Does the maximum isometric force in knee extension differ between the dominant and non-dominant leg in female semiprofessional soccer players?

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Summary

This study investigates muscular asymmetry in female soccer players. A sample of 14 unprofessional female soccer players was analyzed to assess isometric knee extension force in both dominant and non-dominant legs. The results indicated that the dominant leg showed higher force values. These findings are pertinent to rehabilitation and injury prevention in soccer. Nonetheless, the study highlights the necessity for additional research, given that existing literature predominantly focuses on male athletes, leading to a lack of appropriate reference benchmarks for females.

Introduction

Soccer is one of the most popular sports worldwide, exhibiting a highly specific requirement profile [1]. Soccer players develop a dominant leg, which is used for kicking the ball and jumping. The quadriceps femoris, the main muscle for knee extension, is more voluminous and stronger on the dominant side due to the additional strain of extending the knee explosively and powerfully [2]. Previous research has predominantly focused on male soccer players, confirming higher isometric force in the dominant leg [3]. Therefore, this study aimed to elucidate these circumstances in semi-professional female soccer players. We assumed that the dominant leg achieves greater isometric force values in knee extension compared to the non-dominant leg.

Methods

Fourteen semi-professional women (20.86 ± 4.79 years, 166.36 ± 7.46 cm, 61.98 ± 6.95 kg, 14.36 ± 4.18 years of competitive experience) were examined. Knee extension isometric force tests of both legs (randomized) were conducted once a week for seven weeks. Participants sat with a knee joint angle of 90° (figure 1), whereas each of three trials (averaged later) lasted 3-5 s. During the measurement maximum isometric force in knee extension was calculated using a force sensor (in-house construction, sampling rate 1000 Hz, Germany) Statistical analyses of the data were carried out via R (α=0.05).

Figure 1: Illustration of the setup

Results and Discussion

A higher knee extension isometric force for the dominant compared to the non-dominant limb was descriptively evident (in five of seven weeks). From these, weeks three and four reached significance ($p < 0.05$, see figure 2). Hence, for that time, our data seem to confirm the patterns observed in the existing literature [2]. The participants from our study were semi-professional, with reduced or limited performance and conditions standardizations. This might explain why it was not possible to identify more profound differences.

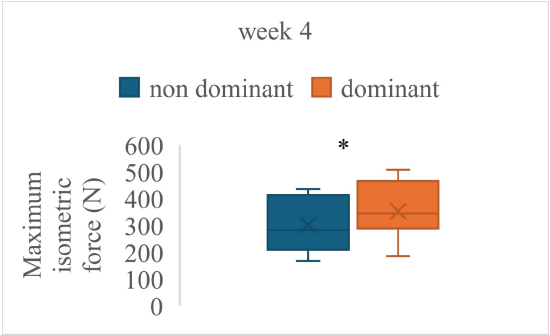

Figure 2: Boxplots comparing maximum isometric force in knee extension (N) for week four. Crosses: mean, horizontal lines: median. *Significant differences: p=0.006.

The development of a dominant knee extension can be physiologically attributed to the increased loading associated with kicking and jumping, which need a powerful knee extension, initiated by the quadriceps femoris [2]. However, since a minimum level of force is essential for success in soccer [4], it could be important to have a general overview about force values in soccer.

Conclusion

Our study implemented semi-professional female soccer players and seems to confirm a higher knee extension isometric force of the dominant leg. These findings align with the existing literature involving male soccer players, suggesting optimization processes in terms of sports-related performance as well as prevention and rehabilitation of injuries [4].

References

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