Introduction

The isometric mid-thigh pull (IMTP) is a multi-joint isometric force monitoring test that can be used to assess athletes’ force-time characteristics (Stone et al., 2019). The IMTP is especially useful for the monitoring of weightlifters because it closely resembles the power position of the clean (Beckham et al., 2013). Therefore, another viable isometric test to use might be an isometric pull from the floor (IPPF) because it mimics the position at the start of the clean (Joffe et al., 2021).

Purpose

The purpose of this study was to compare the force-time characteristics of collegiate level weightlifters in two types of multi-joint isometric force tests and their relationship to competition performance.

Methods

In this study, force-plate technology (Hawkins Dynamics, Westbrook, ME) was used to measure isometric force-time characteristics in collegiate weightlifters. Thirteen collegiate male and female weightlifters (6 males; weight:89.0 ± 10.8, 7 females; weight:74.0 ± 8.1) performed the IMTP test followed by the IPPF test within one month of their competition performances. For the IMTP test, the participants were instructed to stand on force plates and orient their body in the same position of the second pull in the clean. Knee angles were then measured with a goniometer for a knee angle of 125-145 in accordance with Comfort et al. (2018). The participants were given two warm-up pulls at 50% and 75% of maximum effort for both isometric tests. The participants were instructed to pull hard and fast. Two max effort trials were taken for both isometric tests. Test-retest reliability between trials was assessed through Intra-class Correlation Coefficient (ICC). A Pearson’s Correlation Coefficient was conducted to assess the relationship between force-time variables of interest and weighing performance variables in the SN, CJ, and TOT.

Results

The ICC showed a high degree of reliability between trials for isometric peak force (IPF) and rate of force development 0-250ms (RFD) in both protocols. For IPPF, the average measure ICC was .989 (95% CI [.966, .996], F(1,12)=84.971 p<.001) and an average ICC of .919 (95% CI [.745, .974], F(1,12)=11.549 p<.001) respectively. For IMTP, the average measure ICC was .985 (95% CI [.954, .995], F(1,12)=62.8 p<.001) and an average ICC of .936 (95% CI [.798, .979], F(1,12)=14.508 p<.001) respectively. The correlation analysis between IMTP, IPF, and weighting performance indicated that there were Large (.671), Very Large (.711), and Large (.692) correlations with SN, CJ, and TOT performances, respectively. The analysis between IPPF IPF and weighting performance showed Very Large (.806), Very Large (.853), and Very Large (.836) correlations with SN, CJ, and TOT, respectively. The analysis between IMTP, RFD, and weighting performance showed Large (.661), Very Large (.700), and Large (.681) correlations with SN, CJ, and TOT, respectively. The analysis between IPPF, RFD, showed Very Large (.761), Very Large (.785), Very Large (.781) correlations for SN, CJ, and TOT.

Conclusion

Both the IMTP and IPPF multi-joint isometric protocols are both reliable and valid ways to monitor weightlifting performance. The IPPF protocol had somewhat stronger correlations to weightlifting performance in collegiate level athletes than the IMTP protocol.

Practical Implications

IMTP and IPPF protocols can be used by the coach to monitor collegiate weightlifters for program efficacy and adaptations to training. The IPPF protocol may be more time efficient to use for some professionals because the bar height would not need adjusting between athletes. However, for maximal strength assessment it is notable that IMTP had much greater IPF. Furthermore, the IPPF position would likely raise injury potential as the back is in a weak position.

References