International Journal of Physical Education, Sports and Health 2023; 10(2): 348-350

P-ISSN: 2394-1685
E-ISSN: 2394-1693
Impact Factor (RJIF): 5.38
IJPESH 2023; 10(2): 348-350

www.kheljournal.com
Received: 02-01-2023
Accepted: 14-02-2023

Saurabh Tiwari
M.P.Ed., NET (Physical Education), Ph.D., Scholar, CSJM University, Kanpur, Uttar Pradesh, India

Corresponding Author:
Saurabh Tiwari
M.P.Ed., NET (Physical Education), Ph.D., Scholar, CSJM University, Kanpur, Uttar Pradesh, India

Impact of maximal and submaximal resistance training on selected strength parameters among handball players

Saurabh Tiwari

Abstract
The aim of the present study is to find out the influence of maximal and sub maximal resistance training on throwing and jumping performance among Handball players. 45 male Handball players from the different schools located at Kanpur, Uttar Pradesh in the age ranged between 15-17 years were selected. The selected subjects were further divided into three groups namely Maximal Resistance Training Group (MRTG), Sub Maximal Resistance Training Group (SMRTG) and Control Group (CG), on random basis. Prior to the experimental treatments, all the subjects were measured of their strength parameters, leg strength and abdominal strength using vertical jump test and sit ups respectively. All the subjects were determined their 1 repetition maximum (1RM) of resistance trainings, half squat, biceps, triceps, bench press, and leg press. The submaximal resistance group was asked to perform 50 to 60 % of 1 RM and maximal resistance group was asked to perform 90 to 95% of 1 RM for 8 weeks. After completion of eight weeks experimental period, the subjects were measured of their strength variables selected. The results proved that both maximal and sub maximal resistance training improved leg strength and abdominal strength of Handball players compared to control group. The results also proved that maximal resistance training was found to be better than sub maximal resistance training in improving the leg strength and abdominal strength. The differences between sub maximal and maximal resistance training in improving the strength parameters were significant ($P<0.05$). It was concluded that the maximal and sub maximal resistance training can be included in the training schedule of the school level Handball players to improve strength parameters.

Keywords: Maximal, Sub Maximal Resistance Training, Leg Strength, Abdominal Strength. Handball, Throwing, Jumping Performance etc.

Introduction
The concept of physical fitness is not only freedom from disease, but also to gain enough strength, agility, flexibility, endurance and skills to meet the demands of daily life and to build sufficient reserve energy to withstand stress and strain. Thus, physical fitness is a combination of qualities that enable a person to perform well in vigorous physical activities. These qualities include agility, endurance, flexibility and strength. The wealth of a nation depends entirely upon the health of every citizen of the country. Hence physical fitness of school children is a major important factor to be considered Strength has been considered as the most important conditional ability. It has been the most significant factor to enhance sports techniques and performance. Since all sports movement are created by the contraction of muscle, therefore, strength is an important component of various conditional abilities skills and tactical actions. Strength helps the muscles to exert force to physical activity can be performed without strength. Strength in hands helps to pull, push and to lift objects. Strength in legs helps to carry body weight and to carry extra burdens.
Handball (also known as team handball, European handball or Olympic handball) is a team sport in which two teams of seven players each (six outcourt players and a goalkeeper) pass a ball using their hands with the aim of throwing it into the goal of the opposing team. A standard match consists of two periods of 30 minutes, and the team that scores more goals wins.
Modern handball is played on a court of 40 by 20 metres (131 by 66 ft), with a goal in the middle of each end. The goals are surrounded by a 6-metre (20 ft) zone where only the

defending goalkeeper is allowed; goals must be scored by throwing the ball from outside the zone or while "diving" into it. The sport is usually played indoors, but outdoor variants exist in the forms of field handball, Czech handball (which were more common in the past) and beach handball. The game is fast and high-scoring: professional teams now typically score between 20 and 35 goals each, though lower scores were not uncommon until a few decades ago. Body contact is permitted for the defenders trying to stop the attackers from approaching the goal. No protective equipment is mandated, but players may wear soft protective bands, pads and mouth guards.

