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Impact of Deadlift and Power Clean on Vertical and Broad Jump Performance

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Abstract

A transfer between weightlifting and jumps is based on principles of increased demands placed upon the muscular system while performing similar movement patterns. The purpose of this study was to investigate the impact of power-clean (PC) and deadlift (DL) interventions on vertical-jump (VJ) and broad-jump (BJ) performance in college-aged males. The null hypothesis stated no difference between DL and PC groups would be found to impact VJ and BJ performance. Six non- DI male athletes who were experienced with required movements were recruited for the study. Participants were randomly assigned to DL intervention, PC intervention, or control group. ORPYX® shoe pods were placed in shoes to measure force produced in jumps and lifts. All participants performed pre-intervention max VJ and BJ testing. Jump testing was followed by max PC and DL testing for respected groups. Participants in DL and PC interventions performed a training protocol three days a week for six-weeks. Participants were re-assessed post-intervention for max jumps and lifts. Data was analyzed through ORPYX® and transferred to Excel for analysis. Means and standard deviations for force, jumps, and lifts were calculated and analyzed through SPSS. A One-Way ANOVA was used to analyze data. Improvements occurred, but no statistically significant difference was observed ($p < .05$). The null hypothesis was accepted; no significant differences were found between DL and PC in affecting VJ and BJ performance.

Introduction

Many sports include jumping motions within its sport.[1] A transfer between weightlifting and jumps is based on the idea that increased demands are placed upon the muscular system while performing similar movement patterns. This follows the principle of specificity, stating exercise should be similar to the targeted sport movement in considering the kinetics and kinematics.[4] Research comparing lifts such as the PC and squat in improving jump performance has been completed, but a comparison between PC and DL does not have adequate research support.[2] The DL is a compound movement where a barbell is raised in front of an individual from the floor to a full standing position.[2] The PC is a complex, compound exercise used for the purpose of producing force more efficiently at an overload stimulus.[3] The PC is initiated similarly to the DL, but with an added phase where the barbell is caught at the shoulder region with the hands remaining under the barbell.[3] The VJ focuses on jumping as high as one can vertically from a standstill position, and the BJ focuses on jumping as far as one can horizontally from a standstill position. Both jumps use a countermovement, an initial movement from the arms to propel the body in the desired direction of the jump.[2]

Methods

Setting
- Small DI Midwestern University laboratory, fitness center, & varsity weight room
- Spring 2020

Participants
- 6 college-aged males, non-DI athletes, experienced with all movements

Procedures
- Height, age, weight, reach, shoe size assessed and recorded
- ORPYX® shoe pods placed in shoes to measure jump force
- Warmup consisted of cycle ergometer, body squats, and burpees
- 3 VJ and BJ performed with 1 minute between jumps
- Jump height and distance were recorded for each jump
- Warmup from predicted 1RM of specific intervention
- 1RM was determined per intervention
- Force statistics sent via Bluetooth to ORPYX® application.

Figure 1
Catch phase of PC

Figure 2
End phase of DL

Results

Table 1

Participant Mean Demographics

	Age (yr)	Ht (in)	Wt Pre (lbs)	Wt Post (lbs)
x̄	22.50	71.96	204.07	205.72
SD	2.59	3.10	48.17	50.01

Table 2

Mean Pre-& Post-Intervention Vertical Jump and Force

	Pre-VJ (in)	Post-VJ (in)	Δ	Pre-VJ (N)	Post-VJ (N)	Pre-N/lb	Post-N/lb	Δ
x̄	21.50	22.64	1.14	1760.13	1333.51	8.89	6.85	-2.04
SD	3.50	2.86	0.85	263.87	177.80	1.96	2.07	1.17

Table 3

Mean Pre-& Post-Intervention Broad Jump and Force

	Pre-BJ (in)	Post-BJ (in)	Δ	Pre-BJ (N)	Post-BJ (N)	Pre-N/lb	Post-N/lb	Δ
X̄	83.22	84.79	1.57	1820.63	1384.96	9.02	7.14	-1.88
SD	8.63	9.01	2.34	465.93	301.54	1.71	2.34	1.56

