



ISAKOS
CONGRESS
2023



Boston
Massachusetts
June 18–June 21

Welcome

isakos.com/2023 • [#ISAKOS2023](https://twitter.com/ISAKOS2023)



2023



ISAKOS
CONGRESS
2023



Boston
Massachusetts
June 18–June 21

Skating position = pain in the knee joint?

Is there a relationship between muscle strength imbalance and the occurrence of a "jumper's knee" in professional speed skaters?

Natalia Mrozińska, MSc





ISAKOS
CONGRESS
2023



Boston
Massachusetts
June 18–June 21

Author's affiliation and conflicts of interest:

**Natalia Mrozińska,
MSc**

**Carolina Medical
Center, Warsaw,
Poland**

*I have no financial
conflicts to disclose.*



INTRODUCTION

- Speed skating is a sport requiring movement in a highly specific skating position.
- Most work is done by quadriceps and gluteus medius muscles, while the posterior leg muscles are far less involved.
- The correlation of the overloading the anterior thigh muscles during repetitive physical activity has been described and so has patellar tendon enthesopathy as being characteristic ailment of speed skaters.



ISAKOS
CONGRESS
2023



Boston
Massachusetts
June 18–June 21



OBJECTIVE

To assess the correlation between the ratio of the muscle torque of the knee flexors to the extensors and the occurrence of patellar tendon enthesopathy combined with pain in the anterior knee compartment.

To evaluate the impact of corrective training aimed at strengthening the flexor muscles of the knee joint on the reduction of these symptoms.



MATERIAL

30 competitors of the national speed skating team (14 females, 16 males), divided into the study and control group based on the ultrasound examination and pain assessment (VAS scale).

The study group included 14 players (mean age 26.4 ± 6.8 years, height 175 ± 7.5 cm, weight 82 ± 5.9 kg) diagnosed with a chronic patellar tendon enthesopathy on ultrasound examination with pain above 3 on the VAS scale.

The control group consisted of the remaining 16 competitors not presenting with enthesopathy and related symptoms (mean age 25.1 ± 7.5 years, height 176 ± 6.8 cm, weight 79 ± 6.7 kg).



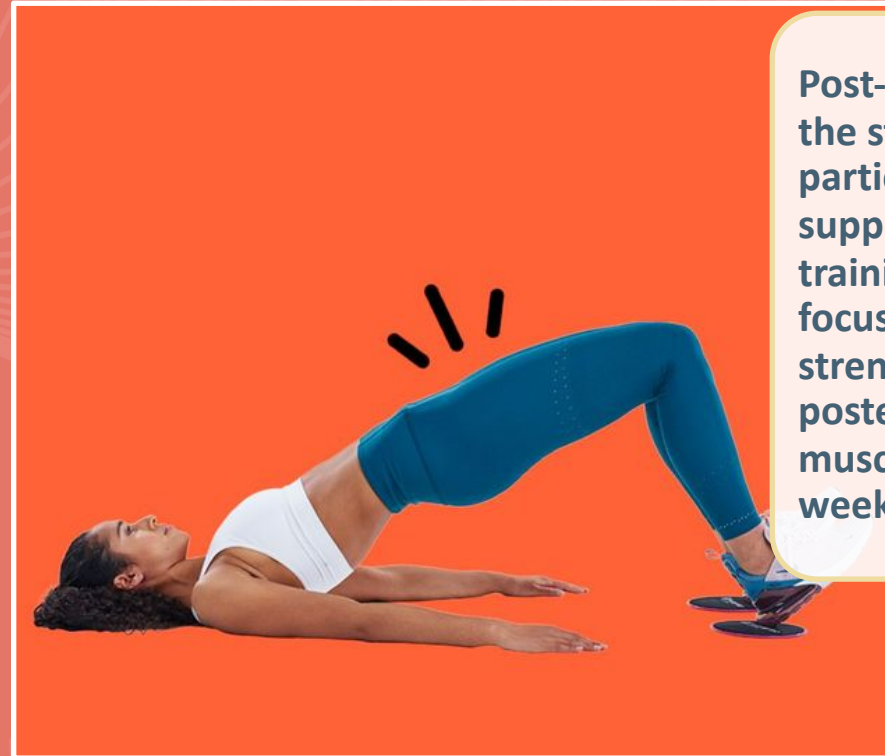
METHODS

Control measures were taken after 6 weeks



The measurements of the muscle torque were done using the HUMAC NORM device during isometric contractions of the knee flexors and extensors, the ratio of the flexors to extensors torque was also calculated.

