# Preventative Treatment of Knee Injury In Early Adolescent Dancers Within the Dance Classroom

Elise Miwa

**INJURY PATTERNS** IN EARLY ADOLESCENT DANCERS

ACCEPTED **CAUSES**

EXISTING **CLINICAL TREATMENTS**

**60% to 90%** of dancers sustain injuries during their careers

**Knee injuries are the most common** dance injury in female dancers ages 8-16

*Steinberg et al., 2013; Phillips & Coetsee, 2009*

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Treatments focused on **flexibility, strength, and proprioceptive control** have been shown to be effective in as few as three weeks

*Phillips & Coetsee, 2009*

# Proposal: Incorporate clinical treatments into the dance classroom to reduce incidence of knee injury

# The Adolescent Growth Spurt

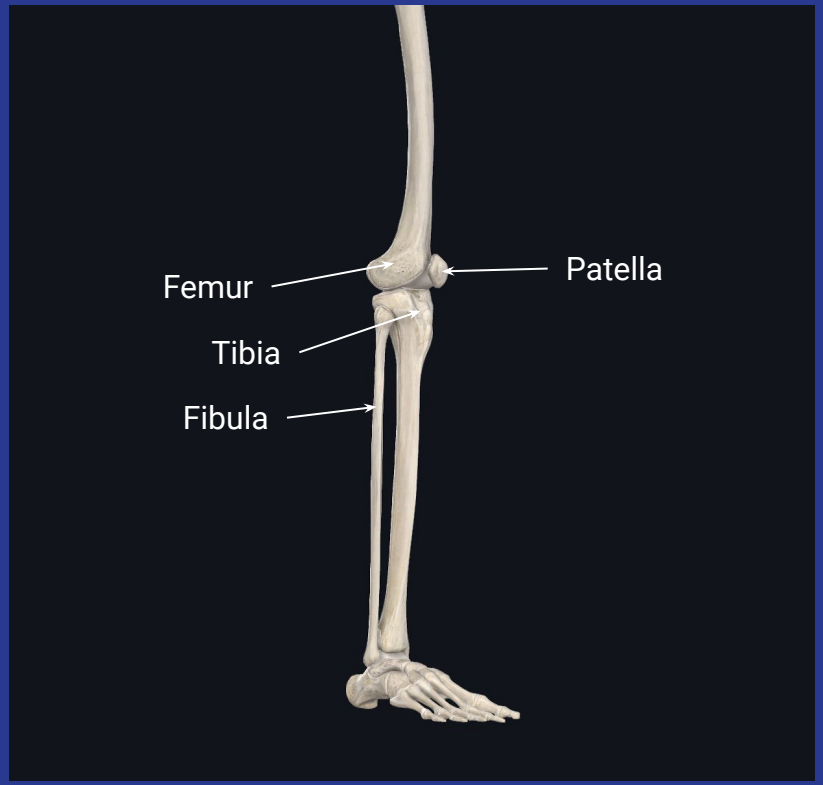
- Occurs between **11-14 years old** and lasts **18-24 months**
  - Generally earlier in girls than boys
- Characterized by a period of **rapid growth** and **increases in or redistribution of weight** due to puberty
- Growth begins from the bones, putting **stress on soft tissues** until they adjust
  - Adjustment of soft tissues lags behind bone growth by up to six months
  - Soft tissue stress leads to **decreases in flexibility, strength, and proprioception**