The modern set of rules was published in 1917 by Karl Schelenz, Max Heiser, and Erich Konigh, on 29 October in Berlin, which day is seen as the date of birth of the sport. The rules have had several revisions since. The first official handball match was played in 1917 in Germany. Karl Schelenz modified the rules in 1919. The first international games were played (under these rules) with men in 1925 (between Germany and Belgium) and with women in 1930 (between Germany and Austria).

Men's handball was first played at the Olympics in the 1936 Summer Olympics in Berlin outdoors, and the next time at the 1972 Summer Olympics in Munich indoors; handball has been an Olympic sport since then. Women's handball was added at the 1976 Summer Olympics.

The International Handball Federation was formed in 1946 and, as of 2016, has 197 member federations. The sport is most popular in Europe, and European countries have won all medals but one in the men's world championships since 1938. In the women's world championships, only two non-European countries have won the title: South Korea and Brazil. The game also enjoys popularity in East Asia, North Africa and parts of South America.

Resistance training is needed to improve strength. Normally better performance is the product primarily of efficient technique, the progression of speed, the maturing competitive attitude, a sound general endurance, all around strength and general mobility. Though development of all round strength is best achieved through different training methods, resistance training is the most widely used and popular method for increasing strength. Harris C, *et al*. (2007) [6] assessed the influence of training intensity on strength retention and loss incurred during detraining. Blazevich AJ, *et al*. (2003) [1] examined changes in the muscle size, muscle architecture, strength, and sprint/jump performances of concurrently training athletes during 5 wk of "altered" resistance training (RT) and concluded that significant muscle size and architectural adaptations can occur in concurrently training athletes in response to a 5-wk training programme. These adaptations were possibly associated with the force and velocity characteristics of the training exercises but not the movement patterns. Factors other than, or in addition to, muscle architecture must mediate changes in strength, sprint, and jump performance. Falk B, *et al*. (2002) [3] documented that resistance training has been shown to be effective in enhancing muscle strength among prepubertal and adolescent boys. Crewther B, *et al*. (2005) [2] documented that a great deal of literature has investigated the effects of various resistance training programmes on strength and power changes. However, the effect of different combinations of kinematic and kinetic variables and their contribution to adaptation is unclear. Goto K, *et al*. (2004) [4] documented that acute and long-term effects of resistance-training regimens with varied combinations of high- and low-intensity exercises were studied and suggested that a combination of high- and lowintensity regimens is effective for optimizing the strength adaptation of muscle in a periodized training program.

Methodology

To facilitate the study, 45 male students from the different schools located at Kanpur, Uttar Pradesh in the age ranged between 15-17 years were selected. The subjects were Handball players who represented their schools in district level sports competitions. The selected subjects were further divided into three groups namely Maximal Resistance Training group (MRTG), Sub maximal resistance training group (SMRTG) and control group (CG), on random basis. Prior to the experimental treatments, all the subjects were measured of their leg strength through vertical jump test and abdominal strength through sit ups test. All the subjects were determined their 1 repetition maximum (1RM) of resistance trainings, half squat, biceps, triceps, bench press, and leg press. The submaximal resistance group was asked to perform 50 to 60 % of 1 RM and maximal resistance group was asked to perform 90 to 95% of 1 RM for 8 weeks. After completion of eight weeks experimental period, the subjects were measured of their strength variables selected. The differences between the initial and final scores were considered as effect of respective treatments and statistically analysed using ANCOVA for significance.

