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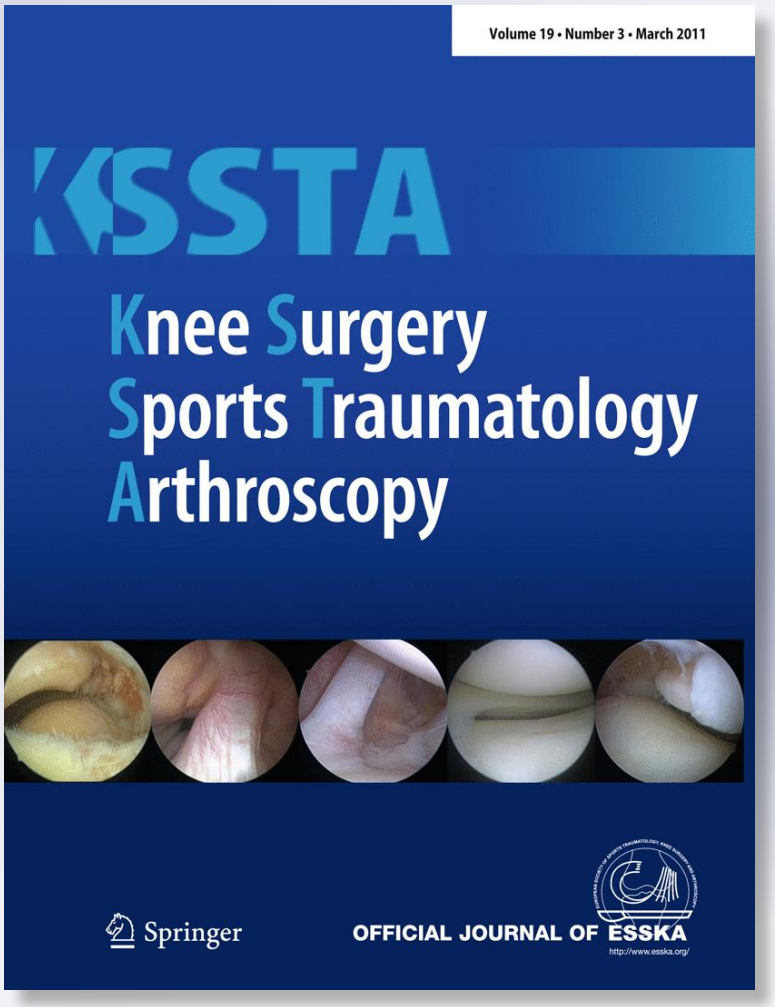

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SPORTS MEDICINE

Patellar tendinopathy in master track and field athletes: influence of impact profile, weight, height, age and gender

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Abstract
Purpose Patellar tendinopathy causes significant morbidity in professional and recreational athletes. Despite the relevance of the problem, its causative factors remain poorly understood. The purpose of this cross-sectional study is to evaluate the influence of age, gender, weight, height and impact profile on developing patellar tendinopathy in master track and field athletes.

Methods During the European Veterans Athletics Championships in Poznań in July 2006, 174 athletes (103 men and 71 women; mean age: 53.8 (SD 11.4) years, range 35–82 years) were evaluated with the VISA-P questionnaire. A fully trained orthopaedic surgeon made a diagnosis of patellar tendinopathy according to clinical criteria.
Results There was no effect of gender upon the presence of patellar tendinopathy (n.s.). No significant track and field specialty effect upon the frequency of patellar tendinopathy was found on the VISA-P questionnaire scores. There was no effect of track and field specialty on the VISA-P score. No evidence of a statistically significant association was found between age and VISA-P score (n.s.). There was no statistically significant difference in either prevalence of patellar tendinopathy or VISA-P score between high-impact and low-impact athletes (n.s.).
Conclusion In master track and field athletes, impact profile, weight, height, age and gender did not exert any influence on developing patellar tendinopathy.

