

Dance injuries In Full

The Royal Society of Medicine, London
28th June 2007

Jane's notes taken during the conference

1) An introduction to dance: Emma Redding

Emma is a dance teacher and dance science researcher at the Laban Centre, one of only two places where it is possible to take an MSc in dance, the other being Wolverhampton University.

- dance is extremely varied in terms of the techniques.
- Within different genres (eg ballet, hip hop) there are specific, codified techniques dancers have to learn. To demonstrate this we watched videos showing ballet, tap and Irish dance.
- dance injuries are more common than sporting injuries.
- the skills required include many needed by athletes such as fast, explosive movements, strength and balance, but also some others, such as being able to spin without dizziness.
- flexibility does not come primarily for the stretchiness of our muscles. 85% of flexibility is predetermined at birth by our anatomy and physiology.
- Dance UK 2002 survey revealed 80% of dancers had been injured in the previous 12 months. The low back was the commonest injury site. 38% of ballet dancers and 37% of contemporary dancers cited fatigue as their cause of injury, 37% and 31% respectively cited it was due to overwork.
- science has informed sport training over the last decade but not dance training. Dance training involves a three year full time degree involving many many hours of practice.
- dancers believed they are "performing artists" not athletes and so have a different attitude to training.
- the skill of dance is so often contrasting: they may need to jump and perform explosive movements but are also required to demonstrate flow, lightness, balance and sequential turning whilst appearing aesthetically pleasing.
- To demonstrate how dancers warmed up, we watched a video of two typical dance training classes. Whilst classical ballet used the bar for repeated movements in part of the warm up, contemporary dancers stood more still but performed repeated movements of the spine in all positions, (ie flexion, extension, lateral flexion, rotation and combinations of all of these).
- the training environment is often very different from the environment the dance is actually performed in. The training rooms are usually light with flat floors and dancers wear leotards. The performing environment is usually a black stage, lit only from the side, and dancers often have to wear costumes. Often they don't have access to the stage until the day before the performance is due to take place. Emma mentioned that she herself had performed in The Old Operating Theatre in London, in an old abattoir, in a forest and even on sand.

2) Dance Physiology: Dr Matt Wyon

Matt is an exercise physiologist. he trained as a dancer between the ages of 6 and 16 but also played rugby.

- When dancers are fatigued their technique goes, their skill goes and they get injured.
- Their "engine" is less efficient than the engine of a sports person, despite appearing to be extremely fit.
- The VO2Max of a dancer is usually 30-57, but is usually at the low end of this scale, whereas a sports person is usually at the top end.
- Few are taught to jump using plyometrics.
- they perform high intensity but intermittent exercise, usually crossing from one side of a room/stage to the other.
- they use performance to get ready for performance, rather than specific exercise training. in other



words, they continue to perform their routines but do not do any exercise training to enable them to get fit to perform. they feel they are at their fittest two weeks after the actual performance has been running, rather than prior to the performance, as is the case with athletes.

- dancers increase their aerobic fitness during the performance of a stage run, whereas athletes lose a bit of their aerobic fitness during their sports performance.
- dancers can jump to around 60cm whereas basketball and volleyball players can actually jump to around 80-90cm.
- there are imbalances in the flexibility of dancers.
- female dancers are now being required to use their upper body more and more in catching and throwing other dancers.
- the majority of dancers have not developed their aerobic power. Solo pieces require much greater physiological work than group pieces because group pieces actually have a lot of "rest" time in them. He argues that dancers are "highly skilled but underpowered" in all areas.
- he asks "do fitter dancers dance better?" what limits their performance, decreased power or complex choreography?
- a member of the audience asked whether they were fatigued more because they simply don't eat enough and therefore cannot replace their glycogen stores. Matt explained because dancers rarely work aerobically to the full extent, dance was not a weight loss mechanism, therefore they decrease food consumption in order to maintain body image.
- dancers believed, in general, that more was better, and that to continually perform would improve their skill. There was less time for food breaks and rest time taken up with repeated practice.

3) Dance Medicine: Dr Roger Wolman, Consultant Rheumatologist, Royal National Orthopaedic Hospital.

- Classical ballet has five standardized positions and it is in striving to attain these perfectly that gives rise to injuries.
- dancers have outstanding proprioceptive awareness
- those with genetic hypermobility syndrome have an increased risk of injuries
- they need to have flexible spines and have 45-60 degrees of external rotation at the hip. Their 1st MTP (metatarsophalangeal) joint needs to dorsiflex to 90 degrees for when they are on demi-point. They need extreme plantarflexion at the ankle.
- because of the need for a certain aestheticism, many have disordered eating habits. Up to 40% of students in some schools have an eating disorder and many have the 'female triad'
- osteopenia/osteoporosis is common.
- bone stress injuries and stress fractures increase in the female triad. metatarsals, tibia and even the spine are all vulnerable areas for injury. Repeated anterior tibial stress fractures are essential to pick up early in diagnosis as they can lead to non-union of the bone and end the dancer's career.

