Athletics meets aesthetics: injury mechanisms and treatment in dance and sport

University of Southern California
Jacquelin Perry Musculoskeletal Biomechanics Research Lab

Combined Sections Meeting 2018
New Orleans, LA, February 21 – 24

COURSE OBJECTIVES

1. Discuss the biomechanical demands with performance of typical dance technique and how these differ from sports athletes
2. Discuss the pathomechanics that contribute to common pathologies seen in dancers in the ankle, knee, hip, and lumbopelvic region and compare these to injury mechanisms typically seen in sports athletes.
3. Discuss the clinical evaluation for these common pathologies and how assessment will differ between dancers and sports athletes
4. Discuss treatment approaches to address these biomechanical demands while addressing the intrinsic aesthetic demands in dance.

Disclosures

• This speaker has no disclosures to report

Introduction

• A 52-member elite ballet company was followed for one year
– 355 injuries were recorded at a rate of 4.4 injuries per 1000 hours and 6.8 injuries per dancer

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[Image: Pie chart showing injury distribution]
Dancer-Named Injuries

“Dancer’s Tendinitis”
A tenosynovitis of the flexor hallucis longus (FHL).

“The Line”
Wendy Whelan in Arabian Coffee in George Balanchine’s The Nutcracker.

Biomechanics

Where does the pointe come from? In the sagittal plane...
In seven female ballet dancers...

<table>
<thead>
<tr>
<th>Bone Pair</th>
<th>Degrees of Motion (mean ± SD)</th>
<th>% Total PF (mean)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tibia - Talus</td>
<td>56.6° ± 5.2</td>
<td>72.6%</td>
</tr>
<tr>
<td>Talus - Navicular</td>
<td>9.5° ± 2.3</td>
<td>10.9%</td>
</tr>
<tr>
<td>Navicular - Cuneiform</td>
<td>8.7° ± 3.1</td>
<td>10.5%</td>
</tr>
<tr>
<td>Cuneiform - Metatarsal</td>
<td>3.4° ± 4.1</td>
<td>8.7%</td>
</tr>
<tr>
<td>Tibia - Metatarsal</td>
<td>78.7° ± 5.8</td>
<td>100%</td>
</tr>
</tbody>
</table>

Biomechanics

Where does the pointe come from? In the frontal plane...

Footwear

Compare to shod sports, where midfoot is constrained...

Metatarsophalangeal Joints

First MTP Joint Flexibility Functional Balance Modified Heel Rises

Functional Extension

In 25 dancers and 25 non-dancers...
- Dancers had 10.8° more functional extension (p<0.001)
- Dancers could balance in demi-pointe 5.5 s longer (p=0.013)
- Dancers could do 6.6 fewer modified relevés (p<0.001)

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**Metatarsophalangeal Joints**

- **Multisegmental Foot**
- **Greatest Range of Motion:** Relevé

Greatest Net Joint Moment: *Saut du chat*

**Do the toe flexors contribute to athletic performance?**

- **Authors highlight movements with a forward lean and forward propulsion.**

**FHL Tendinopathy** also seen in sprinters.

**Muscle Length-Tension**

- **Shorter (PF)**
- **Longer (DF)**

3. Anderson et al., *J Biomech*, 2007 (right)

**Muscle Length-Tension**

- **Ankle Plantarflexion**

- **Ankle Dorsiflexion**

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Control in Weight-Bearing

FHL has been called the “dancer’s Achilles”

Using eight cadaveric lower legs in weight-bearing relevé...

- FHL tension stabilized the arch, but inverted the foot
- Peroneus + FHL tension stabilized the foot and ankle

Evaluation

Contributors to posterior ankle pain
- Posterior ankle impingement
- Retrocalcaneal bursitis
- FHL tendinopathy, tendinitis, tenosynovitis
- Achilles tendinopathy, tendinitis, tendinosis
- Os trigonum (symptomatic or not)
- Avulsion fracture

Importance of Palpation and Strength Testing

What can ultrasound show us?

