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JOURNAL OF SPORTS SCIENCES
https://doi.org/10.1080/02640414.2020.1727822

Routledge
Taylor & Francis Group

SPORTS MEDICINE AND BIOMECHANICS

Unilateral and bilateral patellofemoral pain in young female dancers: Associated factors

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ABSTRACT

Aiming to evaluate the prevalence of unilateral/bilateral patellofemoral pain (PFP) among young dancers, and to investigate whether different factors are associated with PFP in young dancers, 132 dancers aged 12–14 years were assessed for PFP. Anthropometric parameters, proprioception ability, dynamic postural balance (DPB), and muscle strength were measured. PFP was found in 64.1% of the dancers. No significant differences in the prevalence of dancers with no, unilateral, or bilateral PFP at different ages were found. Significant *age effects* were found for anthropometric and developmental measurements, and for intensity of training. *PFP effect* was found for DPB asymmetry, ankle proprioception, and leg-length %height. A higher hip abductor/adductor ratio was associated with PFP in 14-year-old dancers. Binomial logistic regression showed that increased number of hours per day (h/day) and decreased number of hours per week (h/week), low proprioception scores, greater leg length as %height, and more anterior DPB asymmetry were significant predictors of PFP. *In conclusion*: unilateral/bilateral PFP is common among young dancers. Body morphology, reduced ankle proprioception ability, DPB asymmetry, and increased h/day of practice are associated with PFP. Dance teachers should start monitoring the impact of training and implement injury modification/prevention strategies when their students are at a young age.

ARTICLE HISTORY
Accepted 11 October 2019

KEYWORDS
Knee; morphology; impact of training; proprioception; dynamic postural balance; strength

Introduction

Patellofemoral pain (PFP) is one of the most common injury conditions in young dancers, occurring in up to 55% (Steinberg et al., 2012, 2018), yet there is no specific information regarding the prevalence of unilateral PFP versus bilateral PFP in this population. According to the dance literature, general musculoskeletal injuries among dancers may be related to body morphology, anatomic variants, training load and regimen, and age (Biernacki et al., 2018; Gamboa, Roberts, Maring, & Fergus, 2008; Kenny, Whittaker, & Emery, 2016; Moita, Nunes, Esteves, Oliveira, & Xarez, 2017). However, very little is known about specific PFP-related factors in young dancers (Steinberg et al., 2012, 2018). Although body morphology, strength deficits, reduced postural control, and proprioception deficits have been widely reported to be related to PFP in the general population as well as among non-dancer athletes (Boling et al., 2009; Glaviano & Saliba, 2016; Hart, Barton, Khan, Riel, & Crossley, 2017), these specific factors have rarely been measured in young dancers with PFP.

With reference to body morphology, previous research reported higher body mass index (BMI) as a factor related to PFP in post-menarche dancers (Bowerman, Whatman, Harris, Bradshaw, & Karin, 2014 and Steinberg et al., 2018), reported that differences in growth measured by change in foot length are linked to increased injury risk in elite adolescent ballet dancers. As only a limited number of studies have examined the association between body morphology and PFP, it has been noted that further studies should investigate whether aspects of the dancer's body stereotype, such as having long limbs, are linked to dance injuries (Karpodini, Wyon, Comoutos, & Koutedakis, 2017).

Proprioception deficits were previously reported to be related to PFP in non-dancer athletes and in non-athletic populations (Riva, Bianchi, Rocca, & Mamo, 2016), yet have not been investigated among young dancers. Proprioception, a component of the somatosensory system, is defined as the ability to sense joint position in relation to the rest of the body (Yilmaz Yelvar et al., 2016). This ability has been previously found to be an important component in many sports activities (Sasagawa, Ushiyama, Masani, Kouzaki, & Kanehisa, 2009). Improved proprioceptive ability permits enhanced athletic performance, better movement control, and reduced chance of musculoskeletal injuries (Han, Anson, Waddington, Adams, & Liu, 2015; Riva et al., 2016).

Regarding dynamic postural balance (DPB), a previous study reported that non-dancer females with PFP had decreased ability compared with non-PFP controls (de Oliveira Silva et al., 2016). DPB is the ability to perform a task while maintaining or regaining a stable position. DPB is a significant factor for better dance performance, and, as in many other sports, superior DPB ability is necessary for an athlete to reach the highest competitive level and to avoid lower limb injuries (Han et al., 2015; McHugh, Tyler, Mirabella, Mullaney, & Nicholas, 2007; Schwiertz, Brueckner, Schedler, Kiss, & Muehlbauer, 2019).

