Effects of a 6-week Jump Training Program Combined with Two Lifting Programs

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Abstract

We evaluated the effects of a 6-week jump training program on 12 college basketball players using two strength training programs. The Leg Press (LP) group participated in a strength program using the leg press, and the Power Clean (PC) group used the power clean exercise instead of the leg press. Both groups participated in a 6-week jump training program. Pre-program measurements recorded jump scores for one-foot take off and two-foot take offs. The LP group had an average pre-program vertical of 66.68 and 88.05 cm for the 2-foot and 1-foot take offs, respectively. The PC group had an average pre-program vertical of 72.60 and 88.05 cm for the 2-foot and 1-foot take offs, respectively. The LP group had an average post-program vertical of 70.91 cm for the 2-foot take-off for an increase of about 4.2 cm, and 89.75 cm for the 1-foot take-off for an increase of about 1.7 cm. The PC group had an average post-program vertical of 76.2 cm for the 2-foot take-off for an increase of 3.6 cm, and 90.81 cm for the 1-foot take-off for an increase of about 2.75 cm. The comparison of average increases between the LP and PC groups was not significant ($P \geq 0.05$) for either the 2-foot or 1-foot take off.

Key words: jump training, vertical jump, power clean, leg press

Introduction

A common quest for athletes is to become more explosive or more powerful. The most dominant athletes in sports often are more powerful than their opponents. Two general theories prevail regarding how strength training improves performance. One theory says that strength training exercises that mimic sports skills may improve power that transfers onto the particular field of play (Fleck and Kraemer 2004). Strength training exercises that mimic sports skills are usually Olympic lifts or their derivatives such as the power clean. Strength training professionals that adhere to this theory believe that in order to become explosive, an athlete must train explosively in the weight room (Pulkkinen 2001, Lansky 1999, Fleck and Kraemer 2004, Grisaffi 1996, Takahishi 1992).

The second theory holds that no transfer of skills occurs between strength training movements and sport movements. Additionally, these theorists believe that explosive exercises done in the weight room will significantly increase the likelihood of injury (Stein 1999, Mannie 1996, Brzycki 1995). Strength training professionals who embrace this theory believe two requirements are necessary for becoming more powerful and explosive within a specific sports arena. First, the athlete must practice specific movements with perfect technique, literally thousands of times so that the technique becomes automatic. Second, the athlete should strengthen all of the muscle groups, in a balanced fashion throughout a full range of motion. Increased power and explosiveness will occur as a result of improvements in overall strength and efficiency of movement involved in a specific skill. Supporters of this theory believe that sports movements should not be mimicked in the weight room because this practice may increase the chance of injury, and will do nothing to improve the sport-specific efficiency of movement (Bryzcki 2002, Mannie 1999, Stein 1999).

Research Question/Hypotheses

With these theories in mind, we implemented a 6-wk jump training program for the men's basketball team at Montana Tech. Half the athletes participated in a strength training program that utilized the power clean, and the other half participated in a strength training program that used the leg press instead of the power clean; and all participants participated in a 6-wk jump training program. Is the power clean the preferred exercise for developing jumping power? To consider that question we developed the following hypotheses:

Null Hypothesis 1— a difference in the average increase (post-pre) of 2-foot take off jump scores between the leg press and power clean groups following a 6-wk jump training program is not statistically significant ($P \geq 0.05$).

Research Hypothesis 1— an increase in the average increase (post-pre) of 2-foot take off jump scores between the leg press and power clean groups following a 6-week jump training program is statistically significant ($P \leq 0.05$).

Null Hypothesis 2—a difference ($P \geq 0.05$) in the average increase (post-pre) of 1-foot take off jump scores between the leg press and power clean groups following a 6-wk jump training program is not statistically significant.

Research Hypothesis 2— an increase ($P \leq 0.05$) in the average increase (post-pre) of 1-foot take off jump scores between the leg press and power clean groups following a 6-wk jump training program is statistically significant.