Gathered data was statistically analysed using the T-student, Mann-Whitney U and Pearson correlation tests



Post-measurements, the study group participated in supplementary training sessions focused on strengthening the posterior thigh muscles (thrice a week).



ISAKOS
CONGRESS
2023



Boston
Massachusetts
June 18–June 21

RESULTS

The analysis of the mean muscle torque values showed a statistically significant difference in the ratio of the knee extensors to flexors in both groups during the entry measurements with the flexors been the weaker muscle group



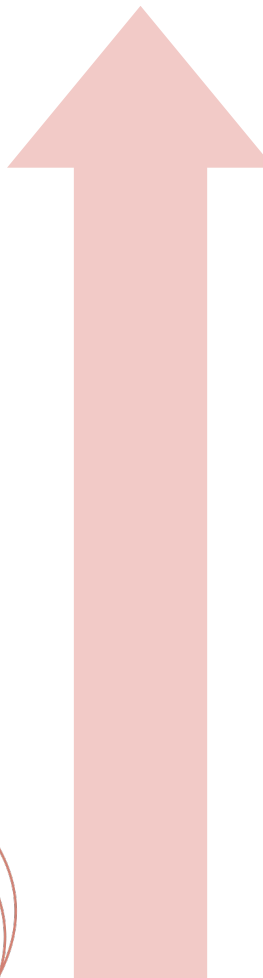
Study group:
right flexors/extensors=0,38,
left flexors/extensors= 0,47

Control group:
right flexors/extensors =0,59,
left flexors/extensors=0,60;

Right
p=0,017

Left
p=0,036

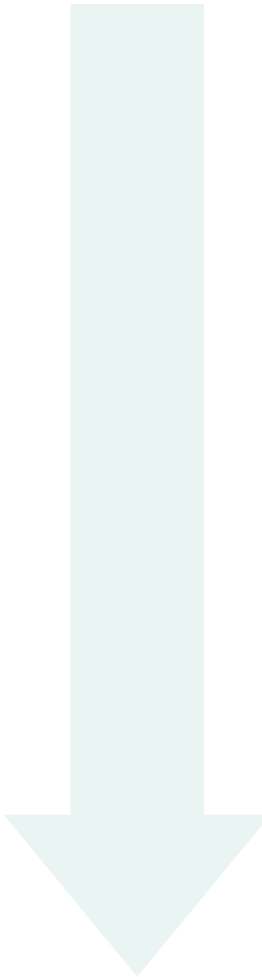
RESULTS



The muscle imbalance between the flexors and extensors was significantly lower in the study group after the 6-week complementary training protocol, whereas the controls' results did not significantly change

(before $182 \pm 3,4$; after $242 \pm 2,8$; $p=0,028$)

The level of pain did significantly decrease in the study group while it remained on the same level in the control group
($p=0,041$)



ISAKOS
CONGRESS
2023



Boston
Massachusetts
June 18–June 21

CONCLUSION

Professional speed skaters present with the reduced muscle torque ratio of the knee flexors to extensors which is associated with the occurrence of patellar tendon enthesopathy, and pain in the anterior knee compartment.

Regular complementary training protocol focusing on strengthening and elasticising the posterior thigh muscles reduces the muscle imbalance between the anterior and posterior muscles limiting the chances of developing or exacerbating pain.



Noordhof D, Hoozemans M, Foster C, Koning J. *Changes in Speed Skating Velocity in Relation to Push-Off Effectiveness*. International Journal of Sports Physiology and Performance 2013; 13(3)

Krumm D, Kuske N, Neubert M, Buder J. *Determining push-off forces in speed skating imitation drills*. Sports Engineering 2021; 24(1):25

Bjerkestrans L, Engebretsen, Bahr R. *Prevalence of Jumper's Knee Among Elite Athletes From Different Sports. A Cross-sectional Study*. The American Journal of Sports Medicine 2005; 33(4):561-7