What can ultrasound show us?
Our Research

Summary

Traditional Eval +
Palpation of FHL @ sustentaculum tali
Toe curl break test
Assessment in relevant ranges of motion
Midfoot and talocural mobility
Ultrasound — thickening? sliding?
Test “toes-off” — increase FHL? decrease gastrocsoleus?
Test balance in relevant ranges of motion and challenging conditions
Use “Human EMG”

Treatment

• Appropriate range of motion from each joint
  – Don’t forget midfoot contributes ~23% of pointe
• Work in relevant ranges of motion
• Modified heel raises as potentially preventative
  – Limitations to their use as treatment for FHL tendinopathy
• Compare to other muscle coordination altering cues and exercises
• Challenge frontal and transverse plane stability as well
• “Optimization of motion”

REFERENCES

Athletics Meets Aesthetics: Injury Mechanisms and Treatment in Dance and Sport

REFERENCES


Aesthetics meets athletics: Knee

Speaker: Hai-Jung (Steffi) Shih
APTA Combined Section Meeting
Feb 24th, 2018

Disclosures

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Demands on the knees: athletes vs dancer

https://www.youtube.com/watch?v=FMtUqoxfR50
https://www.youtube.com/watch?v=5M20XZ7g

Common knee injuries

• Overuse
  • Patellofemoral pain
  • Patellar tendinopathy
  • Iliotibial band syndrome
  • Infrapatellar bursitis
  • Fat pad impingement
• Traumatic
  • ACL/PCL tears
  • MCL/LCL tears
  • Meniscal tears
  • Cartilage defects

Prevalence

• Knee injuries account for up to 6-36% of injuries in dancers

<table>
<thead>
<tr>
<th>Injury</th>
<th>Dancers</th>
<th>Athletes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patellofemoral pain</td>
<td>29%</td>
<td>25%</td>
</tr>
<tr>
<td>Patellar tendinopathy</td>
<td>42%</td>
<td>14.2%</td>
</tr>
<tr>
<td>ACL injury</td>
<td>0.2-0.4%</td>
<td>1-8%</td>
</tr>
</tbody>
</table>

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Pathomechanics – dynamic valgus

- Associated with traumatic and overuse knee injuries
- Hip
  - Adduction
  - Internal rotation
- Knee
  - Abduction
  - Foot
    - Pronation

Pathomechanics – sagittal plane

Pathomechanics – pelvic drop / trunk lean

Pelvic drop & trunk lean away from stance leg  
↑ knee varus moment

Desired

Pelvic drop & trunk lean towards stance leg  
↑ knee valgus moment

Dancers vs. athletes in landing knee angle

Here is some good news...

Dancers vs. athletes in landing hip moment

Here is some good news...

Dancers vs. athletes in trunk lean
Here is the bad news...

Aesthetic requirements in dance

- 5 jumps/ min * 2 hours = 600 jumps/ performance


Here is the bad news...

Gluteus muscles: Mechanical disadvantage

- Gluteus maximus: prevents dynamic valgus
- Extension
- External rotation
- Abduction (upper fibers)
- Mechanical disadvantage (length tension relationship)

Here is the bad news...

Dance footwear lack arch support

- Pronation of the foot is linked to knee dynamic valgus
- Barefoot dancing
- Ballet, jazz, modern, and character shoes usually emphasize flexibility over support

Here is the bad news...

Character shoes: Shifts demands to the knee

- Character shoes: Shifts demands to the knee

Evaluation – Identify knee valgus in turn out plane (“Hiption”)

- Evaluation – The basics
- Hip range of motion: tibial external rotation compensates for turn out
- Patellar (hyper)mobility
- Arch height

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Evaluation – Functional tasks

Treatment – Gluteal muscles
- Glute & deep hip external rotators activation
- Human EMG: making sure feeling it at the right place

Treatment – Adductors and hamstrings
- Adductors have mechanical advantage to act as extensors in turned out position
- Using adductors and hamstrings to share quadriceps load during plies...
  - Caveat: over-relying on hamstrings vs. gluteal
  - Doesn’t work as well in single leg activities
- Imagery
  - Imagine squeezing your legs together like a jellyfish when coming up from a plie

Treatment – Foot orthosis
- Custom made orthosis worn during the day (not during dance)
  - Decreased pain by 1.9/10 (a variety of symptoms including PFPS)
  - Improvement in ability to dance without symptoms by 4.6/10
- Unloading the tissue throughout the day helps!

