THE IMPACT OF LOAD ON THE FORCE-TIME CHARACTERISTICS OF THE HEXAGONAL BARBELL JUMP IN RESISTANCE-TRAINED MEN

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Introduction

The development of rapid force production is important for the success of many athlete as power can often be the major factor separating athletes (1). Swinton et al. (3) indicated that weighted jumps are considered to be one of the most effective exercises for developing these characteristics. There are a multitude of weighted jump variations; however, the hexagonal barbell jump (HEXJ) has been recommended for improving jump height, peak force, peak power, and rate of force development (2,3). Although both weighted static jumps and weighted dynamic jumps were found to produce similar power outputs, static jumps were found to produce slightly higher values in stronger individuals (1). There is currently limited research regarding the optimal load prescription for the static HEXJ to optimize rapid force production. Because of this, the purpose of this study was to examine the impact that load had on the force-time characteristics of the HEXJ.

Methods

- Twenty resistance-trained males (age: 23.5 ± 3.0 years, height: 175.1 ± 8.7 cm, body mass (BM): 79.6 ± 11.8 kg, relative 1RM back squat: 1.90 ± 0.28 kg/kg) participated in two separate testing sessions
  - Session one: 1RM back squat followed by familiarization of the HEXJ
  - Session two: subjects performed unloaded HEXJ repetitions as well as repetitions with loads corresponding to 20, 40, 60, 80, and 100% of their BM.
- Two jumps were performed at each load on a force platform and the force-time data were used to determine propulsion net relative mean force (NetRelMF), duration (Dur), and net impulse (NetIMP).
- Each variable was compared between the HEXJ loads using a series of one-way repeated measures ANOVA with Bonferroni post hoc tests.

Results

Table 1. Propulsion force-time characteristics during the hexagonal barbell jump performed with different percentages of body mass (BM).

Load (% BM)	Net Mean Force (N/kg)	Duration (s)	Net Impulse (Ns)
0	8.7 ± 1.1	0.35 ± 0.03	235.8 ± 33.2
20	9.1 ± 1.1^{ab}	0.35 ± 0.03	257.5 ± 42.8^{c}
40	9.3 ± 1.1^{abc}	$0.38 \pm 0.03^{*}$	277.6 ± 41.6^{cf}
60	8.9 ± 1.4^{ab}	$0.41 \pm 0.03^{*}$	292.0 ± 49.3^{cf}
80	8.4 ± 1.1	$0.45 \pm 0.04^{*}$	296.2 ± 47.9^{cef}
100	8.0 ± 1.3	0.46 ± 0.06^{cdef}	291.4 ± 48.7^{cef}

a = significantly greater than 100%; b = significantly greater than 80%; c = significantly greater than 0%; d = significantly greater than 60%; e = significantly greater than 40%; f = significantly greater than 20%; * = significantly greater than all lighter loads

Figure 1. Starting position of the HEXJ.

Figure 2. Propulsion and flight phase of the HEXJ.

Conclusions

- The propulsion NetRelMF, Dur, and NetIMP were significantly impacted by the external load used during the HEXJ.
- Greater NetRelMF magnitudes were produced during the HEXJ with light-moderate loads (20-60% BM) while shorter propulsion Dur and larger NetIMP magnitudes were produced using lighter and heavier loads, respectively.

Practical Applications

- Using lighter loads with the static HEXJ may provide a superior training stimulus for rapid jumps as the lighter loads have shorter Dur.
- Training with loads from 20-60% BM may provide a similar NetRelMF stimulus.
- Heavier loads may need to be prescribed if the goal is to produce large NetIMP magnitudes.
- It is important that practitioners recognize using percentages of BM has its shortcomings and that individuals may respond differently to the prescribed loads.

References

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