Methods

Subjects/Procedures

Twelve athletes ranging in age from 18-23 yrs from the Montana Tech men's basketball team volunteered for this study. Half of the athletes were assigned to the normal strength training program (power clean group) provided by the basketball coaches, and the other half of the athletes were assigned to the same program with the following change: the power clean that is normally performed was replaced with the leg press (leg press group). So the athletes participated in the same strength training program except one group used the power clean and the other used the leg press. Exercises for the strength training programs included leg press/power clean, leg extension, leg curl, abdominal curl, hyperextension, bench press, lat pull down, triceps extension and bicep curl. The strength training program was combined with a jump training program based on the recommendations of Michigan State University's Strength Coach, Mike Vorkapich, in his article Jump Training (2001). Exercises included a warm-up and followed with various combinations of walking thigh pulls, jump skips, tuck jumps, frog jump, backboard slaps and x-out layups. We used a Vertec vertical leap measuring device to assess both sets of jump scores on an evening when the athletes had one day of rest from practice and strength training. Each athlete was allowed two jumps for each take-off, and the initial jump scores were compared with jump scores tallied at the end of training.

Both groups participated in a pre-program 2-foot static take off and 1-foot dynamic take off vertical jump test prior to a 6-wk jump training program. Jump training was a 2 day/wk program that implemented exercises specific to basketball jumping with both one- and two-foot take-off drills. The program consisted of a range of 80-110 foot jumps, leaps and bounds, and the duration of the program was approximately 20 min/session. Following the 6-wk jump-training, subjects completed the same vertical jump test to detect any improvement.

Results

The LP group had an average pre-program vertical of 66.68 and 88.05 cm for the 2-foot and 1-foot take offs, respectively (Table 1). The PC group had an average pre-program vertical of 72.60 and 88.05 cm for the 2-foot and 1-foot take offs, respectively (Table 2). The LP group had an average post-program vertical jump of 70.91 cm for the 2-foot take-off for an increase of about

Table 1. Leg Press (LP) Group Results.

Leg Press	Beg 1 ft	End 1 ft	Beg 2 ft	End 2 ft
LP1	91.44	96.52	69.85	71.12
LP2	85.09	90.17	57.15	63.5
LP3	91.44	90.17	64.77	72.39
LP4	81.28	82.55	60.96	64.77
LP5	86.36	87.63	69.85	74.93
LP6	92.71	91.44	77.47	78.74
Avg	88.05	89.75	66.68	70.91
		P = 0.4199		*P = 0.6190*

Table 2. Power Clean (PC) Group.

Power Clean	Beg 1 ft	End 1 ft	Beg 2 ft	End 2 ft
PC 1	83.82	86.36	69.85	72.39
PC2	95.25	97.79	78.74	83.82
PC3	82.55	85.09	67.31	71.12
PC4	76.2	83.82	67.31	72.39
PC5	85.09	87.63	71.12	71.12
PC6	105.41	104.14	81.28	86.36
Avg	88.05	90.81	72.60	76.20

4.2 cm, and 89.75 cm for the 1-foot take-off for an increase of ~1.7 cm. The PC group had an average post-program vertical of 76.2 cm for the 2-foot take-off for an increase of 3.6 cm, and 90.81 cm for the 1-foot take-off for an increase of about 2.75 cm.

Due to the relatively small sample sizes ($n = 6$ for both the LP and PC groups) the non-parametric Mann-Whitney test was conducted to determine statistical significance between the groups. Both groups improved their average vertical jump performance, which we expected.

Results were not statistically significant when comparing the average increase for the 2-foot Jump between the LP and PC groups ($P > 0.05$). Thus, we failed to reject null hypothesis 1. Similar results were obtained when we compared the average increase between the two groups for the 1-foot jump ($P > 0.05$). That is, we also failed to reject null hypothesis 2.

Discussion

Use of the power clean to improve athletic performance is an intensely debated topic. Results of this project allow us to conclude that the power clean was no more effective than the leg press, to improve vertical leap scores for these groups when combined with a jump-training program. The leg press is a simple exercise that is safe to perform. The power clean is a complex exercise that has more danger factors as a result of significantly higher compressive and shear forces than the leg press with potential injuries occurring to the wrist, elbow, shoulder, back, hip and knee (Brzycki 2002, Kielbaso 1999).

Limitations to our study include the fact that our convenience sample was small and is not necessarily representative of the entire population. Also, we should have tracked their strength changes during the 6-wk period. We recommend that future research include tracking strength changes, using larger sample-sizes that include a control group, and conducting similar studies on females.

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