Treatment – Taping
- Knee/patellar taping
- Arch support
- Hip external rotation cue

Proprioception and stability
- On different surface / remove vision

https://www.youtube.com/watch?v=ovc4D5pamco
Take home message

- Anterior knee pain and other knee injuries have common pathomechanics
- In non-dance specific activities, dancers may be protected from these pathomechanical patterns
- However, when considering the aesthetic requirements of dance, there may be some disadvantages in lower extremity alignment that predispose dancers to overuse knee injuries
- We need to evaluate and treat dancers in dance-specific positions and activities

Questions & Discussions

This is my thank you dance!

References

- Kulig, K, Oie, Yc, Chang, Yc, Gerrie, Mc. Aches and Pains: Lower Extremity Patterns.

References

Athletics meets aesthetics:

Hip

Pamela Mikkelsen, PT, DPT, OCS
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Division of Biokinesiology and Physical Therapy

Disclosures

• This speaker has no disclosures to report

Dance vs sport

• Hip injuries account for
  • 11-17% of dance injuries
  • 4-6% of sports injuries
• More Common with cutting, pivoting, speed changes

Injuries per 1000 exposure hours % attributed to overuse

<table>
<thead>
<tr>
<th></th>
<th>Injuries per 1000 exposure hours</th>
<th>% attributed to overuse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male hockey players</td>
<td>1.03</td>
<td>17.5</td>
</tr>
<tr>
<td>Female hockey players</td>
<td>0.78</td>
<td>18.4</td>
</tr>
<tr>
<td>Dancers</td>
<td>0.09</td>
<td>85</td>
</tr>
</tbody>
</table>

Common Hip Injuries

• Femoral acetabular impingement (FAI)
• Labral Tears
• Iliopsoas syndrome
• Snapping hip
• Greater trochanteric – pelvic impingement
• Microinstability
• Glute tendon tear
• Ligamentum teres sprains and tears
• Greater trochanteric bursitis

FAI

• CAM, Pincer, or combination
• Deformities vary in reporting from 10-71%
• 68% in hockey players
FAI in Dancers

- Conflicting evidence
  - CAM deformity in Females: 12%; males: 57% of subjects
  - 74.2% of subjects had ≥2 of 6 signs of pincer deformity
  - No difference in LCE angle between ballet vs sporting population
  - One out of 59 female dancers with CAM deformity

CAM Impingement

Labral Lesion Location

- Controls: anterosuperior (2) or anterior (3)
- Dance: anterosuperior (2), superior (1), or posterosuperior (8)

Dance vs Sport

- Controls: anterosuperior (2) or anterior (3)
- Dance: anterosuperior (2), superior (1), or posterosuperior (8)

Extreme ROM

<table>
<thead>
<tr>
<th>Cartilage Lesions</th>
<th>Dancers</th>
<th>Non-dancers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cartilage Lesions</td>
<td>55.9%</td>
<td>21.4%</td>
</tr>
<tr>
<td>Herniation Pits</td>
<td>52.5%</td>
<td>17.9%</td>
</tr>
<tr>
<td>Mean Subluxation distance</td>
<td>2.05 mm</td>
<td>Not Tested</td>
</tr>
</tbody>
</table>
Creating impingement?

- Not the typical FAI morphological deviations
- Perhaps a mechanical cause of “pincher-like” positioning of the hip = tissue stress
- Abnormalities may be problematic sooner
- Dancers without abnormalities can have injuries with repetitive movements

Evaluation

- Hx of DDH, LCP, SCFE
- Pain assessment
  - Where is the pain?
  - When is the pain?
- Hip special tests appropriate?
  - FADIR (anterior hip impingement test)
  - Impingement sign (flexion, IR)
- FABER
- ROM
  - Beighton Score
  - Popliteal angle

Evaluation: DDx

- Lumbar referral
- AVN
- Stress fx
- Nerve entrapment
- Pelvic floor dysfunction

Triple hop for FAI

- Medial triple hop and lateral triple hop tests
  - 3 consecutive hops for distance

<table>
<thead>
<tr>
<th>Distance Traveled (cm)</th>
<th>Healthy Dancers</th>
<th>Painful Dancers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medial hop</td>
<td>410 ± 50</td>
<td>354 ± 43</td>
</tr>
<tr>
<td>Lateral Hop</td>
<td>343 ± 54</td>
<td>294 ± 38</td>
</tr>
</tbody>
</table>

Treatment considerations in Dance

- Extreme ranges of motion (ER, flexion, extension, IR)
- Hypermobility – Joint stability
- Rigid aesthetics
Similarities in treatment

- Understand anatomy and mechanics
- Work within abilities of the athlete
- Work within the context of the movement
- Imagery and external focus
  - Internal focus: malleolus points to the ceiling, short foot and glutal engagement
  - External focus: Stretching like a star, elevating like a balloon
  - Combination: Two legs spiraling out from each other, jump over a puddle... with pelvic initiation at top of jump

Glutes

- Sport and dance
  - Powerful movement generator
  - Eccentric control and dynamic shock absorber
  - Injury prevention with LE alignment
  - Often weak with FAI symptoms
  - Cannot maintain turnout in all dance motions
  - When should they be working?