**Proprioception:**
the awareness of one's own musculoskeletal framework

*IADMS, 2001; Haas, 2018; Kish & Morton, 2019*

# The Knee Joint:
## Mechanics

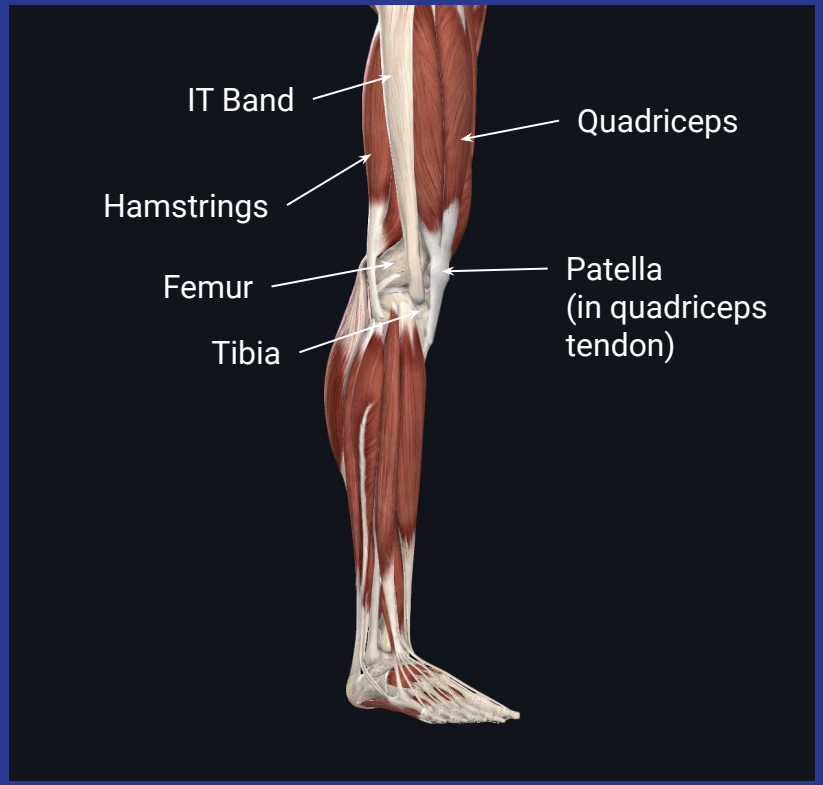
- The distal **femur** and proximal **tibia** form a **modified hinge joint** that flexes, extends (may hyperextend), and rotates slightly at maximal extension
- The **patella** slides over the anterior articular surface of the **femur** forming a **gliding joint** (patellofemoral joint)




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# The Knee Joint:
## Musculature

- Muscles **pull** on bones to create movement at joints
  - **Quadriceps** straighten the knee
  - **Hamstrings** bend the knee
- Muscles are connected to bones by **tendons**
  - **Patella** is embedded in the quadriceps tendon




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# Proposal: Incorporate clinical treatments into the dance classroom to reduce incidence of knee injury

# Treatment Components:

1. Flexibility
2. Strength
3. Proprioception

# Flexibility

**Hamstrings** become tight during growth, putting strain on the patellar tendon at the front of the knee

Treatment:

**Isolate** the hamstring by immobilizing the rest of the body, especially the pelvis

Classroom Goal:

Achieve a passive **90° Straight Leg Raise** without resistance





*Kish & Morton, 2019*

# Strength

**Longer limbs** create a longer lever arm, requiring more strength to control

Treatment:

Low risk **open chain** exercises

- **Adaptation:** The body changes in response to overload if given time
- **Progressive overload:** Muscles must be increasingly challenged

Classroom Goal:

Maintain **strength to weight ratio**





*Kish & Morton, 2019; Grossman, 2015*

# Proprioception

Changes in **height, weight, and proportion**, coupled with **nerve stress**, lead to proprioceptive deficits

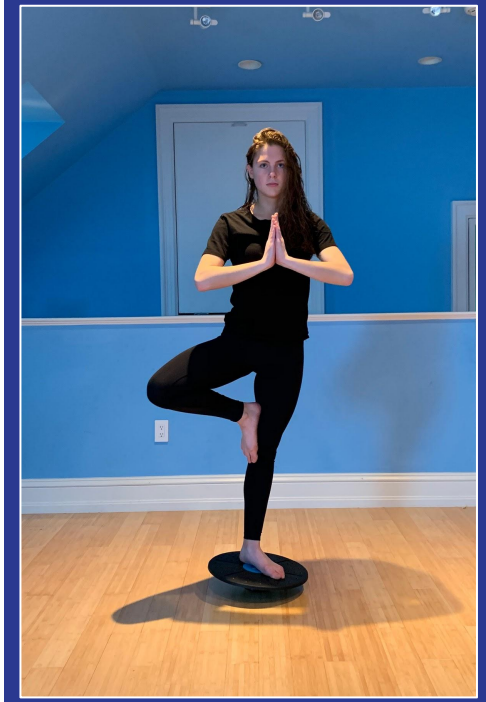
Treatment:

Incorporate **balance challenges**, especially on **unstable surfaces**

- Increase difficulty by **decreasing base of support** and **closing eyes**

Classroom Goal:

Balance on **one foot** for **twenty seconds** with **eyes closed**





*Kish & Morton, 2019; Grossman, 2015*

# Next Steps

- Work with dance studios and teachers to implement these practices in a practical setting
- Collect data on injury rates to determine the efficacy of incorporating these practices in a classroom setting

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