Figure 3
Comparison Pre-post VJ

Pre-post Vertical Jump Height

Figure 4
Comparison Pre-post BJ

Pre-post Broad Jump Distance
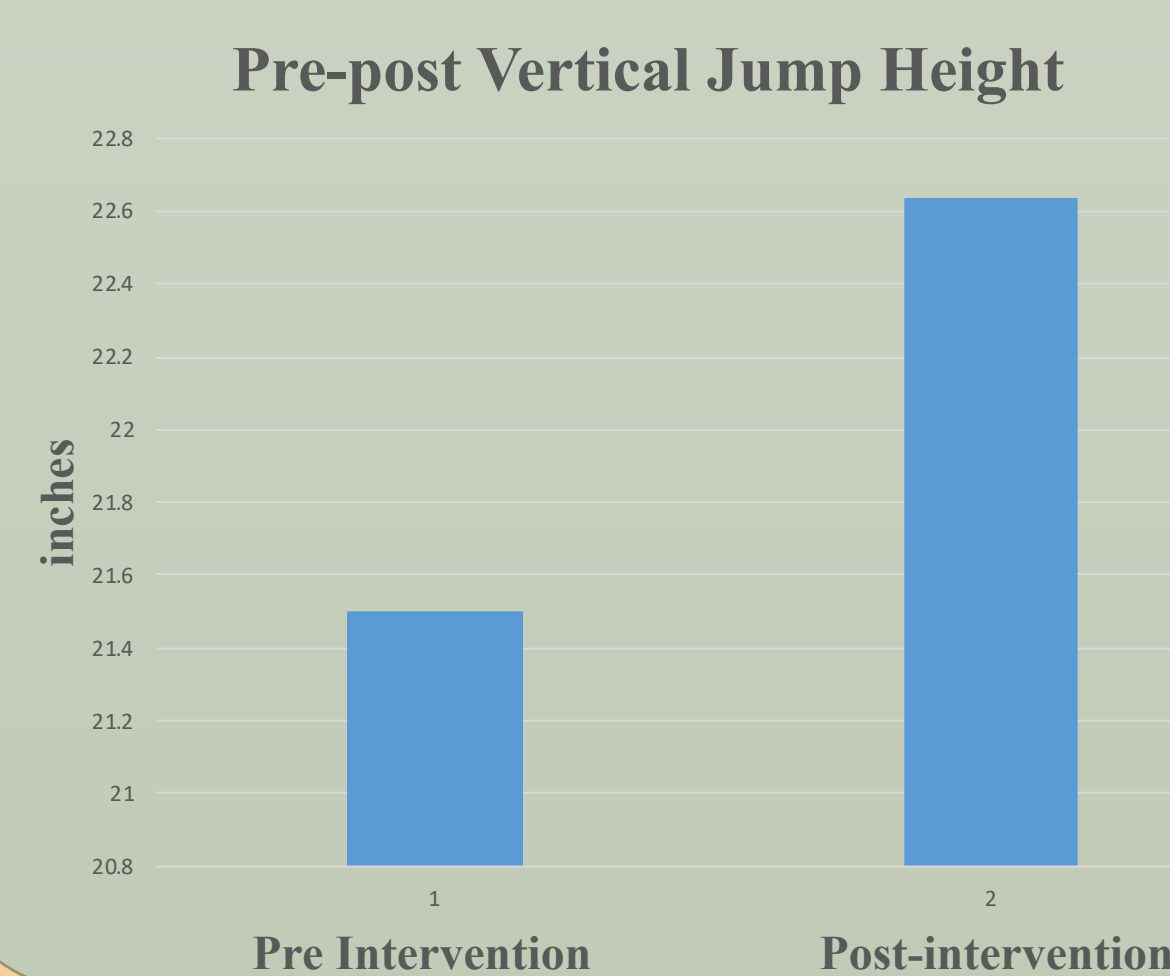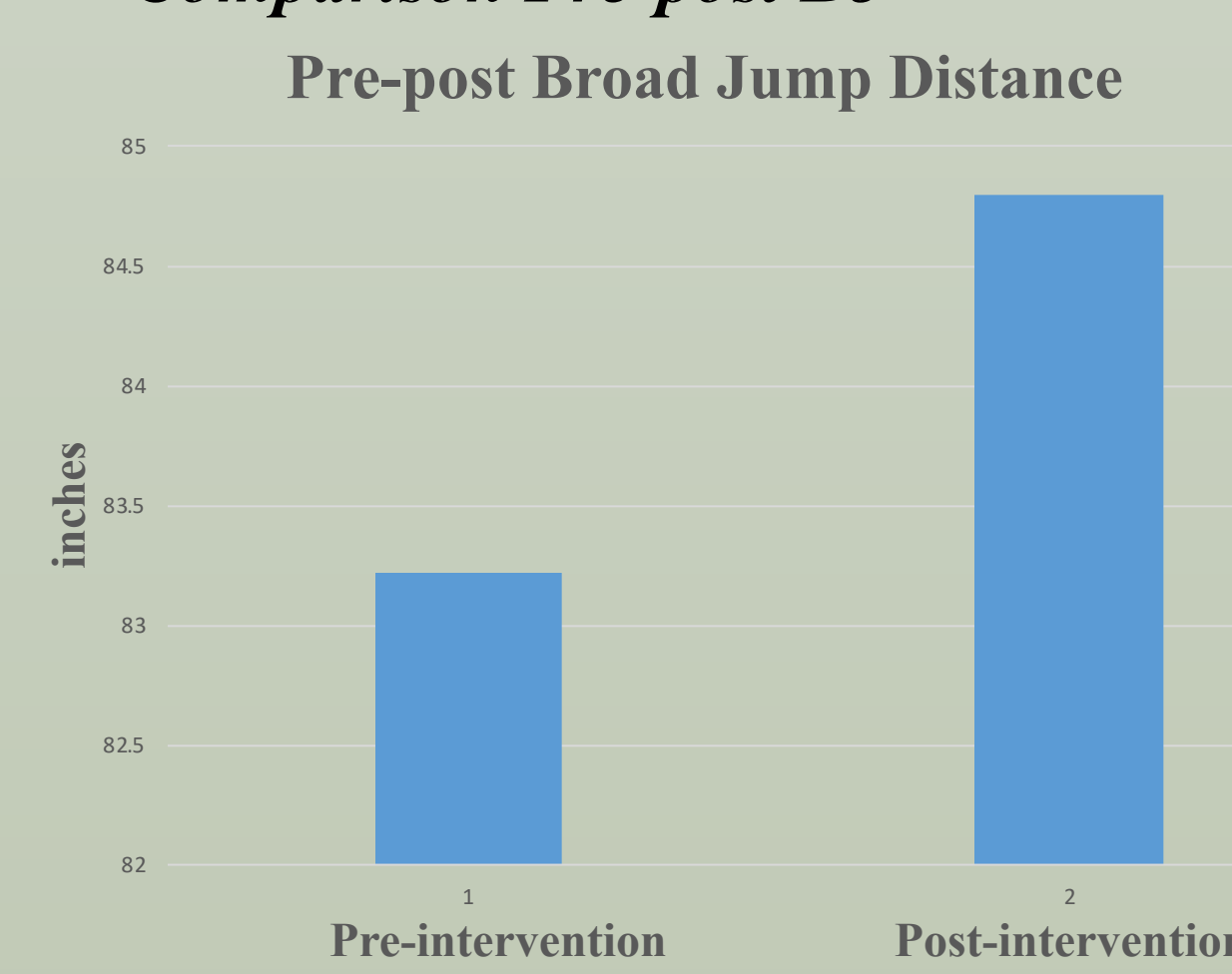
Results cont.

