The foot and ankle in modern dancers: unique or different from ballet?
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Epidemiology: Incidence of injury/1000 hrs
Risk factors
Prevention-Intervention
  - Preseason screening
  - Outcomes Tools: DFOS, SF-36
  - Injury surveillance
  - On-site clinic
Intrinsic RF
  - Previous injury
  - Structural alignment
  - Hypermobility
  - Tightness
  - ROM: measurement
Extrinsic RF
  - Technique/Style of dance: Horton, Graham, Dunham/W African, Contemporary, Release
  - Seasonal patterns
  - Environmental conditions
  - Equipment: Foot care is footwear
Functional Evaluation
  - Parallel: demi plié, demi-relevé, primitive squat
  - Turned out: demi plié & demi-relevé in 1\textsuperscript{st}, grand plié in 2\textsuperscript{nd}
  - Tondu
  - Single leg pressure relevé & balance
  - Sauté in 1\textsuperscript{st}
Problems in technique alignment
  - Forcing turnout, forcing deeper demi plié, rolling in, over-pointing, insufficiency or imbalance
Motor Control:
  - Structure, mechanics, potential stressors
  - Proximal v distal control
  - GLOBAL HARMONY

Foot & ankle injuries
Ankle: Anterior & posterior impingements, Achilles t, lateral ankle sprains, peroneal t, subluxing peroneal t, FHL & posterior tibialis tendinitis, Os trigonum and Steida’s process
Midfoot: Lisfranc sprain, Cuboid subluxation, 5th & 2nd met fractures
Forefoot: Hallux valgus & rigidus, sesamoiditis to non-union fracture

Practical theme
Modalities, manual Therapy, tape & support, and Modification
Global Harmony & adequate rehabilitation – we need to rehab the modern dancer as an athlete-dancer ready for on the field play

Contributors to injury & reinjury
Recurrent ankle sprains with no rehab
Misdiagnoses
Insufficient aerobic conditioning: Fatigue → overuse → inj
Awkward postures, duration, heaviness of lifting, extremes of ROM, repetitiveness
Training errors

Equipment that I love: rotation discs, Pilates chair, Pilates reformer, trampoline

Mandatory for PT: all sizes of balls, tape (Cover-roll + Leucotape, Elasticon, Coban, Kinesiotape, Dynamic tape) ice buckets, orthotics (Superfeet)

Neglected: Jump program including eccentric strengthening
Motor control of deep turnout muscles

Rehabilitation management for foot and ankle injuries in dancers ©

Phase 1: Early post op or acute injury – Extreme restriction

- Appropriate protective padding, bracing, taping, and footwear
  - Bunion taping
  - Plantar fascia taping for FHL t, PI fasciitis, calc inv
  - Plantar plate tape / pad
  - Calcaneal taping
  - Achilles tendon taping
  - Lis franc taping / protection
- Activity modification – no dancing, NWB floor barre in sneakers
- Active range of motion of 1st MTP, IP, talocrural joints, doming, and PWB roll through exercises
• Cross training for cardiovascular endurance (stationary bicycle, arm ergometer) and lumbo-pelvic strength (Pilates reformer and large therapy ball
• Technique analysis
• Integration of lumbo-pelvic-hip (deep rotators) control on rotation discs
• Stretch large lower extremity muscles groups
• Ice bucket post-activity

Phase 2: Moderate restriction – protected movements

• 1st MTP joint mobilization (grade II, anterior to posterior)
• Neuromuscular electric stimulation to ankle plantar flexors in NWB (if immobilized in boot for long period)
• Floor barre in socks, barefoot, or ballet slippers
• Careful PWB MTP dorsiflexion warm up before class
• Technique class (simple, slow): modify turnout, improve supportive proximal muscle control (lumbo-pelvic-hip muscles). Always check movement alignment and motor control in PT before resuming them in class
• Acceptable footwear for class with protective padding with as necessary
• Work in 1st or 2nd positions only (no 3rd, 4th, or 5th):
  o No pointe shoes
  o No demi relevé
  o No grand plié except 2nd
  o No frappe
  o No jumping
• Cross training for cardiovascular endurance and lumbo-pelvic-hip strength
• Reduce muscular weakness and imbalances including ankle and toe dorsiflexion and plantar flexion strengthening, FHL flexibility
• Improve postural core control for dance-specific function
• Balance and proprioception bilateral and unilateral (flatfoot) training (balance board, foam)
• Ice bucket post-activity
Phase 3: Minimal restriction – expanding movement boundaries

- 1st MTP, metatarsal, tarsal, talocrural (NWB & WB), fibula joint mobilization
- Neuromuscular electric stimulation to ankle plantar flexors in WB
- Acceptable footwear for class with protective padding with as necessary
- Careful PWB MTP dorsiflexion warm up before class
- Begin work in third position (no 4th or 5th position)
- Begin grand plié (1st and 3rd positions) in modified range
- Begin bilateral relevé & level changes: partial range progression from ¼ to ½ to ¾ to full height
- Eccentric training on Pilates chair (Soleus) and Reformer (Gastrocnemius):
  - Begin plyometric training on reformer:
    - 1 spring to 2 springs
    - Parallel to turned out
    - Toe push–offs
- Unilateral foot intrinsic exercises at the barre
- Ice bucket post activity

Phase 4: Progressive movement challenges

- Continue protective padding with acceptable footwear for class as necessary
- Begin work in 5th position
- Begin unilateral relevé: balances and single turns
- Pressure relevé balance training on unstable surfaces
- Begin simple 2–legged jumps at barre → progress to center floor and simple single limb hops
- Continue plyometric progression: hops on reformer and trampoline for single limb power
- Sport cord resistance for running and directional transitions
- Ice bucket post post activity as necessary

Phase 5: No restrictions

- Return to all traveling and jumping (petit and grand allegro) dance activities
• Jump program: progression of reps and duration of parallel and turned out: prances, changement, bounding, pas de chat, sissone, jeté
• Increase tempo demands
• Resume more advanced classes and several classes/day
• Wean from pads and icing as tolerated

Abbreviations: NWB, non-weight bearing; 1st, first; MTP, metatarsalphalangeal; IP, interphalangeal; PWB, partial weight bearing; 2nd, second; 3rd, third; 4th, fourth; 5th, fifth; WB, weight bearing.

References