Assessment of Weight Lifters' Power and Cardiovascular Endurance Evaluation

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Abstract
This research compared the strength and cardiovascular stamina of weight lifters (n = 100) versus power lifters (n = 100). The 2019–2020 academic years' H.P. state level competition is where the data for this study were gathered. Pull-ups, medicine ball throws, and basketball throw tests were used to gauge the strength of the arms and shoulders, the bent-knee sit-up test the strength of the abs, and the standing wide leap and vertical jump the strength of the legs. The Tuttle pulse ratio test was used to measure cardiovascular toughness. An independent "t" test was used to assess the significance of the difference in averages between weight lifters and power lifters. The results indicated that weight lifters have significantly stronger in arm and shoulder strength in comparison to power lifters, when measured by pull ups test, medicine ball put and basketball throw test. Weightlifters were also significantly stronger in abdominal strength and leg strength in comparison to power lifters. They have also shown significantly greater cardiovascular endurance in comparison to power lifters.

Keywords: Arm & Shoulder Strength, Abdominal strength, leg strength, cardio-vascular strength, weight lifters and power lifters

Introduction:

Weightlifting has a lengthy history in the contemporary Olympic Games and has widespread and expanding global participation. Weightlifters must produce exceptionally high peak forces, contractile rates of force generation, high peak power outputs, and contractile impulses while doing the two competitive lifts, the snatch and the clean and jerk (C&J) (Garhammer, J. 1993 & Storey A et al, 2012). The goal of power lifting is to perform the squat, bench press, and dead lift exercises with the highest weights achievable for one repetition (one-repetition maximum, or 1-RM). Lifters compete in several classes depending on age, body mass, and gender. The earliest game that humans have ever played is probably weightlifting and powerlifting. In order to achieve high degree performance in these sports, it is essential to examine a weight lifters and power lifters from every possible aspect. Of course, it involves integral approach of different sport science specialties. However the role of strength and cardiovascular endurance is perhaps one of the most crucial in this regards.

It is essential because, the strength and conditioning training is now an integral part of athletic preparation for all serious athletes and sports teams. Issues such as volume and frequency of training, choice of exercises and movement cadence are debated by athletes,coaches and exercise scientists. One of the most controversial issues in this field is the use of „explosive" exercises to increase strength and power. These can be defined as "resistance exercises characterized by maximal or near-maximal rates of force development or by high acceleration" **(**http://www.nsca-lift.org**).** Typical examples of such exercises, commonly prescribed by strength coaches, are Olympic-style lifts such as the clean and jerk and snatch, and derivatives of these such as the power clean and hang clean. (Chu DA, 1998), said that performing any weight training exercises at a relatively fast cadence, are popularly believed to beeffective in enhancing strength, power and the rate of force development. However, the selective recruitment of muscle fiber types is impossible. As such, muscle fibers are recruited by the nervous system in a logical progression according to the force requirements and not the speed of movement (Bryzcki, 1991). For example, slow twitch fibers meet the demands of low muscular intensity, whereas the fast twitch fibers are eventually recruited when the other fatigue resistant fibers are exhausted. Therefore slow twitch fibers are recruited first and fast twitch last and there is no definitive proof that undertaking explosive tasks will by-pass this process. Interestingly, Fleck & Kraemer (1997) suggest that there are exceptions to the recruitment order by size when very high velocity movements are undertaken, although they provide no research data to support this claim.

Maximal strength training can be defined as strength training with high loads and low repetitions. Different references state different percentages and number of repetitions as limits of maximal strength training, but very standard values are over 80% of one repetition maximum for loads and a maximum of six repetitions per set (McArdle et al. 2015, 513). The aim of maximal strength training is to improve individuals" neuromuscular performance and most importantly maximal force production (Wang et al. 2010 and Heggelund et al. 2013). One of the great assets of maximal strength training is the capability of improving one"s force production without significant changes in body mass (Wang et al. 2010; Netreba et al. 2011), since most of the adaptations that maximal strength training produces are neural adaptations and do not require hypertrophy to occur (Netreba et al. 2011). Cardio-vascular endurance is the ability of the heart, lungs and blood vessel to deliver oxygen to our body tissues. Cardio-vascular fitness deals with the physiological aspects of fitness and is particularly related with the fitness of the heart and circulatory system and its adjustment to stress conditions. Breath hold is also very important in weight lifting and power

lifting to lift the weight.

Methodology

The purposive sampling procedure was adopted by the investigator for the present study. The total sample of present study comprises of 200 subjects including weight lifters (n=100) and power lifters (n=100), who had participated in the state level competition of Himachal Pradesh. Age group ranged from 18-28 years.The arm and shoulder strength was measured with help of pull ups, medicine ball put and basketball throw. Abdominal strength was measured with the help of bent knee sit ups test and leg strength was measured with the help of standing broad jump and vertical jump. Tuttle pulse ratio test was used for the measurement of cardio-vascular endurance. In order to determine the significance of difference between means of weight lifters and power lifters independent" test was applied.

