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The characteristics of lower limb muscle strength in elite Japanese athletes: focusing on the difference in sports type and competition season

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## INTRODUCTION:

The competition and training environment varies depending on the competition season, i.e., summer or winter, not to mention that it varies depending on sports type. Therefore, physical characteristics of elite athletes are considered to be affected by the competition season as well as the sports. Previous studies have suggested that lower limb muscle strength is an important factor in a variety of sporting activities (1). There have been several reports that have examined lower limb muscle strength for different competitive events, but not in terms of the competition season and sports type. This study aimed at investigating lower limb muscle strength in elite Japanese athletes with a focus on the sports type and competition season.

## METHODS:

Elite Japanese male athletes of various competition events were involved in this study (N=1364). They were divided into 5 categories of sports type (2, 3) (a. SPRINT/POWER, b. ENDURANCE, c. ARTISTIC, d. BALLGAME, e. OTHER) and also into 2 competition seasons (Summer or Winter). Isokinetic knee extension and flexion strength tests were conducted at the angular velocities of 60 and 180 deg/s. The peak extension and flexion torque (PT) and those normalized to their body weight (PT/BW) were extracted from each velocity condition. Differences in PT and PT/BW of both knee extension and flexion at each angular velocity among the categories were tested by a two-way ANOVA (5 sports types  $\times$  2 seasons). Statistical significance was set at  $p < 0.05$ .

## RESULTS:

In 60 deg/s knee extension, significant main effects of the sports type and season were found, without any interaction. Winter season athletes showed significantly higher PT/BW than summer season athletes. Post-hoc multiple comparison revealed that PT/BW in SPRINT/POWER was significantly higher than OTHER. On the other hand, significant interactions were found between the sports type and season for PT/BW in 180 deg/s knee extension, and 60 deg/s and 180 deg/s knee flexion. In 180 deg/s knee extension, there were significant differences between Summer (S-) and Winter (W-) in PT/BW of ENDURANCE (S-ENDURANCE  $<$  W-ENDURANCE) and OTHER (S-OTHER  $<$  W-OTHER). Significant differences were also found between the seasons in PT/BW of 60 deg/s knee flexion for ENDURANCE (S-ENDURANCE  $<$  W-ENDURANCE) and BALLGAME (S-BALLGAME  $>$  W-BALLGAME) and in PT/BW of 180deg/s knee flexion for SPRINT/POWER (S-SPRINT/POWER  $>$  W-SPRINT/POWER), ENDURANCE (S-ENDURANCE  $<$  W-ENDURANCE) and BALLGAME (S-BALLGAME  $>$  W-BALLGAME).

## CONCLUSION:

Our results suggest that not simply the sports type but also the season of them affect the lower limb muscle strength of elite athletes substantially. Seasonal differences may be due to the season-specific feature in sporting movement, e.g., forward-bent posture and tonic muscle contraction in skiing and skating.

## REFERENCES:

- 1) Alexander, Canadian Journal of Sport Sciences, 1989
- 2) Gullich & Emrich, European Journal of Sport Science, 2014
- 3) Gastin, Sports Medicine, 2001

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