Keywords Patellar tendon · Tendinopathy · Athletes · Aetiology · Sports · Injuries

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Introduction

Tendon injuries account for a substantial proportion of overuse injuries in sports [25, 26, 29]. Patellar tendinopathy occurs in several sports, with jumping athletes being the most susceptible [24]. It can severely limit or even end an athletic career, and recovery from each episode can be prolonged [27].

Tendon problems have been attributed to a variety of intrinsic and extrinsic factors [10]. The aetiology of tendinopathy remains unknown, and the lack of consistency in

the published literature also reflects a lack of understanding of causation [1, 5, 9, 17, 18, 28]. A genetic component has been proposed, but no definitive data are available [11, 12].

Aged tendons show little evidence of degeneration [13, 14, 19, 21–23]. Normal ageing of connective tissue is morphologically different from degeneration. Aged tissue has a low rate of metabolism, decreased elasticity and low tensile strength [23]. These are aetiopathogenetic theories, and a cause–effect relation has not been shown in studies based on hypothesis testing. The present investigation is the second part of a previous investigation into tendinopathy in master track and field athletes [20]. In competing Masters track and field athletes, no influence of age, gender, weight, height or impact profile on the development of Achilles tendinopathy was found [20].

The aim of this cross-sectional study is to evaluate the correlation between patellar tendon problems and participation in master track and field athletics. The null hypothesis is that, in competing master track and field athletes, there is no influence of age, gender, weight, height and impact profile on developing patellar tendon problems.

Materials and methods

Data were obtained during the European Veterans Athletics Championships in Poznań in July 2006. Athletes reported their best discipline, which was further categorized as specialization in walking, in long-distance running events (5,000 and 10,000 m), sprint events (100, 200 and 400 m) and middle distance events (800 and 1,500 m), hurdle events and jumping events (long jump, triple jump, high jump and pole vault). Athletes specialized in walking and long-distance running were pooled into a low-impact profile group, and all others into a high-impact profile group.

A total of 3,008 athletes participated in the Championship, with 2,133 men and 875 women. The participants in this study were recruited with flyers, posters and verbal approach in the various stadia during the Championships.

The study included 174 athletes (103 men and 71 women; mean age: 53.8 (SD 11.4) years, range 35–82 years) (Table 1). A master or veteran athlete in track and field athletics is a person older than 35 years.

Each participant was evaluated with the VISA-P questionnaire. The VISA-P questionnaire [36] was translated into Swedish, Italian, Dutch, German, French, Spanish and Russian by medically qualified bilingual speakers. A fully trained orthopaedic surgeon (GG) made a diagnosis of patellar tendinopathy according to clinical criteria [10]. All the clinical examinations were performed by the same orthopaedic surgeon (GG).

Table 1 Athletes demographics

	Age (years)	Height (cm)	Weight (kg)
Women (means ± SD)	52.6 (9.7)	162.7 (6.4)	57.7 (6.2)
Range	36–73	149.1–179.2	44.4–75.1
Men (means ± SD)	54.6 (12.4)	174.2 (6.8)	69.5 (8.5)
Range	35–82	155.0–189.8	49.4–100

If the score of the VISA-P questionnaire was less than 100, subjects were examined by the fully trained orthopaedic surgeon to ascertain whether a diagnosis of patellar tendinopathy was appropriate. Questionnaires were filled in by the participants themselves with specifically trained research assistants available if the subjects required any help. Height and weight were measured before inclusion into the study.

Both legs were exposed from above the knees, and the patient examined while standing, supine and prone. The knee was inspected for any malalignment, deformity, obvious asymmetry in tendons size, localized thickening and any previous scars. The patellar tendon was palpated for tenderness, heat, thickening, nodule and crepitation.

Once the tester had elicited local tenderness by palpating the tendon at the inferior pole of the patella or in the main body of the tendon with the knee fully extended and the quadriceps relaxed, the knee was flexed to 90 degrees, thus putting the tendon under tension. If tenderness over the lower pole of the patella decreased or disappeared altogether markedly, a diagnosis of patellar tendinopathy was made [10]. Results were classified as tenderness present on flexion or absent.