Deep Hip External Rotators

- Rotator cuff of the hip
  - Piriformis, gemelli, quadratus femoris, obturator internus, obturator externus
  - Maintain a stable instantaneous center of rotation of the femoral head
  - Injury prevention or rehab in sports?

Task: Deep Hip Muscle Activation

- Externally rotate without the glutes
  - Sidelying Clam
  - Human EMG

Task: Deep Hip Muscle Activation

- Prone hip ER/IR, watch glute and hamstring compensation
  - Add resistance band
Task: Deep Hip Muscle Control
- Externally rotate without the glutes
  - Hooklying series

Task: Deep Hip Muscle Strengthening
- Weightbearing
  - Standing body on leg ER

Task: Dance Specific Hip Control
- Control the turnout
  - Plie imagery – feel the bone turn out more and more until you have no other option but to bend the legs
  - Tendu/degage
  - Unstable surfaces for balance training
  - “Do less work”

Task: “Normalize” hip ROM
- Anterior translation of the femur with hip flexion
- Palpate for excessive superficial muscle activation?

Hip Flexion
- Smaller iliopsoas with hip pain
- Excessive use of superficial hip flexors (TFL, rectus femoris) anterior translation
- Deep hip flexors (iliopsoas) have a line of pull closer to the joint center

Hip Flexion - Treatment
- Manual therapy
  - If a dancer is hypermobile, and the muscles are pulling the femur anteriorly, are joint mobs appropriate?
Athletics Meets Aesthetics: Injury Mechanisms and Treatment in Dance and Sport

Task: Activation of Deep Hip Flexors

- Hookingly marching
- Feedback with palpation of the anterior hip
- Cues to feel the "abdominals" pull the leg up
- Like a marionette but the strings are attached near the joint

Task: Control of hip flexors

- Supine developpe series

Final Thoughts

- Dancers move through large ranges of motion that can cause pathology despite no morphological issues
- Motor control and efficiency
- Everybody’s working!

REFERENCES


Athletics Meets Aesthetics:
Pelvic Floor

Brooke Winder, PT, DPT, OCS
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University of Southern California
Division of Biokinesiology
and Physical Therapy

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PELVIC FLOOR DYSFUNCTION: EXAMPLE DIAGNOSES

- Stress and urge urinary incontinence (UI)
- Fecal incontinence
- Urinary frequency or urgency
- Overactive bladder
- Pelvic organ prolapse

Almers et al., Neurourology and Urodynamics, 2010
Thyssen et al., JAMA, 2008

Disclosures

- This speaker has no disclosures to report

PELVIC PAIN

- Pain localized to the pelvis, perineum, anterior abdominal wall at/below the umbilicus, lumbosacral back and/or buttocks, vulva, vagina, or coccyx

Le P and Fitzgerald CM, Phys Med Rehabil Clin N Am, 2017

PELVIC PAIN

- Coccydynia
- Vulvodynia
- Dysmenorrhea
- Dyspareunia
- Painful bladder syndrome
- Pelvic floor tension myalgia
- Pudendal neuralgia
- Myofascial pelvic pain syndrome
- Levator ani syndrome
- Chronic pelvic pain syndrome

Bonder et al., Phys Med Rehabil Clin N Am, 2017
Le P and Fitzgerald CM, Phys Med Rehabil Clin N Am, 2017

PELVIC FLOOR DYSFUNCTION IN DANCERS

- Young, female athletes are at increased risk for
  - Incontinence
  - Pelvic pain
  - Sexual dysfunction
- Symptoms are highly underreported

Non-dance athletes:
- Trampolists
- Gymnasts
- Volleyball players
- Runners
- Triathletes
- Basketball players
- Soccer players

Almers et al., Jour of Ob/Gyn, 2008
De Rosa et al., Current Urology Health, 2002
Vinton et al., J Women Health, 2011

