Queen Mary University of London

Barts and The London School of Medicine and Dentistry

William Harvey Research Institute

The risk factors for patellar tendinopathy in adolescent athletes: A systematic review

Esther Wright(1), Dylan Morrissey(2), Saira Chaudhry(2)

(1) Barts and The London School of Medicine and Dentistry (2) Centre for Sport and Exercise Medicine, Queen Mary University of London

Introduction

Patellar tendinopathy (PT) is a common overuse injury affecting the patellar tendon; characterised by collagen degeneration with prolific neovascularisation and an absence of inflammatory cell infiltration[1]. Elite athletes in jumping sports are the most frequently affected[2]. Degenerative conditions are associated with older athletes, and until recently it was not thought that PT was prevalent within the adolescent population. A 2011 review examined the risk factors for PT within the adult athletic population[3]. To date, no review has focused exclusively on adolescent athletes, despite a number of recent studies recognising the susceptibility of younger athletes to overuse injuries.

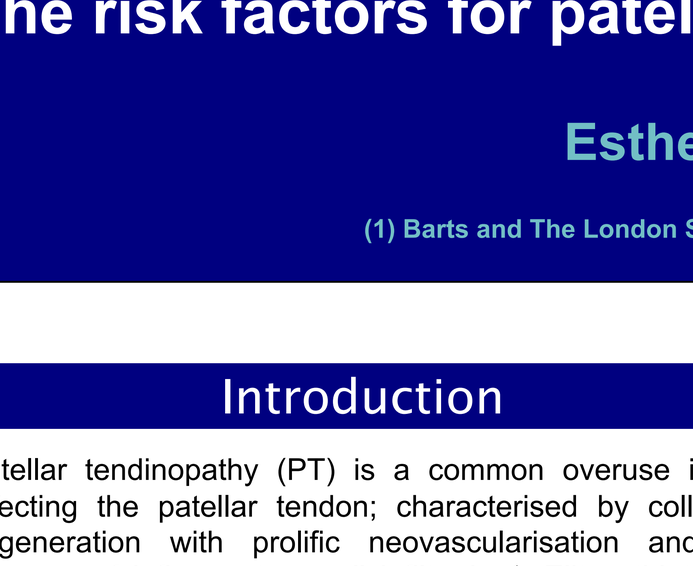

Figure 1: Anatomy of the patellar tendon[4]

Objectives

- To identify the risk factors for PT in adolescent athletes
- To determine whether the risk factor profile for PT is similar between adolescent and adult athletes
- To identify modifiable risk factors which may be reduced by altering training or technique

Methods

The Medline, Pubmed, Scopus, Embase and Web of Science databases were searched from inception until 1st January 2016

Inclusion criteria	Exclusion criteria
Mean age <21	Non- English
Athletic population	Animal studies
Investigated anthropometric, sports related or strength and flexibility related risk factors associated with PT	Review articles, abstracts, letters, books, case reports
Diagnosis of PT using either ultrasound, clinical examination or a combination of both	Papers focusing solely on prevalence