The Victorian Institute of Sports Assessment—Patellar questionnaire (VISA-P) is an easily self-administered questionnaire used to evaluate symptoms of patellar tendinopathy and their effects on physical activity [36]. The VISA-P score has already been formally cross-culturally adapted to Swedish [6], Italian [30] and Dutch [38]. The questionnaire assesses (a) symptoms, (b) simple tests of function and (c) ability to play sport. Six of the eight questions are scored on a visual analogue scale from 0 to 10 with 10 representing optimal health. The maximal VISA score for an asymptomatic, fully performing individual is 100 points, and the theoretical minimum is 0 points. The VISA scale has excellent short-term test–retest and inter-tester reliability (both, $r > 0.95$) as well as good short-term (1 week) stability ($r = 0.87$). The VISA-P is responsive to changes in clinical conditions [4].

The institutional ethics review board of Manchester Metropolitan University (proposal 2005/11.08) approved the study, and all athletes gave written informed consent to participate in this study.

Statistical analysis

Student's t test was used to detect group differences (gender and impact profile) for normally distributed data (height and weight). The sum scores of the VISA-P questionnaires were compared between groups with either the Mann–Whitney test (in the case of dichotomous categorical variables, e.g. gender, impact profile) or with the Kruskal–Wallis test (for track and field specialty). Associations between these two scores and also between each score and age were investigated by correlation analysis. The VISA-P score was re-coded into a Boolean variable (true/false) to indicate the presence of patellar tendinopathy, a score less than 100 potentially indicated a problem. Associations between gender, impact profile and track and field specialty were tested with the Chi-squared test. Results are given either as mean and either standard deviation (SD) or range. The level of statistical significance was set at $P < 0.05$.

Results

Eighty-one participants were diagnosed with patellar tendinopathy. There was no effect of gender upon the presence of patellar tendinopathy (n.s.) (Table 2).

Although patellar tendinopathy across groups seemed to be slightly more prevalent in the sequence: walkers, long distance runners, middle distance runners, sprinters, hurdlers, jumpers, no significant track and field specialty effect upon the frequency of patellar tendinopathy was found on the VISA-P questionnaire scores (n.s.). Equally, there was no effect of track and field specialty on the VISA-P score (n.s.).

There was no evidence of a statistically significant association between age and VISA-P score (n.s.) (Fig. 1).

There was no statistically significant difference in either prevalence of patellar tendinopathy or VISA-P score between high-impact and low-impact athletes (n.s.) (Table 3).

Finally, no differences were found in age, weight and height between athletes who did or did not suffer from patellar tendinopathy.

Table 2 Gender comparison

	VISA-P		
	N	Score < 100	Score
Men	103	64 (55.7%)	91.0 (51–100)
Women	71	38 (64.4%)	90.6 (49–100)
All	174	102 (58.6%)	90.8 (49–100)

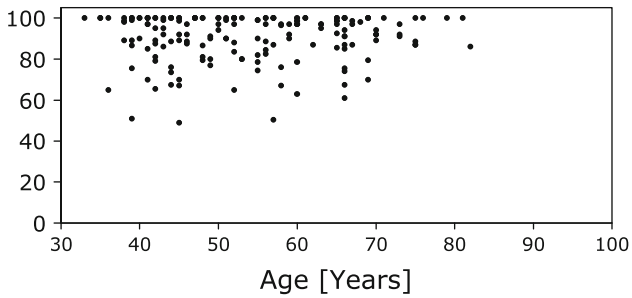

Fig. 1 Plot of age versus VISA-P score. No significant correlation was found. The visual impression might suggest a tendency towards less depressed scores at older ages

Table 3 Age, weight and height for the two groups (with and without patellar tendinopathy) and associated P values of the comparisons