Considering muscle strength, previously published studies have reported data where individuals with PFP exhibit different muscle strengths compared with healthy ones (Glaviano & Saliba, 2016; Neal et al., 2018; Rathleff, Rathleff,

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THE Takeaways

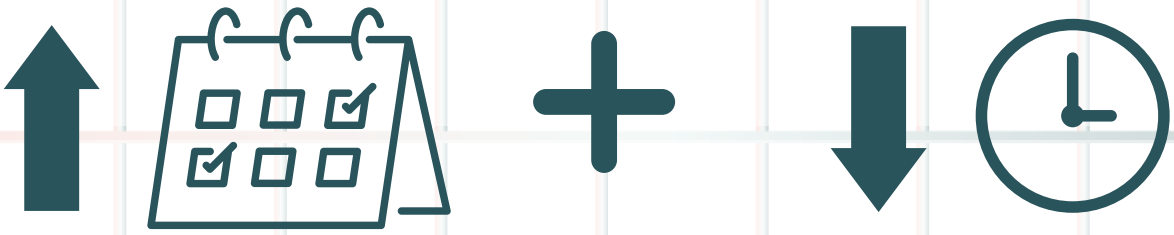
- A cross-sectional study of 132 female dancers ages 12-14
- This study evaluated the prevalence of unilateral and bilateral patellofemoral pain and associated factors related in young dancers
- Published in 2020 by the Journal of Sports Sciences

THE Takeaways

- No significant diff in prevalence of PFP with increased age
- More dancers had PFP in both knees verses just one knee
- Factors examined:
  - Training intensity
  - Leg length
  - Dynamic Postural Balance
  - Proprioception
  - Muscle Strength

THE Takeaways

- Training Intensity
  - Significant increases in hours training per week in current and previous dance year a risk factor
  - Increases in hrs/day w/ decrease in days/week is a risk factor



Therefore, dancers should train fewer hours per day, but more days per week to spread out the impact on the knee over time.

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THE Takeaways

- Leg Length
  - Leg length assymtry not a risk factor factor in this study
  - Greater leg length as a % of height is a risk factor for PFP

Therefore dancers with longer legs compared to overall body height should pay special attention to developing strength and stability.

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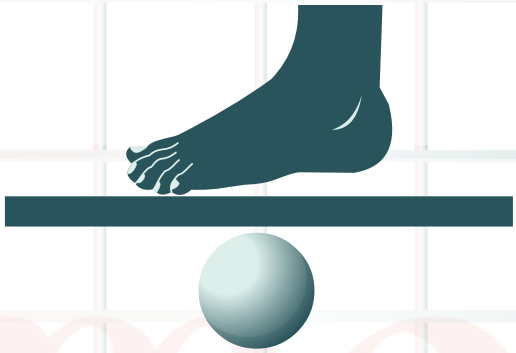
THE Takeaways

- Dynamic Postural Balance
  - The ability to perform a task while maintaining or regaining a stable position
  - Tested using Y Balance Test
  - Asymmetry in anterior to posteromedial direction DPB a risk factor



Therefore dancers, should train on various types of unstable surfaces such as wobble boards.

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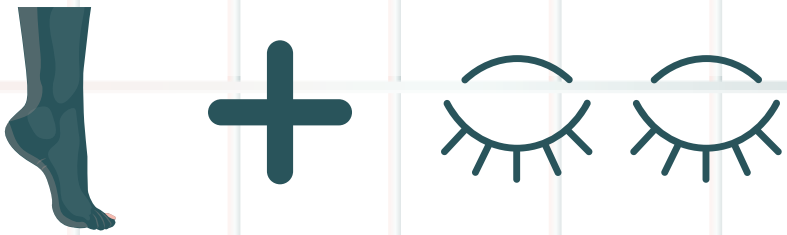
THE Takeaways

- Proprioception
  - The ability to sense joint position in relation to the rest of the body
  - Tested using Active Movement Extent Discrimination Apparatus
  - Decreased ankle proprioception a significant predictor for PFP



Therefore dancers, should add ankle proprioception exercises to their training program from an early age.

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THE Takeaways

- Muscle Strength
  - Increased hip ABD strength compared to hip ADD is a risk factor for PFP
  - Weak hip EXT strength leads to ABD assisting and then over developing
  - No relationship found between ankle or knee strength and PFP

Therefore dancers, should add hip adduction and hip extension to their cross training.

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