Result and Discussion

After analysis of data results has been presented in following tables:

Table-I: Comparison of arm & Shoulder Strength between weight lifters and power lifters

Variables	Weight lifters (N=100)		Power lifters (N=100)		MD	t Value
	Mean	SD	Mean	S.D		
Pull Ups	10.6	1.59	9.43	1.28	1.21	5.93**
Medicine ball put	9.54	1.27	8.66	.67	.87	6.10**
Basketball Throw	8.41	1.07	7.75	.51	.66	5.36**

**significant at .01 level; t-.2.60

Table-I reveals that weight lifters were showing higher level of arm & shoulder strength when measured by pull ups (M=10.6, SD=1.59), by medicine ball put (M=9.54, SD=1.27) and basketball throw (M=8.41, SD=1.07) in comparison to their counterparts, i.e, power lifters (M=9.43, SD=1.28), (M=8.66, SD=.67) and (M=7.75, SD=.51), respectively. The observed differences were highly significant in pull ups (t=5.93, df=198, p<.01), in medicine ball put (t=6.10, df=198, p<.01) and basketball throw (t=5.36, df=198, p<.01) among the weight lifters and power lifters.

Table-II: Comparison of Abdominaland Leg strength between weight lifters and power lifters

Variables	Weight lifters (N=100)		Power lifters (N=100)		MD	t value
	Mean	SD	Mean	S.D		

Sit Ups	35.08	3.37	33.58	3.17	1.5	3.23**
Standing Broad Jump	2.09	.18	1.96	.12	.13	6.29**
Vertical Jump	35.64	4.57	33.14	2.46	2.49	4.81**

**significant at .01 level; t-.2.60

Table-II reveals that weight lifters were showing higher level of abdominal when measured by sit up (M=35.08, SD=3.37), and leg strength measured by standing broad jump(M=2.09, SD=.12) and vertical jump(M=35.64, SD=4.57) in comparison to their counterparts, i.e, power lifters (M=33.58, SD=3.17), (M=1.96, SD=.12) and (M=33.14, SD=2.46), respectively. The observed differences were highly significant in sit ups score (t=3.23, df=198, p<.01), standing broad jump (t=6.29, df=198, p<.01) and vertical jump (t=4.81, df=198, p<.01) among the weight lifters and power lifters.

Table-III: Comparison of cardio-vascular endurance between weight lifters and power lifters

Sport	Mean	SD	SEM	MD	t value
Weight lifters (N=100)	29.98	3.37	.34	1.54	3.52**
Power lifters (N=100)	28.44	2.78	.28		

**significant at .01 level; t-.2.60

Table-III reveals that weight lifters were showing higher level of cardio vascular endurance (M=29.98, SD=3.37) in comparison to their counterparts, i.e, power lifters (M=28.44, SD=2.78). The observed differences were highly significant, (t=3.52, df=198, p<.01) among the weight lifters and power lifters.

Discussion on findings:

It was evident from table-I that weight lifters have shown significantly higher score of pull ups, medicine ball put and basketball throw test in comparison to power lifters. It indicates that weight lifters have possessed greater arm and shoulder strength in comparison to power lifters. The greater arm and shoulder strength helps for the weight lifters to lift the more weight in snatch and clean & jerk skill of weight lifting. In contrast to above result, Hakkinen, K. et al (1986) have reported that power lifters were not as strong as weight lifters. Hakkinen, K. et al (1986) also suggests that the type of training used by Olympic lifters may be effective in increasing muscle strength and power concurrently.

It was evident from table-II that weight lifters have shown significantly higher score of sit

up test in comparison to power lifters. It indicates that weight lifters have possessed greater abdominal strength in comparison to power lifters. The greater abdominal strength helps for the weight lifters to generate more power to lift weight in clean & jerk skill of weight lifting. According to Baur et al. (2010) weight lifters need a highly developed strength capacity of abdominal muscles to compensate for these sports specific loads. Hendrick and wada (2008) suggested that weight lifters should strengthen the explosive force of trunk extensors. Weight lifting generates a high level of muscular power effectively transferring power to the bar in a short time. It has been also found that weight lifters were significantly good in standing broad jump and vertical jump in comparison to power lifters. This indicates that weight lifters have possessed greater leg strength in comparison to power lifters. The greater leg strength helps for the weight lifters to lift more weight in clean movement in weight lifting. The results of present study are not in line with results reported by Jefferey, M. et al (1999). They found that weight lifters and power lifters have near about similar leg strength. However, Anupkrishan et al (2017) have also reported that standing broad jump has significant positive correlation with power among the weight lifters. Carlock, J.M et al (2004) have found that vertical jump power is strongly associated with weight lifting ability.

It was evident from table-III that weight lifters have shown better cardiovascular in comparison to power lifters. The observed differences were found highly significant between them. These finding were in agreement with those obtained by Kusintz and Keener (1958) in their investigation of weight training. They concluded that weight training caused a significant improvement in circulatory respiratory endurance. Foss (1960) also concluded that weight training caused an improvement in cardio-respiratory endurance

Conclusions

When tested by the pull-up, medicine ball, and basketball throwing tests, it was shown that weight lifters had much stronger arms and shoulders than power lifters. Leg and abdominal strength were also much greater in weight lifters compared to power lifters. Additionally, compared to power lifters, they have demonstrated much superior cardiovascular endurance.

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