	Age (years)	Weight (kg)	Height (cm)
Athletes with patellar tendon pain	53.3 (11.0)	65.7 (10.3)	168.9 (8.3)
Athletes without patellar tendon pain	54.4 (11.8)	63.8 (8.8)	170.0 (9.0)
P values	0.52	0.18	0.42

Values are given as mean and their standard deviation

Discussion

The most important finding of the present study is that impact profile, weight, height, age and gender did not influence the development of patellar tendon problems in master track and field athletes. The null hypothesis that, in competing master track and field athletes, there is no influence of age, gender, weight, height and impact profile on developing patellar tendon problems is therefore accepted.

One of the strengths of the present study is the use of a validated questionnaire (VISA-P) to evaluate patellar tendon problems [36]. On the other hand, the division into athletic categories made in this paper is by no means exclusive. Many athletes train and compete in more than one discipline. However, most athletes focus their training for and compete in one or very few, usually related disciplines. Moreover, there is 95% concordance between the self-rated best event and the event with greatest age-graded performance [37], underlining the athletes' inclination to specialize. Therefore, the categorization of the different athletic disciplines as performed in the current analysis probably is a fair reflection of the different athletic profiles with regard to the relative contribution of impact forces during training and competition, but it may underestimate these exercise-specific aspects of athletic training and competition.

Another limitation of this study is that no information on the medication taken by the athletes that may have influence on the local tendon as of the patella tendon (e.g. nonsteroidal anti-inflammatory drugs, steroids) was available. However, there are more than 20 countries in Europe, and more than 30 different languages spoken. Drugs have a different trade name in different European countries, and some drugs may be licensed in only some of these countries. It would have been unduly difficult to analyse the information gathered.

In the present study, close to 50% of the participants had evidence of patellar tendinopathy. Athletes taking part in a given track or field speciality were not presenting more frequently with patellar tendinopathy. In a prospective study of change in patellar tendon abnormality over a volleyball season [31], changes in tendon abnormality and pain did not appear to be entirely dependent upon load.

Gender has been indicated as an important factor in developing tendinopathy, and women seem to experience less patellar tendinopathy than men [2, 3]. However, in the present study, an association between gender and development of patellar tendinopathy was not found.

Age is another factor that seems to predispose to tendon problems, and the prevalence of tendon ailments seems to increase with age in the general population [24]. However, it is important to discriminate between increasing age leading to (causing) intra-tendinous changes, and increasing age predisposing to tendinopathy. There is good evidence that tendons do not degenerate with age as such, but a reduction in proteoglycans and an increase in crosslinks as a tendon ages make tendons stiffer and less capable of tolerating load [13, 14, 19, 21–23]. Thus, older people exposed to only moderate tendon loads should not necessarily have an increased risk of tendinopathy.

Body composition has recently been linked to tendinopathy; a greater waist circumference has been shown to increase the prevalence of patellar tendinopathy [32]. In addition, other studies suggest that both upper limb and other lower limb tendinopathies increase when adipose tissue levels increase [7, 8]. Interestingly, master athletes seem to maintain their body composition throughout their life span at least as long as they train and compete [33]. Also, a correlation between higher fasting plasma glucose levels within the normoglycaemic range and rotator cuff tears has been found [15], but not between rotator cuff tears and lipids levels [16]. Again, master athletes have been reported to maintain low to normal fasting glucose levels and lipid levels at older age [34, 35]. It is therefore possible that metabolic alterations, as reflected by blood glucose and lipid levels and by body composition, rather than age or gender per se, engender a risk for patellar tendinopathy. Finally, this study did not reveal any association between height or weight and patellar tendinopathy.

Conclusion

In the present study on study of master track and field athletes, no influence of impact profile, weight, height, age and gender on developing patellar tendon problems was detected. Additional research is required to improve our understanding of the causative factors for patellar tendon problems in ageing athletes.

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Conflict of interest None declared.

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