Turkey

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Background Due to risk of reinjury and osteoarthritis, timing of return back to level 1 (jumping, pivoting and hard cutting) sports after surgeries is important. Dance injuries are much like sports injuries and literature is not available on the time to return to dance, rate of reinjury and osteoarthritis following arthroscopic surgery.

Objective In this study, we investigated rates of osteoarthritis and reinjury following arthroscopic knee surgery in folk dancers.

Design Retrospective clinical study.

Setting Professional folk dance group.

Interventions (or Assessment of Risk Factors) Risk of reinjury and osteoarthritis following knee surgery in professional folk dancers.

Results The dancers suffered 14 knee injuries requiring arthroscopic surgery (3 meniscus tears, 4 anterior cruciate ligament tears one of which is with posterolateral corner tear, 1 posterior cruciate ligament tear, 1 patellar dislocation, 1 infrapatellar bursitis, 2 Hoffa's fat pad syndromes, 2 symptomatic medial plicae) during a ten-year period. Following surgeries, the dancers could restart to perform live on the stage in 19.5 ± 12 (range: 5 to 52) weeks on average. Injuries and postoperative times to return to dance was 56.7 ± 23 (26–108) months to follow-up with the same clinic and same surgeon for the patients. One dancer had reoperation due to meniscus re-tear after 4 years. The rate of reinjury is 7.14% after knee surgery. All of the dancers who underwent arthroscopic knee surgery were evaluated for osteoarthritis according to the Kellgren Lawrence classification. The osteoarthritis were classified as G:0 in 7 patients, G:1 in 3 patients, and G:2 in 4 patients on final knee radiographs. All of the operated patients continued with their careers in dancing.

Conclusions Knee surgeries for the cases mentioned above do not necessarily put an end to their dancing career. This may be attributed to the dancers' balance and coordination skill focus compared to endurance focus during training.

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BONE MINERAL DENSITY AND ASSOCIATED FACTORS: DO YOUNG FEMALE DANCERS AND OTHER RECREATIONAL SPORT ATHLETES DIFFER?

¹Meghan Critchley, ²Clodagh Toomey, ³Stacey M Lobos, ^{1,2,4}Luz Palacios-Derflinger, ^{1,2,5}Sarah J Kenny, ^{1,2,3,4,5}Carolyn Emery. ¹Sport Injury Prevention Research Centre, Faculty of Kinesiology, University of Calgary, Calgary, Alberta, Canada; ²Alberta Children's Hospital Research Institute, University of Calgary, Calgary, Alberta, Canada; ³Human Performance Laboratory, Faculty of Kinesiology, Calgary, Alberta, Canada; ⁴Department of Community Health Sciences, Cumming School of Medicine, Calgary, Alberta, Canada; ⁵O'Brien Institute for Public Health, University of Calgary, Calgary, Alberta, Canada

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Background As an aesthetic activity, dancers are susceptible to Relative Energy Deficiency in Sport (RED-S), specifically low bone mineral density (BMD). Compared to sedentary groups, dancers have significantly higher BMD, but little is known about how BMD in dancers relates to other athletic populations. This knowledge may better inform comparative values and risk of bone injury.

Objective To evaluate associated factors of BMD among female dancers and sporting athletes.

Design Cross-sectional study.

Setting Human Performance Lab, University of Calgary.

Patients (or Participants) 275 females [138 pre-professional dancers (18.4 years IQR: 15.3, 19.9); 137 recreational sport athletes (23.2 years IQR: 21.9, 24.7)] participated.

Interventions (or Assessment of Risk Factors) Factors evaluated: Age (years), BMI (kg/m^2), supplement intake (Ca+, vitD; yes/no), stress fracture history (yes/no), irregular menses (yes/no), and MRI/bone scan (yes/no), one-year injury history (yes/no), and activity (dance/sport). All two-way interactions were evaluated.

Main Outcome Measurements Whole-body BMD (g/cm^2) was estimated from dual-energy x-ray absorptiometry. Lower extremity (LE) segmentation followed published protocols.

Results The mean whole-body BMD was 1.03 g/cm^2 (SD:0.10) in dancers and 1.14 g/cm^2 (SD:0.08) in athletes. LE BMD was 1.10 g/cm^2 (SD:0.11) in dancers and 1.19 g/cm^2 (SD:0.08) in athletes. Age was positively associated with whole-body BMD ($b=0.008, 97.5\% \text{ CI}; 0.004, 0.012$) and LE BMD ($b=0.007, 97.5\% \text{ CI}; 0.002, 0.010$). Activity modified the relationship between BMI and BMD ($p<0.001$), for example, for a BMI of 20.1 kg/m^2 (mean of participants) the difference between dancers and athletes is -0.389 g/cm^2 [97.5% CI: $-0.566, -0.195$] and -0.381 g/cm^2 [97.5% CI: $-0.552, -0.197$] for whole body and LE BMD respectively. No other variables were associated with BMD.

Conclusions Older age is associated with higher BMD in female pre-professional dancers and sport athletes. The relationship between BMI and BMD depends on activity type for both whole-body and lower extremity sites. Efforts to prevent bone injury should focus on younger dancers and athletes and consider the associations of changing body composition over a training season with low BMD.

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INJURY ASSOCIATED WITH DANCE EDUCATION: A SYSTEMATIC REVIEW

¹Meghan Critchley, ^{1,2,3}Sarah Kenny, ⁴Ashleigh Ritchie, ^{4,5}Katy Chambers, ⁶Carly D McKay. ¹Sport Injury Prevention Research Centre, Faculty of Kinesiology, University of Calgary, Calgary, Alberta, Canada; ²Alberta Children's Hospital Research Institute, University of Calgary, Calgary, Alberta, Canada; ³O'Brien Institute for Public Health, University of Calgary, Calgary, Alberta, Canada; ⁴Royal Academy of Dance, London, UK; ⁵Trinity Laban Conservatoire of Music and Dance, London, UK; ⁶Department for Health, University of Bath, Claverton Down, Bath, UK

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Background Several studies have investigated injury in specific genres (i.e., ballet, contemporary) and/or levels (i.e., pre-professional, professional) of dance. Less is known about injuries sustained during the teaching of dance, which accounts for the highest proportion of the global dance community.

Objective To determine the risk of injury associated with participation in organized dance education.

Design Systematic review.

Setting Formal dance education (e.g., community classes, dance schools/studios, university programs).

Patients (or Participants) Dance students and teachers.

Main Outcome Measurements Six electronic databases were searched to August 2020 (Medline, EMBASE, SportDiscus, CINAHL, SCOPUS, Cochrane). Inclusion criteria were: original data from dance teacher/student samples, injury and exposure related to formal dance classes, any dance genre. Studies were excluded if no estimate of exposure was reported, if injuries occurred during rehearsal/performance, or if dance was used as a therapeutic intervention or for exercise. Two reviewers independently assessed each paper for inclusion at abstract and full text screening stages. Study quality was assessed using the Joanna Briggs Institute Level of Evidence tool.

Results Twenty-five papers were included.

Most studies ($n=22$) focused on dance students only, two included only dance teachers, and one study included both. The quality of studies ranged from poor to moderate. For students and teachers, most injuries were overuse/chronic and involved the lower limb. Student injury rates were estimated at 0.8–9.3 injuries/1000 h. In dance teachers, a single study described 732 pain reports/1000 h and injury incidence