The Relationship between Common Anthropometric Measurements and Isokinetic Strength in Men’s College Soccer Team

Shawn D. Felton, Paul A. Burkett, Mitchell L. Cordova, FACSM

Sports Medicine Research Laboratory, Department of Rehabilitation Sciences, Florida Gulf Coast University, Fort Myers, FL USA

Abstract

The use of isokinetic testing has been widely utilized by clinicians to evaluate lower extremity strength. Prior research has demonstrated its efficacy and clinical evaluation of musculoskeletal performance. Prior research has also investigated the relationship of anthropometric measurements such as BMI and body fat percentage in determining strength output within the athletic population. However, the relationship between common anthropometric and isokinetic strength measures in men’s collegiate soccer has not been previously reported. The purpose of this study was to investigate the relationship between common anthropometric variables and average torque production of the knee extensors measured by isokinetic testing at three angular velocities in a men’s collegiate soccer team. METHODS: Fifteen healthy male collegiate soccer athletes (mean: age 19.80, HT 178 cm ± 8.23 cm, mass 74.50kg ± 6.67 kg) volunteered for this study. Anthropometric measurements and isokinetic torque were measured at 60°/sec, 180°/sec and 300°/sec. Significant relationships were also found between anthropometric measurements and men’s basketball athletes’ isokinetic torque were not significant for prediction of angular velocity. Previous research has demonstrated the efficacy and reliability of common anthropometric measurements such as BMI and body fat percentage in determining strength output with the nature of the data set. Therefore, in a prior study conducted by the authors no correlation was measured to the nearest 0.1 cm with participants barefoot using a wall-mounted stadiometer (Heighthonometer, QuickMedical, Issaquah, USA). Body mass index (BMI, kg/m²) and lean body mass index (LBMI, kg/m²) were calculated. The athletes participated in a lower extremity warm-up and then isokinetic strength of knee flexion and extension was measured through three angular velocities of 60°, 180°, and 300°/sec. RESULTS: The inconsistent findings concerning the relationship between common anthropometric and isokinetic measurements such as BMI and body fat percentage predicted isokinetic average peak torque at 300°/sec. The results of the regression indicated the three predictors (Lean Mass, LBMI, & Body Fat) explained 64.6% of the variance (R² = .646, F(3, 11) = 15.00, P < .05). Table 3. It was found that Lean Mass significantly predicted 180°/sec average peak torque (β = .51, P = .027), as did % Body Fat (β = .262, P = .041). Hierarchical linear regression analysis was used to test if anthropometric measurements predicted isokinetic average peak torque at 300°/sec. The results of the regression indicated the three predictors (Lean Mass, LBMI, & Body Fat) explained 75.6% of the variance (R² = .755, F(3,11) = 11.349, P < .001). Table 4. It was found that Lean Mass significantly predicted 300°/sec average peak torque (β = .51, P = .004), as did % Body Fat (β = .179, P = .038). A significant inverse correlation between body fat and peak torque produced at 180° and 300°/sec ranged from (.547 to -.692 P < .05) and significant positive correlation between lean mass and average peak torque at 180° and 300°/sec was found (r = .509 to .676 P < -.05). CONCLUSION: The inconsistent findings concerning the relationship between common anthropometric measurements and isokinetic strength measures in men’s collegiate soccer team. This group went on to win the conference regular season championship, suggesting that the subjects were highly skilled athletes in their sport. A previous study found body mass and percentage of body fat among variables that explained the variance in isokinetic strength for both knee extensors and flexors in young male competitive soccer players aged 10 to 17 years. Fat mass free has been reported to be related to anaerobic power in elite young male wrestlers. This study supported the percent body fat and lean body mass as predictors of isokinetic strength in college aged athletes who are highly skilled athletes in their sport.

In conclusion, the results suggest that lean body mass and body fat percentage may be predictors of isokinetic knee muscle strength at angular velocities of 180°/sec and 300°/sec in highly skilled men’s intercollegiate soccer athletes.