Effects of maintaining different ballet positions

i) turn out of the feet to 180 degrees. This requires 45-60 degrees of external rotation at the hip. This is difficult to achieve and to compensate dancers often tilt their pelvis anteriorly leading to increased lumbar lordosis. They also roll over on the forefoot, the arch falls and they place increasing stress on the 1st MTP joint leading to hallux valgus. The tilted pelvis also leads to weakness in abdominal and core muscles.

The rolling over onto the foot also leads to torsional stress on the tibia and fibula, compartment syndrome and torsional stress at the knee.

ii) point and demi-point

This increases pressure at the posterior ankle leading to inflammation and fibrosis. There is posterior impingement and the result is posterior ankle pain, especially if there is an enlarged talus bone and os trigonum. We were shown MRIs of MTP fractures and of inflammation of the posterior ankle.



Os trigonum syndrome occurs in 10% of people. problems are only symptomatic in plantarflexion. It is very common within the dancing population. It is associated with the flexor hallucis longus tendon which becomes inflamed and leads to posterior ankle pain. The management of this condition is rest, avoid active plantarflexion, physiotherapy, steroid injection and perhaps surgical incision of os trogonum. However surgery leads to a much delayed recovery time.

iii) Plie

Involves extreme dorsiflexion and anterior ankle problems. Traction spurs develop on the talus bone and on the anterior lip of the tibia.

The forefoot is the most common site of injury in 40% of dancers. Conditions include:

- hallux valgus
- hallux rigidous (in older adults, ie osteoarthritis)
- sesamoid injuries, especially medial sesamoid. This is a very bad injury.

Midfoot disorders include cuboid subluxation.

Hindfoot disorders include flexor hallucis longus inflammation as already discussed.

Knee

15% of injuries occur to the knee. Injuries include

- patello-femoral problems
- iliotibial band problems
- patellar tendon problems

__ posterior knee pain. This is due to the aesthetic requirement of the dancer being able to hyperextend the knee, stretching the posterior structures, especially gastrocnemius and possibly also hamstrings and popliteus.

Hip

Conditions include:

- trochanteric bursitis
- ischial bursitis
- adductor strain
- sacroiliac joint injuries
- stress fractures at the femoral neck, especially in amenhorroic women
- snapping hip syndrome. this is actually quite uncommon and occurs as gluteus medius and the ITB snap over the greater trochanter. treatment is NSAIDs, physiotherapy, stretching of the ITB and iliopsoas.

Low back

Extreme hyperextension leads to both bone stress injury and stress fractures in the pars interarticularis, usually at L4/L5. Injuries to facet joints also occur.

4) Imaging of Dance Injuries: Dr Margaret Hall-Craggs, Consultant Radiologist

- in a survey of 57 female ballet dancers, 17 reported 27 stress fractures. 63% had metatarsal fractures, 22% tibial fractures, 7% spine fractures.
- imaging can help pick up a stress "injury" before it becomes a stress fracture. MRI is best for imaging this.

Other things MRI can detect is synovitis, tendinopathy and tears and splits in tendons.



- flexor hallucis longus is commonly abnormal in dancers due to its long tunnel. It can be damaged posteriorly. In 40 dancers there were 9 abnormal FHL tendons. 2 were symptomatic, 5 asymptomatic and 2 no symptoms.
- arthrography is good to detect labral injuries in the hip.
- a new method of imaging cartilage is called DeGEMRIC.
- functional imaging is being used to map brain activity. The part of the brain that detects a certain movement increases its oxygen usage when we use that body part more. When dancers are watching the form of dance with which they are familiar, their brains become extremely active. So ballet dancers' brains become active when these viewers watch ballet, but are not so active when they watch a form of dance called copoeira, and the reverse is true of copoeira dancers.

5) Rehabilitation of Dance Injuries: Mr Nick Allen

- dancers wearing an 8kg cloak as part of their costume lost 4kg in bodyweight during a show.
- in 53 dancers surveyed during one season (ie Aug-July) they found 370 injuries.
- the dancers' aerobic base is crucial to rehabilitation, yet many are aerobically less fit than athletes.

Jane Johnson MCSP, MSc, BSc, BA(Hons)

Co-Director and esteemed author of *Soft Tissue Release: Hands-on Guides for Therapists*