PELVIC FLOOR DYSFUNCTION IN DANCERS

<table>
<thead>
<tr>
<th>SPORT</th>
<th>% Urinary leakage during sport</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gymnastics</td>
<td>56%</td>
</tr>
<tr>
<td>Ballet</td>
<td>43%</td>
</tr>
<tr>
<td>Aerobics</td>
<td>40%</td>
</tr>
<tr>
<td>Badminton</td>
<td>31%</td>
</tr>
<tr>
<td>Volleyball</td>
<td>30%</td>
</tr>
<tr>
<td>Handball</td>
<td>21%</td>
</tr>
<tr>
<td>Basketball</td>
<td>17%</td>
</tr>
</tbody>
</table>

Cross-sectional study of stress urinary incontinence in female athletes, N= 291, Mean age = 22.8 y.o.

Thyssen et al., Int Urogynecol J, 2002

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- Chronic pelvic pain syndrome

Bonder et al., Phys Med Rehabil Clin N Am, 2017
Le P and Fitzgerald CM, Phys Med Rehabil Clin N Am, 2017
ASSOCIATED FACTORS WITH PFD COMMON TO THE DANCE POPULATION

- Low estrogen levels, amenorrhea, female athlete triad\(^1,2\)
- Low Vitamin D status\(^3,4\)
- Low back pain
- Hip joint pathology
- Impact activity: repetitive jumping and landing

4. Badalian and Rosenbaum, Obstetrics & Gynecology, 2010

LOW BACK PAIN: ASSOCIATION WITH PELVIC FLOOR DYSFUNCTION

- Common in dancers; prevalence similar to other elite sports\(^1\)
- Low back pain has high association with urinary incontinence\(^2,3\)
- Low back pain associated with pelvic floor muscle dysfunction\(^4\)

1. Swain et al., Phys Ther in Sport, 2017
3. Eliasson et al., Man Ther, 2008
4. Arab et al., Man Ther, 2010

HIP PATHOLOGY: ASSOCIATION WITH PELVIC FLOOR DYSFUNCTION

- Obturator internus (OI)
- Primary hip rotator
- Direct anatomic relationship to pelvic floor

Hip pathology
Compensatory guarding in pelvic floor
Increased resting state of pelvic floor muscles

RISK FACTORS IN DANCERS: REPETITIVE JUMPS AND LANDINGS

- Dance leaps involve high vertical ground reaction forces (3.5-4.4x body weight)\(^1\)
- Repetitive, abrupt increases in intra-abdominal pressure alters demand on pelvic floor\(^2,3\)
- Pelvic floor (levator ani) EMG activation levels correlate with increased IAP levels and the weight of the viscera\(^4\)

2. Cobb et al., J Surg Res., 2005

RISK FACTORS IN DANCERS: REPETITIVE JUMPS AND LANDINGS

- Repetitive impact and abrupt increases in IAP
- Positive training effect: improves strength and control of pelvic floor muscles
- Persistent overload contributes to tissue damage, weakness

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PELVIC FLOOR IN IMPACT ATHLETES/DANCERS

- Computational modeling study of female pelvic floor and surrounding fascial/visceral structures in jumping:
  - Valsalva caused descent of pelvic floor tissues posterior-inferiorly
  - Box jump/landing caused higher IAP and horizontal compression of bladder against pubic bone

WHAT IF WE NOW ADD ANOTHER DEMAND? TURNOUT AND THE PELVIC FLOOR

Repetitive activation of obturator internus/deep external rotators:

- Altered pelvic floor muscle length-tension relationship
- Potential for pelvic floor shortening, increased muscle resting state, or repetitive use injury?
- Does this further increase the pelvic floor demand in jumps?

