

# Biomechanics – Static measures

## Major Findings

With Patella Pro:

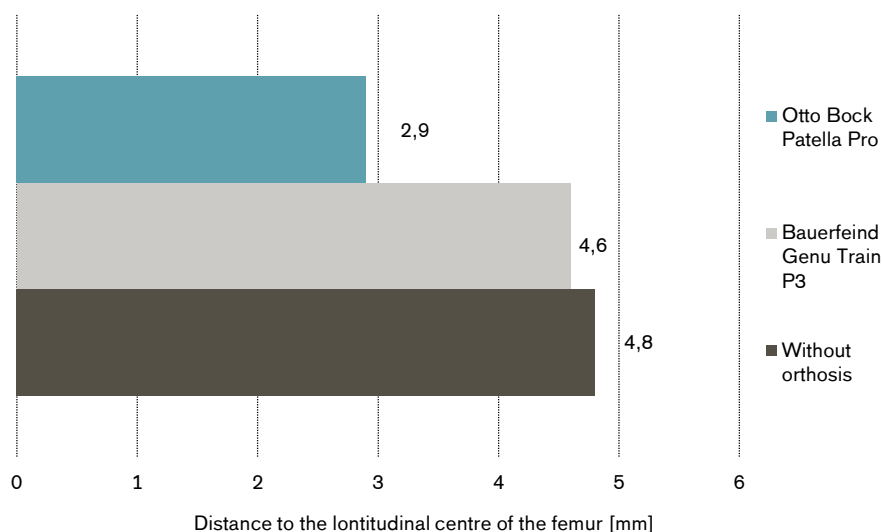
→ **The patella was recentered at 0°, 15° and 30° knee flexion**

Lower position

Medialization (up to 15.6%)

Reduced tilt (up to 5° reduction)

### Reduced lateralisation with Patella Pro



Brüggemann et al., 2010

## Clinical Relevance

Patients with Patellofemoral Pain Syndrome (PFPS) suffer from retro- and/or peripatellar pain, which worsens during activities involving heavy use of the patellofemoral joint – such as walking, running, climbing stairs, squatting and prolonged sitting. It is generally caused by a functional misalignment whenever the knee joint assumes a valgus position due to inner rotation of femur and tibia. This results in a decentralisation of the patella. (Rembitzki et al., 2013)

An instability of the patella occurs most often when the knee is between 0-30° flexion and happens because the patella is not fully engaged into the patellar groove. (Zaffagnini et al., 2010)

The Patella Pro recentering orthosis aims to keep the patella in the correct position within the entire flexion range.

## Summary

Analyses with MRI and video fluoroscopy have shown that the decentralisation of the patella may be corrected with Patella Pro.

Brüggemann et al. (2010) found that patients who extended their knees from a 45° flexion angle under full or partial weight loading demonstrated a significantly reduced lateralization of the patella when wearing Patella Pro. The lateralization was reduced by 40% compared to the unbraced condition and by 37% compared to the Bauerfeind Genu Train P3 orthosis (9.5 times greater medialization with Patella Pro).

These findings have been confirmed by Becher et al. (2015) who demonstrated that the patella was significantly medialized in a 0°, 15° and 30° knee flexion angle. Additionally they found, that the patella also was less tilted and in a more distal (lower) position when wearing Patella Pro.

The general function principle of the Patella Pro was investigated by Brüggeman et al. (2010) on cadaver legs. They moved the knee joint with pneumatic actuators and measured the lateralisation of the patella via Vicon motion analysis. Although the results failed to reach a statistical significance due to a high standard deviation of the measured values it could be shown that the patella was medialised by 1.04 – 1.66 mm.

A clinical study that investigates the effectiveness of Patella Pro combined with physical therapy is currently running and assesses the patients' pain, knee function and the self-reported perception of recovery over a follow-up period of one year. (Petersen et al., 2014)

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### References of summarized studies

Becher C, Schumacher T, Fleischer B, Ettinger M, Smith T. & Ostermeier S. (2015). The effects of a dynamic patellar realignment brace on disease determinants for patellofemoral instability in the upright weight-bearing condition. *Journal of Orthopaedic Surgery and Research*, 10:126.

Brüggemann G-P, Heinrich K, Liebau C, Ellermann A, Potthast W, & Rembitzi I. (2010). Patella-Re-Zentrierungs-Orthese Patella Pro Biomechanische Evaluation: ex vivo und in vivo. *Proceedings of the ISPO World Congress, Leipzig*.

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### Other References

Petersen, W., Ellermann, A., Rembitzki, I. V., Scheffler, S., Herbort, M., Sprenger, F. S., . . . Liebau, C. (2014). The Patella Pro study - effect of a knee brace on patellofemoral pain syndrome: design of a randomized clinical trial (DRKS-ID:DRKS00003291). *BMC musculoskeletal disorders*, 15, 200. doi:10.1186/1471-2474-15-200

Rembitzki, I. V., Liebau, C., & Petersen, W. (2013). Patellofemoral Pain Syndrome: A multimodal therapeutic approach. *medicalsportsnetwork*, 01.13.

Zaffagnini, S., Dejour, D., & Arendt, E. A. (2010). *Patellofemoral pain, instability, and arthritis: Clinical presentation, imaging, and treatment*. Berlin, London: Springer.

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