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PREDICTING THROWING PERFORMANCE WITH FORCE-VELOCITY MECHANICAL PROPERTIES OF THE UPPER LIMB IN EXPERIENCED HANDBALL PLAYERS

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Summary

This study investigated the relationship between force-power-velocity (F-P-V) mechanical variables measured during the ballistic bench press throw (BPT), shoulder isokinetic rotation strength, and the throwing velocity in handball players. F-P-V mechanical variables were calculated during the BPT and an isokinetic shoulder isokinetic internal rotation test. Throwing performance was assessed for the standing and 3-step throwing velocity. A strong correlation was found between V0 and maximal throwing velocity for standing throwing and three-step throwing (all r2 > 0.45, f2 = 0.85). Also, Pmax had a weak association with three-step throwing performance (r2 = 0.18, f2 = 0.22). As a result, this finding showed the importance of measuring the upper limb F-P-V profile obtained from the BPT in predicting throwing performance.

Keywords: mechanical properties; bench press throw; shoulder rotator; throwing velocity; handball

INTRODUCTION

Overarm throwing is considered one of the most critical actions in handball sports related to the gain of competition, which requires the players to throw as fast and accurately as possible to score a goal. It is well known that the overarm throw is a typical ballistics movement that requires the athlete to accelerate a given ball as much as possible to reach the highest throwing velocity in the shortest time (1). Although previous studies have proposed fundamental methods for quantifying upper-limb explosive capacity, such as the ballistics bench press, the Force-Velocity (F-V) mechanical properties obtained during the ballistics bench press have not explored its association with the throwing performance. Thus, the present study aimed to investigate the F-V mechanical properties obtained during the ballistics bench press with a different type of throwing performance in handball players.

RESEARCH METHODS

Twenty-seven French national second-division male handball players (age: 20.0 ± 3.2 years, height: 180.5 ± 6.3 cm, weight: 73.9 ± 7.9 kg) volunteered for the investigation. Force-Velocity (F-V) mechanical parameters (i.e., theoretical maximal force [F0], velocity [V0], power [Pmax]) of the upper limb were obtained during the single-arm ballistics bench-press for the dominant arm according to the validated method (2). The throwing performance was assessed by the maximal standing and 3-step running throwing velocity using a Stalker ® ATS II radar gun.

RESULTS AND DISCUSSION

The simple linear correlation analysis found that the V0 was significantly correlated with standing throwing velocity (r2 = 0.51, f2 = 1.04, $p < 0.001$) and 3-step running throwing velocity (r2 = 0.46, f2 = 0.85, $p < 0.001$). A significant correlation was also found between the 3-step running throwing velocity and the Pmax (r2 = 0.18, f2 = 0.22). In contrast, no significant correlation was found between other mechanical properties and throwing performance. Additionally, the players with a higher throwing performance display the higher mechanical variables of V0 and Pmax obtained from the ballistic BPT (Table 3, Figure 1).

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Vietnam Handball team meets Thailand team at SEA Games 31 held at Bac Ninh Sports University of Viet Nam

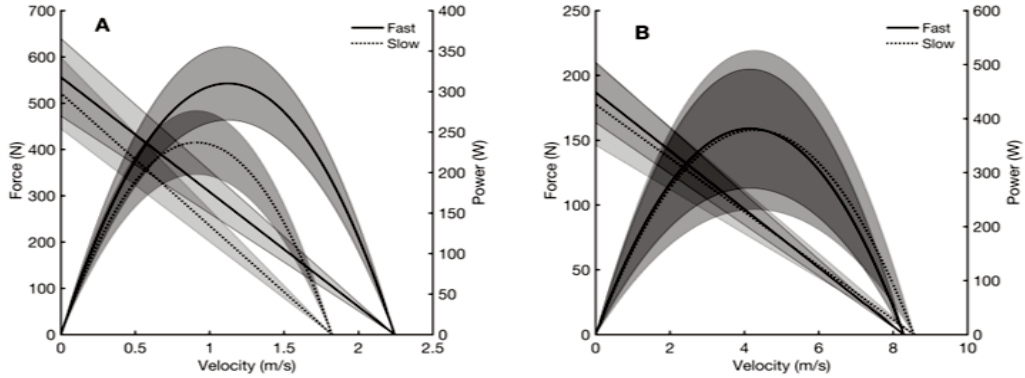

Figure 1. F-P-V mechanical profile obtained in the unilateral ballistic bench press throw (A) and internal shoulder rotation (B) displayed by throwing performance (Low vs. Fast throwing performance group).

CONCLUSION

The main results of the present study showed the importance of the upper limb F-V profile assessment in predicting throwing performance, especially the V0. In short, the handball players revealed higher V0 during the ballistics bench press, which could also perform the faster throwing performance. This finding demonstrated that the mechanical parameters obtained from the ballistics bench press should be used to evaluate the upper-limb explosive capacity and allow the coach to design the particular training session to improve the explosive capacity of the upper limb to enhance the throwing performance.

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