Balance & Proprioception for Dancers
Ashley Takekawa, PT, DPT, ATC

Balance

Proprioception

- Definition: the unconscious perception of movement and spatial orientation arising from stimuli within the body itself
- Provides information about muscle stretch, tendon tension, joint position, and deep vibration
- Both static joint position and kinesthetic sense

Proprioceptors

Muscle Spindle

1) Stretch
2) Speed of Stretch
Well documented that impaired balance performance is risk factor for traumatic LL injury

Balance-specific training has been shown to decrease injury incidence in athletes

"Participation in dance is not, by itself, necessarily related to increased proprioceptive function in the ankle." Schmitt 2005

So...dancers need to do more than just dance!

Dancers have 2x as many ankle sprains as other athletes

Proprioceptive ability decreases following an ankle injury

Injuries requiring immobilization can result in severe muscle atrophy, changes in motor cortex excitability, firing rates of motor units, and contractile properties of skeletal muscles

Those with ankle instability from serious or multiple sprains demo decreased SLB

Proprioceptive training must be initiated ASAP after ankle injury to prevent CAI
Proprioceptive Deficits Following ACLR

- Study found impaired dynamic balance bilaterally in those who underwent unilateral ACLR 12 months out.
- Both limbs may be affected by unilateral trauma, possibly due to physical inactivity, altered sensory feedback from the injured joint affecting the uninjured side, or modifications to central motor programs.
- Paterno et al. found that those with balance deficits following ACLR were twice as likely to suffer a rerupture over the following year.

Balance Testing for Dancers

- SLB, Y-balance, Bess, Romberg, sharpened Romberg—ceiling effect for dancers.
- More functional options (with dance-specific postures/basis):
  - Modified Romberg (2 parallel, arms crossed, eyes closed)
  - Lunge
  - Stance-relevé SL
  - Standing lunge
  - Developmental sequence
- 3 that are significantly predictive of dance teacher classification for pointe readiness:
  - Topple Test
  - Airplane Test
  - Single-leg squat Test

Special Considerations for Adolescence

- There is a decrease in motor ability and dynamic balance during adolescence resulting from the sensorimotor system’s adjustment to rapid growth changes.
- This is the time most dancers first go on pointe.

What to Look For

- More than just loss of balance
- Consider what’s happening at each joint from the ground-up
Demi Plie–Releve

- PHOTO
- Foot: elongated toes, not gripping, slight pronation (1st MT drops to ground)
- Releve: elongated toes, articulation through metatarsal, active arch
- Ankle
- Knee
- Hip
- Trunk

Grande Plie

- VIDEO
- Foot
- Ankle
- Knee
- Hip
- Trunk

Passe-Releve SLB

- PHOTO
- Foot
- Ankle
- Knee
- Hip
- Trunk
- Must be able to control hypermobile arc of motion
- Posteriorly: female dancers have 113° ankle PF ROM on avg, compared to 48° in general population
- Watch for “winged” or “sickled” compensations while en pointe/releve
- 90–10° great toe ext required for demi pointe (less can lead to sickling, thus predisposing to inversion ankle sprain)

Standing March

- VIDEO
- Foot
- Ankle
- Knee
- Hip
- Trunk
- Weak or fatigued hip abduction increases postural sway and STJ inversion during SLS
Developmental Sequence

- Video
- Foot
- Ankle
- Knee
- Hip
- Trunk

Topple Test

- Video
- Foot
- Ankle
- Knee
- Hip
- Trunk

Airplane Test

- Video
- Foot
- Ankle
- Knee
- Hip
- Trunk

Single-Leg Saute Test

- Video
- Foot
- Ankle
- Knee
- Hip
- Trunk
Proprioception Exercises

- Preliminary (or WB restrictions)
  - Floor barre
  - VIDEO
  - Tendus against wall
  - Developpes in supine and sidelying—add side plank
  - Demi Pointe into ball
  - PHOTOS
  - Reformer/jumpboard or Total Gym
  - VIDEO
  - Port de bras arms

- Seated
  - Seated releves/jumps
  - VIDEO
  - On swiss ball
  - PHOTOS
  - Weight shifts
  - Port de bras arm movements
  - Trunk twists

- Kneeling
  - Thoracic SB, rotations, rotations w/ extension
  - PHOTOS
  - Quadruped
  - PHOTOS
  - Bird dog variations with spinal extension/arabesque
  - Tall kneel
  - VIDEO
  - Weight shifts
  - Gesture leg movement
  - Advance surfaces
  - On rotators discs
  - Reformer (hip IR/ER foot in strap)

- Standing
  - 1st position flat
  - Add typical turnout changes, port de bras arms, perturbations, active-back extensions
  - 1st position plie w/ transfer
  - 1st position on releve
  - PHOTOS
  - Turned out flat
  - Forable tilt
  - Not then releve
  - Straight leg from right squat
  - Forable standing jumps
**Proprioception Exercises**

- **Standing**
  - VLOG
  - Bolder Discs
  - Brisk and unbalance walk
  - ¼, ½, full turns
  - SLB w/ gesture leg developpe, battement, van de jamm
  - Adjust upper body tales expr. for male dancers

- **On Rise**
  - VLOG
  - Stance class
  - Petit Jete prep
  - Balance
  - Changes surfaces
  - Medial and lateral forces

**References**

- Hamilton W. (2016 April). Musculoskeletal characteristics of elite professional ballet dancers: findings from a profile conducted on America's two leading ballet companies. Presented at Harkness Center for Dance Injuries’ Clinical Expertise and Evidence in Dance Medicine, New York, NY.