ECCCENTRIC UTILIZATION RATIO AND STRETCH SHORTENTING CHARACTERISTICS WITHIN COLLEGIATE GOLF POPULATIONS

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Introduction

Globally, golf is one of the most popular sports. In order to achieve optimal levels of performance, modern golf athletes generally possess adequate levels of flexibility, muscular strength and power, and rotational power (Smith, 2010). Recently, interest in investigating mechanisms which contribute to muscular power production within the competitive golf population and how they influence golf performance (e.g., club head speed, ball speed, and drive distance) has grown. Across sport, the countermovement jump (CMJ) and squat jump (SJ) are commonly utilized to assess muscular power. When combined, the CMJ and SJ can be extrapolated to assess the eccentric utilization ratio (EUR) and stretch-shortening cycle percentage (SSC%) which provides the practitioner with more in-depth information regarding mechanisms utilized to complete jumping tasks within the sagittal plane (McGuigan, et al., 2006; Secomb, et al., 2015). To our knowledge, no study has been conducted to assess the EUR characteristics of collegiate male golf athletes. Thus, the purpose of this investigation was to assess underlying mechanisms which contribute to muscular power expression. It was hypothesized that little variation would be observed in CMJ and SJ performance, while greater variation would be observed when mechanisms which influence muscular power were assessed.

Methods

10 collegiate male golfers participated in this study (n = 23; age; 21.31 ± 1.70 years, height; 70.05 ± 3.56 in, body mass; 185.79 ± 34.80 lbs). The CMJ was utilized to assess the stretch-shortening cycle during the coordinated whole-body locomotion. With their hands by their sides, participants began the CMJ by test by performing a fast countermovement of their lower limbs to the 90-degree position and then jumping as high as possible. Participants were allowed to us a backward arm swing as they flexed their knees to the 90-degree position and forward as they extended their knees into the jump. The SJ was utilized toa assess the contractile ability of the lower extremities. SJs were performed with the participant flexing the knee to approximately 90 degrees with the hands on the hips to reduce upper extremity contribution to lower-extremity power production. Participants remained stabilized in the 90-degre position for 2-seconds prior to performing the jump. The stabilization in the 90-degree position restricted the use of elastic energy in the muscles. In both the CMJ and SJ, participants were instructed to land in the same point of takeoff. All measurements were collected with the JustJump Mat® (Probotics Inc., Huntsville, AL,USA) and closely follow valid and reliable methodological approaches utilized within previous research (Kucic et al., 2020).The best attempt of three attempts for both, the CMJ and SJ were utilized to calculate the EUR and SSC%. In accordance with previous research, EUR was calculated as follows; (CMJ height/SJ height). SSC% percentage was calculated as follows (CMJ height – SJ height)/SJ height (McGuigan, et al., 2006). Data was analyzed using IBM SPSS statistics (Version 24.0; IBM Corporation, New York, NY). Descriptive statistics were calculated in order to summarize results from the dataset.

Results and Discussion

Results from this study revealed expected and unique findings in regard to muscular power production within the collegiate golf population. As expected, CMJ (23.94 ± 2.85 in) and SJ (21.45 ± 2.54 in) performance were within normal ranges and comparable to most other athletic populations. However, observations from our sample revealed unique characteristics with regard to the EUR (1.12 ± 0.90) and SSC% (11.97 ± 8.91). As observed, there seems to be little deviation in the EUR within this specific golf sample. However, there appears to be a fair amount of deviation in SSC% which may be useful and cost-effective method for further understanding mechanisms which contribute to muscular power on an individual level.

Significance

The purpose of this investigation was to assess underlying mechanisms which contribute to muscular power expression within the golf population. Findings revealed greater variation in mechanisms utilized to produce muscular power when compared to general muscular power abilities. Based on these findings, it may be useful to further consider how golfers generate muscular power and which individualized approaches may be best suited for the enhancement or maintenance of these qualities.

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References

Kukiæ, F., Todoroviæ, N., Èvoroviæ, A., Johnson, Q., & Dawes, J. J. (2020). Association of improvements in squat jump with improvements in countermovement jump without and with arm swing. Serb J SportsSci, 11(1), 29-35.
McGuigan, M. R., & Winchester, J. B. (2008). The relationship between isometric and dynamic strength in college football players. Journal of sports science & medicine, 7(1), 101.
Secomb, J. L., Lundgren, L. E., Farley, O. R., Tran, T. T., Nimphius, S., & Sheppard, J. M. (2015). Relationships between lower-body muscle structure and lower-body strength, power, and muscle-tendon complex stiffness. The Journal of Strength & Conditioning Research, 29(8), 2221-2228.

Smith, M.F. The Role of Physiology in the Development of Golf Performance. Sports Med 40, 635–655 (2010). https://doi.org/10.2165/11532920-000000000-00000