Methods

Subjects: Fifteen healthy male collegiate soccer athletes (mean: age 19.80, HT 178 cm ± 8.23 cm, mass 74.50kg ± 6.67 kg) volunteered for this study. Anthropometric measurements and isokinetic torque were measured at 60°/sec, 180°/sec and 300°/sec. Significant relationships were also found between anthropometric measurements and men’s basketball athletes’ isokinetic torque were not significant for prediction of angular velocity. Previous research has demonstrated the efficacy and reliability of common anthropometric measurements such as BMI and body fat percentage in determining strength output with the nature of the data set. Therefore, in a prior study conducted by the authors no correlation was measured to the nearest 0.1 cm with participants barefoot using a wall-mounted stadiometer (Heighthonometer, QuickMedical, Issaquah, USA). Body mass index (BMI, kg/m²) and lean body mass index (LBMI, kg/m²) were calculated. The athletes participated in a lower extremity warm-up and then isokinetic strength of knee flexion and extension was measured through three angular velocities of 60°, 180°, and 300°/sec. RESULTS: The inconsistent findings concerning the relationship between common anthropometric and isokinetic measurements such as BMI and body fat percentage predicted isokinetic average peak torque at 300°/sec. The results of the regression indicated the three predictors (Lean Mass, LBMI, & Body Fat) explained 64.6% of the variance (R² = .646, F(3, 11) = 15.00, P < .05). Table 3. It was found that Lean Mass significantly predicted 180°/sec average peak torque (β = .51, P = .027), as did % Body Fat (β = .262, P = .041). Hierarchical linear regression analysis was used to test if anthropometric measurements predicted isokinetic average peak torque at 300°/sec. The results of the regression indicated the three predictors (Lean Mass, LBMI, & Body Fat) explained 75.6% of the variance (R² = .755, F(3,11) = 11.349, P < .001). Table 4. It was found that Lean Mass significantly predicted 300°/sec average peak torque (β = .51, P = .004), as did % Body Fat (β = .179, P = .038). A significant inverse correlation between body fat and peak torque produced at 180° and 300°/sec ranged from (.547 to -.692 P < .05) and significant positive correlation between lean mass and average peak torque at 180° and 300°/sec was found (r = .509 to .676 P < -.05). CONCLUSION: The inconsistent findings concerning the relationship between common anthropometric measurements and isokinetic strength measures in men’s collegiate soccer team. This group went on to win the conference regular season championship, suggesting that the subjects were highly skilled athletes in their sport. A previous study found body mass and percentage of body fat among variables that explained the variance in isokinetic strength for both knee extensors and flexors in young male competitive soccer players aged 10 to 17 years. Fat mass free has been reported to be related to anaerobic power in elite young male wrestlers. This study supported the percent body fat and lean body mass as predictors of isokinetic strength in college aged athletes who are highly skilled athletes in their sport.

In conclusion, the results suggest that lean body mass and body fat percentage may be predictors of isokinetic knee muscle strength at angular velocities of 180°/sec and 300°/sec in highly skilled men’s intercollegiate soccer athletes.

Results

Introduction

Previous research has demonstrated the efficacy and reliability of isokinetic testing in the evaluation of muscular performance including lower extremity strength. Prior research has also suggested that isokinetic force production is associated with sports related performance in young male athletes. For example, it has been suggested that isokinetic force production in the legs could be used to evaluate and predict on-ice skating speed and skating power in men’s intercollegiate ice hockey players. Prior research has also investigated the relationship between strength output and anthropometric measurements such as BMI and body fat percentage. The conclusions concerning these relationships have been inconsistent. In young male competitive soccer players ages 10 to 17 years, certain anthropometric measures were related to isokinetic strength for both knee extensors and flexors, with 73-93% of the variance explained by using combinations of age, body mass, percentage of body fat, and hours training per week. Body mass was the main independent variable that explained variance, which was in agreement with a previous study. In college students who were not competitive athletes, knee isokinetic strength was reported to be significantly negatively correlated with the percentage of body fat and positively correlated with fat free mass. Fat free mass, but not percent body fat, was reported to be related to anaerobic power in college aged athletes. The nature of the data set. Therefore, in a prior study conducted by the authors no correlation was measured to the nearest 0.1 cm with participants barefoot using a wall-mounted stadiometer (Heighthonometer, QuickMedical, Issaquah, USA). Body mass index (BMI, kg/m²) and lean body mass index (LBMI, kg/m²) were calculated. The athletes participated in a lower extremity warm-up and then isokinetic strength of knee flexion and extension was measured through three angular velocities of 60°, 180°, and 300°/sec. Figure 1. Statistical Analysis:

• Descriptive Statistics Table 1 were calculated for all anthropometric measurements and average peak torques of the bi-lateral thigh musculature at 60°, 180°, and 300°/sec.

• Hierarchical linear regression utilized for prediction due to the Hierarchical nature of the data set.

References

4. Lopes, EA, Peru, N, Figueira, J, Faria, C, Andersson, R. Body composition, muscle mass and strength are predictors of knee isokinetic strength in male college aged students who are highly skilled athletes in their sport. 2017.