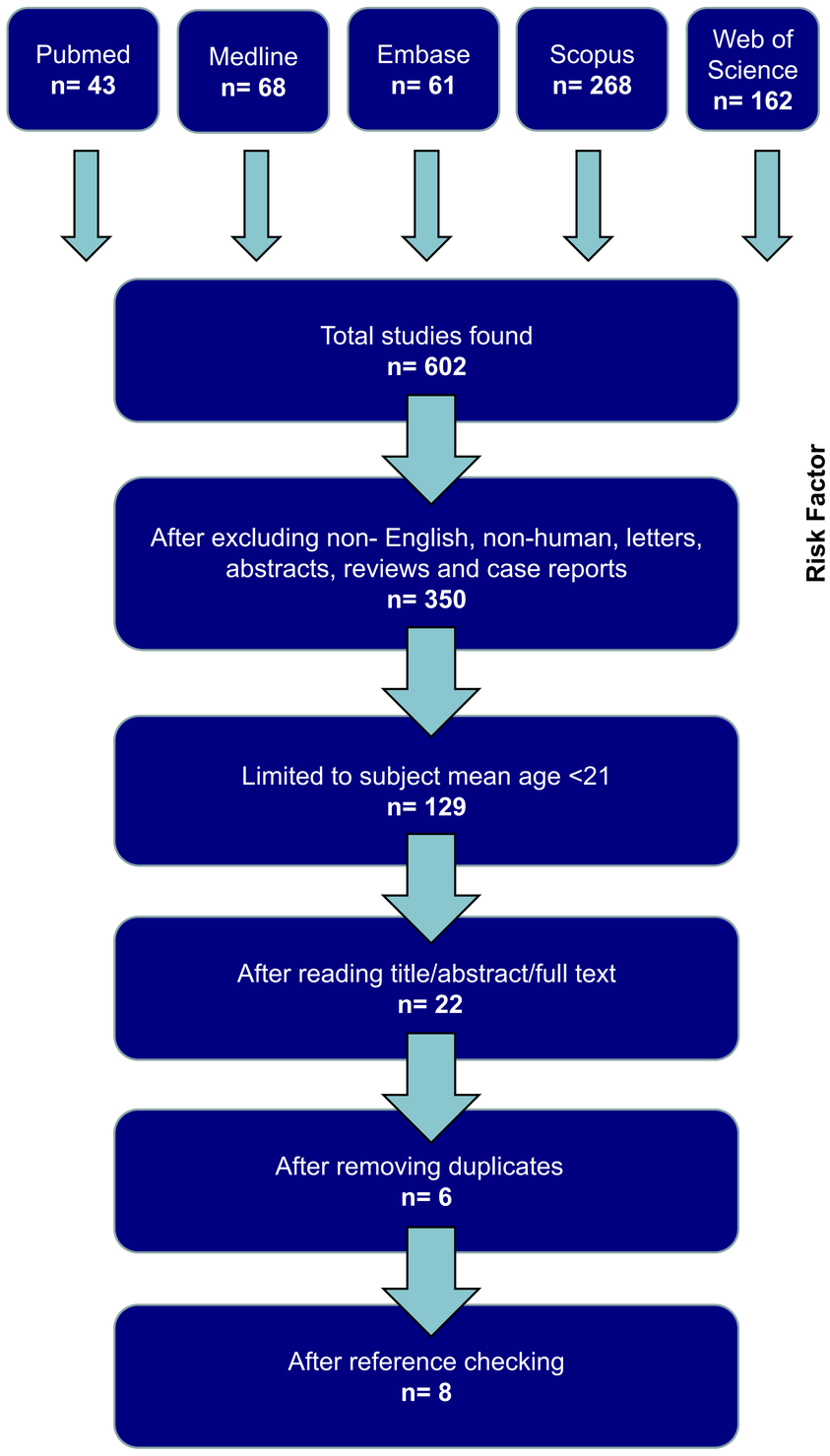

Figure 2: Flowchart of search strategy

Results

Data extraction

- Demographics
- Investigated risk factors
- Anthropometric data
- Ultrasonography results
- Sport related
- Strength/flexibility-related factors

Quality Assessment

- Van der Windt et al. for observational studies[5]
- Adapted to be specific to PT

Strength of evidence assessment

- Strength of evidence for each potential risk factor was determined
- Classified as strong, moderate, some or inconclusive

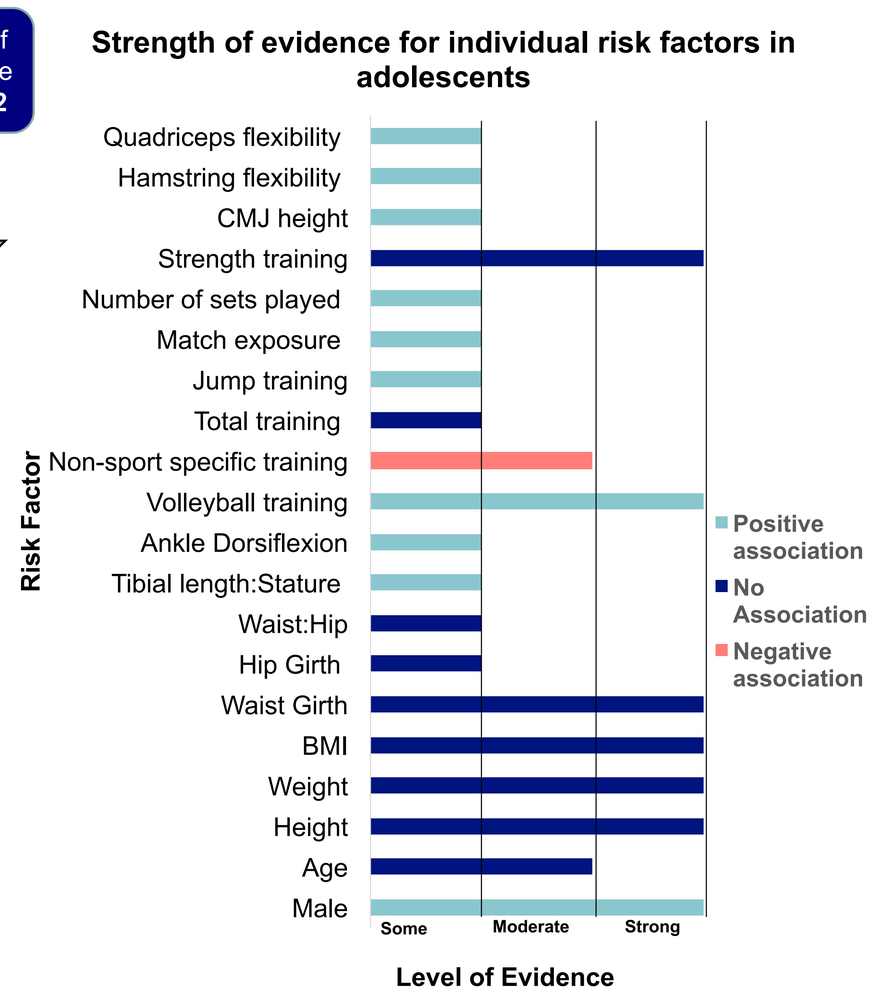

Figure 3: Strength of evidence for risk factors in adolescents

Discussion

- Strong evidence for male risk factor in adolescents, whereas inconclusive for adults. The discrepancy is not explained by body composition
- Evidence for training volume, match exposure and jump training may be explained by the mechanical theory: repetitive submaximal loading of a tendon results in repeated microtrauma[6]
- Body composition and anthropometric risk factors identified for adults but not adolescents. Younger athletes may not yet have reached their mature height and weight
- Single sport athletes may not obtain a wider range of motor skills associated with diverse sporting activities. This results in neuromuscular deficits and subsequently increases PT risk[7]

Limitations

- Limited strong and moderate evidence
- Only observational studies
- Majority of studies focused solely on elite athletes
- Inconsistency in diagnostic methods of PT
- Training data was collected from exercise diaries, which introduces the risk of recall bias

Conclusion

There is some consistency in risk factor profile for PT between adults and adolescents. There is less evidence for anthropometric risk factors amongst adolescents. Young athletes are vulnerable when progressing to senior sport due to an escalation in training hours and increased jump frequency. Further research should be carried out to determine a safe jump frequency, match exposure and training volume for adolescent athletes.

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