Figure 5

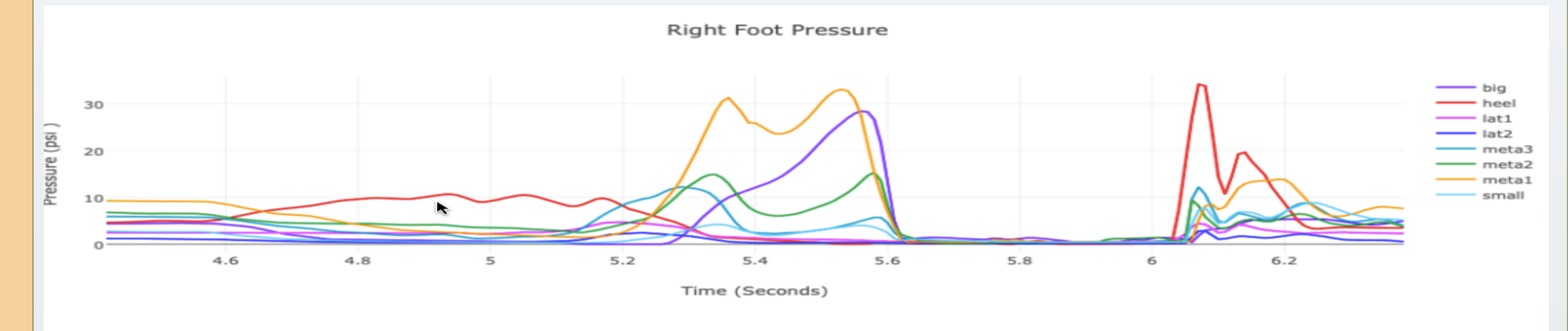*ORPYX® application right foot pressure from a broad jump*