DANCER: BIOMECHANICAL CASE STUDY

- 37 y.o. professional dancer with chief complaint of chronic SI/low back pain
- Concurrent symptoms:
  - Painful intercourse
  - Urinary frequency
  - Difficulty initiating urine stream
  - Feeling of incomplete voiding
  - Chronic bladder irritation
  - Constipation/straining with bowel movements

DANCER: BIOMECHANICAL CASE STUDY

- Surface EMG:
  - Gluteus maximus

- Intra-rectal EMG sensor for pelvic floor activation
- Observed pelvic floor activation during several basic dance tasks

DANCER WITH PELVIC FLOOR PAIN

- Basic dance motions assessed:
  - Plies, tendus, degages, battements in parallel and turnout
  - Sautes: Parallel and turnout
DANCER WITH PELVIC FLOOR PAIN

Mean = 216.7%

Mean = 51.4%

R = 0.65

TURNOUT INCREASES PELVIC FLOOR ACTIVATION IN A DANCER WITH PELVIC PAIN

INTERVENTIONS:

- Balance this dancer’s turnout demand with interventions to increase internal rotation and pelvic floor relaxation
- Initial offload pelvic floor by limiting turnout and jumps when possible
- Refer to pelvic floor physical therapist for internal muscle examination!

INTERVENTIONS

Pelvic floor relaxation

- Diaphragmatic breathing
- Child’s pose
- Deep squat
- Modified happy baby

Focus on hip internal rotation and posterior hip mobility:

- Manual therapy to improve hip internal rotation ROM as needed
- Joint mobilization with/without belt, soft tissue/fascial mobilization to gluteus maximus and deep outward rotators
- Patient performs:
  - AROM and strengthening into hip internal rotation
  - Self mobilization to posterior hip (ball, foam roller)
  - Posterior hip stretches

COMPOUNDING THE STRESS FROM ABOVE: ALTERATIONS IN DANCE TECHNIQUE

1. Excessive abdominal wall activation
   - Possible result:
     - Creation of excessive intra-abdominal pressure
     - Facilitates pelvic floor concentric lift without adequate lengthening phase
     - Contribute to abdominal myofascial restrictions and referred pain to pelvic region

2. Breath-holding or non-optimal breathing mechanics
   - Results in:
     - Limited diaphragm and pelvic floor descent
     - Poor intra-abdominal pressure (IAP) regulation

1. Hartmann and Sarton, Best Practice & Research Clinical Obstetrics and Gynaecology, 2014
**INTERVENTIONS: ABDOMINAL WALL MOBILITY**
- Address myofascial restrictions along abdominal wall
  - Can decrease pain referral patterns to pelvis, groin and pelvic floor
  - Decreases fascial pull on pelvic floor region
  - Improve ability to properly recruit abdominal muscles in a balanced manner

**INTERVENTIONS: BREATHING MECHANICS**
- Re-educate proper breathing mechanics:
  - Diaphragmatic breathing and lateral rib expansion
    - May need to improve thoracic mobility to reduce inspiratory position of ribs
  - Manual therapy for rib mobility
  - Self mobilization techniques for ribs and thoracic spine

**INTERVENTIONS: BREATHING MECHANICS**
- Re-educate proper breathing mechanics:
  - Proprioceptive feedback to improve lower lateral rib expansion
    - Theraband or towel roll at lower ribs

**INTERVENTIONS: IMPROVE IAP REGULATION**

**SUGGESTIONS FOR ORTHOPEDIC PT's**
- Include screening questions in intake forms and subjective history
  - Urinary leakage with coughing, sneezing, or activity/exercise?
  - Feeling of difficulty initiating a urine stream?
  - Feeling of incomplete emptying of the bladder?
  - Strong urge to urinate that occurs frequently?
  - Leakage or dribble after emptying your bladder?
  - Constipation/straining with bowel movements?
  - Pain with intercourse? Pain with menstruation?

**QUESTIONNAIRES**
- Pelvic Floor Distress Inventory
- Pelvic Floor Impact Questionnaire—short form 7
- Pelvic Pain and Urgency/Frequency Questionnaire
SOURCES OF PELVIC FLOOR AS A CONTRIBUTING FACTOR

- Yes to screening questions/questionnaires
- Cues for abdominal or pelvic floor recruitment increases back, hip, SI joint or pelvic pain
- Back pain/hip pain worsens cyclically during menstrual cycle
- Patient not responding to back or hip interventions as expected

REFERENCES


DANCERS WITH PELVIC FLOOR DYSFUNCTION

- Include in your differential diagnosis with low back, sacroiliac and hip pain
- Consider the likely relationship between turnout and the demand on pelvic floor
- Understand the demands of jumping on your dancers’ pelvic floors
- Kelagais may not be appropriate in the case of pelvic pain and/or urinary incontinence that results from a hypertonic pelvic floor
- Address breathing and intra-abdominal pressure regulation
- Refer to pelvic floor physical therapist for internal muscle assessment

REFERENCES