The Impact of Velocity Based Training on Lower Body Muscular Power in Division 1 Men's Lacrosse Players

EXERCISE SCIENCE
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ABSTRACT

The purpose of this study was to compare the results of a maximal jump assessment across a ten-week period of lower extremity power-focused resistance training. The aim of the study was to evaluate an undulating velocity-based training (VBT) program for the barbell back squat compound movement and how it would affect maximal counter-movement jump (CMJ) height. VBT equipment was used to track variables such as mean velocity, mean power, and peak power for the barbell back squat movement for one set per week of the program. The main findings inferred that the results of the VBT program had a positive affect on the lower extremity power production capabilities in the form of increased jump height measurements. Results displayed that the undulating program was also viewed as suitable for athletes training in-season.

What is Velocity-Based Training, and How is it Going to Revolutionize the Training Industry?

- *Velocity-based training (VBT) is an objective methodology for understanding athlete performance during weightlifting. It uses technology to track movement speed of a compound movement.*[1,2]
- *VBT provides insights into athlete performance regardless of training program.*[1,3]
- *VBT has grown with new research and technology, expanding in the last decade.*[4]

Is Velocity Based Training A Viable Method to Estimate a One-Repetition Maximum?

- *One-repetition maximum (1RM) assessments and predicted 1RM equations are considered 'golden standards' for resistance training programs but have limitations.*[5]
- *Factors affecting 1RM include biological and technical variance, fatigue, motivation, and test reliability.*[5,6]
- *VBT considers these factors and prescribes loads based on sub-maximal working sets.*[1]
- *VBT offers a more individualized approach compared to traditional 1RM-based training programs.*[1,3]

PARTICIPANTS

- One male athlete from a Division 1 lacrosse team (n=1)
- 22-year-old fourth year, 225 pounds (109 kg), 6'3" (190.5 cm)
- Defensive player, starter on the team
- Participant was not informed of participation until after data collection

METHODS

Overview

- Ten-week training program
- Undulating VBT program for BB back squat comparing pre and post-program vertical jump heights utilizing CMJ height
- Goal: Assessing the effect of undulating VBT program on lower extremity muscular power through CMJ assessments

Equipment

- JustJump mats used to measure vertical jump height
- Vitruve VBT equipment used to BB back squat velocity

Design

- CMJ with no restrictions
- 2x1 CMJ per training week
- BB back squat held on a separate training day
- VBT parameters measured: mean velocity, mean power, and peak power
- Undulating VBT program
- Percent of 1RM was used to program calculated by a nRM[1]
- Prescribed sets vs open sets[7]

Week	Target Velocity (m/s)
1	0.55
2	0.50
3	0.60
4	0.55
5	0.50
6	x
7	0.65
8	0.55
9	0.68
10	0.58

Table 1. Target Velocity Per Week

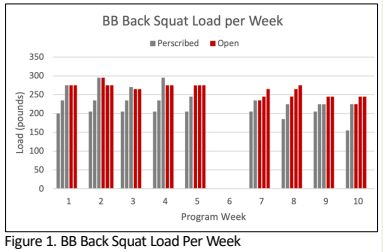

Figure 1. BB Back Squat Load Per Week

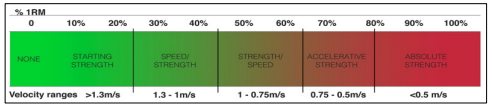

Figure 2. Velocity Training Zones

RESULTS

- Mean jump height fluctuated, but ultimately peaked at the end
- Upwards trend in mean jump height
- Actual velocities for each training week were very similar to the target velocities
- Mean power followed a ricochet trend

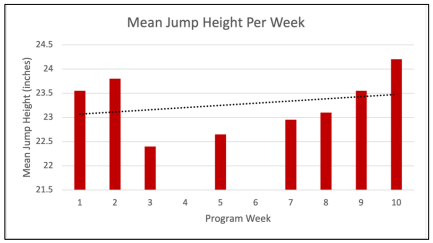

Figure 3. Mean Jump Height Per Week

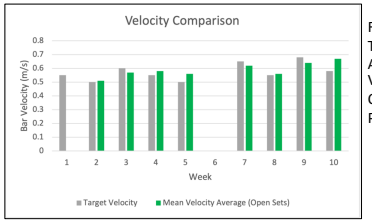

Figure 4. Target vs. Actual Velocity Comparison Per Week

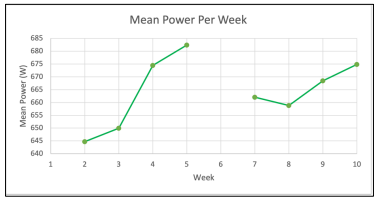

Figure 5. Mean Power Per Week

DISCUSSION

- CMJ on different training day than BB Back Squat VBT so neuromuscular fatigue would not affect results[8]
- Sinusoidal results promote characteristics of the undulating program
- Mean power across training days peaked during Week 5, but steadily picked up again at the end of the program
- Results reflect target velocities for each respective week (Table 1)
- Some missing data due to missing training days for competition
- Emphasis on accelerative strength training zone for the VBT program (Figure 2)[2]

Limitations

- Size of case study	- CMJ technique
- Length of program	- Missed training days
- Prescribed sets may be too taxing or not enough stimulus	- Sperate day of testing vs. VBT training day

TAKE HOME MESSAGES

Lower extremity strength and power are directly related to increases in athletic performance[9,10]

Undulating VBT programs are superior for student-athletes that have various external stressors

VBT programs should continue to be researched and applied to athletes in various sports

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