Table 4

Pre-& Post-Intervention Force and Force Per Pound

	Pre-max (lb)	Post-max (lb)	Δ	Pre-max (N)	Post-max (N)	Pre-N/lb	Post-N/lb	Δ
x̄	268.75	301.25	32.50	1732.63	1525.63	9.09	7.94	-1.15
SD	80.66	90.31	13.23	251.13	238.12	1.58	1.19	2.24

Figure 6
Propulsion phase of BJ

Figure 7
Flight phase of VJ
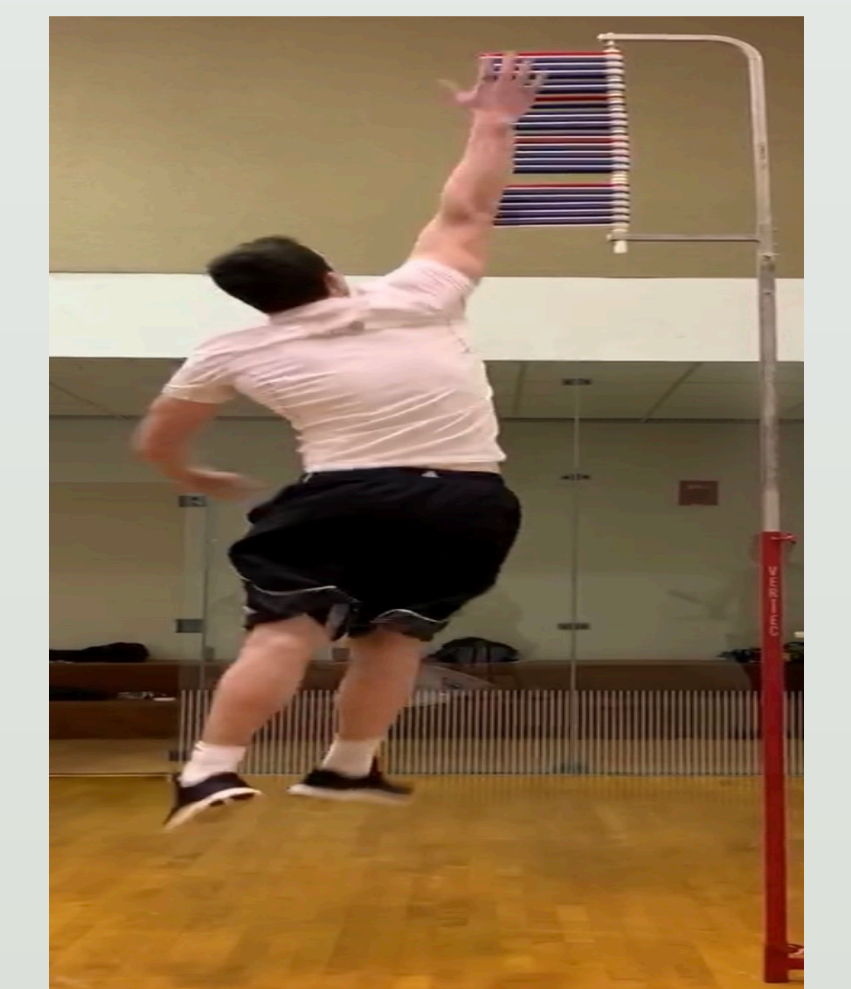
Table 5

Broad Jump – One Way ANOVA Results

	df	P-value	F	F crit
Distance	1	0.29	2.18×10^{-6}	18.51
N/lb	1	0.16	4.73	18.51

Table 6

Vertical Jump – One Way ANOVA Results

	df	P-value	F	F crit
Ht	1	0.32	1.76	18.51
N/lb	1	0.24	2.75	18.51

Conclusion

Statistical analyses indicated no significant difference between PC and DL in improving VJ and BJ performance. While not statistically significant, mean improvements in jump performance and decreases in force produced were found. Practically, this implies that participants were "lighter on their feet" when jumping, as they were using a more productive countermovement to propel themselves into more successful jumps than prior to intervention. The study suggests that adding Olympic lifts to a training program with strength, power, and hypertrophy principles practically can improve jump performance. Similar studies should include more participants to decrease possibility of random error and increase validity, as well as compare plyometric training to Olympic weightlifting in improving jump performance.

Acknowledgements

References

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