Results

Table 1: Effect of Maximal and Sub Maximal Resistance Training on Leg Strength of Handball Players

	SMRTG	MRTG	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained F
Pre Test	46.07	47.00	45.33	Between	20.93	2	10.47	
Mean				Within	2470.27	42	58.82	0.18
Post Test	51.47	55.13	46.53	Between	558.71	2	279.36	
Mean				Within	1883.20	42	44.84	6.23*
Adjusted Post Test	51.52	4.49	47.13	Between	407.64	2	203.82	
Mean				Within	509.88	41	12.44	16.39*
Mean Diff	5.40	8.13	1.20					

Table F-ratio at 0.05 level of confidence for 2 and 42 (df) =3.22, 2 and 41 (df) =3.23. *Significant

Table 2: Multiple Comparisons of Paired Adjusted Means of Sub Maximal, Maximal and Control Groups on Leg Strength

SMRTG	MRTG	Control	Mean DIFF	Reqd. C. I
51.52	54.49		2.97*	3.33
51.52		47.13	4.39*	3.33
	54.49	47.13	7.36*	3.33

* Significant

Table 3: Effect of Maximal and Sub Maximal Resistance Training on Abdominal Strength of Handball Players

	SMRTG	MRTG	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained F
Pre Test	27.20	27.93	26.93	Between	8.04	2	4.02	
Mean				Within	368.27	42	8.77	0.46
Post Test	30.20	32.80	26.93	Between	259.24	2	129.62	
Mean				Within	285.73	42	6.80	19.05*
Adjusted Post Test	30.31	32.40	27.22	Between	200.05	2	100.03	
Mean				Within	113.11	41	2.76	36.26*
Mean Diff	3.00	4.87	0.00					

Table F-ratio at 0.05 level of confidence for 2 and 42 (df) =3.22, 2 and 41 (df) =3.23.
*Significant

Table 4: Multiple Comparisons of Paired Adjusted Means of Sub Maximal, Maximal and Control Groups on Abdominal Strength

SMRTG	MRTG	Control	MEAN DIFF	Reqd. C. I
30.31	32.40		2.10*	1.57
30.31		27.22	3.08*	1.57
	32.40	27.22	5.18*	1.57

* Significant

Discussions

The results presented in Table 1 and 3 proved that maximal and sub maximal resistance training significantly improved strength parameters, leg strength and abdominal strength of the school Handball players as the obtained F values of 16.39 and 36.26 on adjusted means were greater than the required table F value of 3.23 to be significant at 0.05 level. Since significant F values were obtained, the results were subjected to post hoc analysis and the multiple paired adjusted mean comparisons were presented in Tables 2 and 4 on leg strength and abdominal strength of Handball players. The results proved that both maximal and sub maximal resistance training improved leg strength and abdominal strength of Handball players compared to control group. The results also proved that maximal resistance training was found to be better than sub maximal resistance training in improving the leg strength and abdominal strength. The differences between sub maximal and maximal resistance training in improving the strength parameters were significant. ($P<0.05$). Blazevich AJ, *et al*. (2003) [1] examined changes in the muscle size, muscle architecture, strength, and sprint/jump performances of concurrently training athletes during 5 wk of "altered" resistance training (RT). It was found significant muscle size and architectural adaptations can occur in concurrently training athletes in response to a 5-wk training program. And concluded factors other than, or in addition to, muscle architecture must mediate changes in strength, sprint, and jump performance. This study proved that submaximal and maximal resistance significantly contributed for improving in strength variables mainly due to improvement in muscle size and architectural adaptations. And the more intense the subjects trained improved more leg strength and abdominal strength. The findings of this study are in agreement with the findings of Blazevich AJ, *et al*. (2003) [1]

Conclusions

It was concluded that the maximal and sub maximal resistance training can be included in the training schedule of the school level Handball players as these methods of training improves their strength variables, leg strength and abdominal strength.

References

1. Blazevich AJ, Gill ND, Bronks R, Newton RU. "Training-specific muscle architecture adaptation after 5-wk training in athletes." Med Sci Sports Exerc. 2003;35(12):2013-22.
2. Crewther B, *et al*. "Possible stimuli for strength and power adaptation: acute mechanical responses.", Sports Med. 2005;35(11):967-89.
3. Falk B, *et al*. "The association between adiposity and the response to resistance training among pre- and early-pubertal boys.", J Pediatr Endocrinol Metab. 2002;15(5):597-606.
4. Goto K, *et al*. "Muscular adaptations to combinations of high- and low-intensity resistance exercises.", J Strength Cond Res. 2004;18(4):730-7.
5. Govindarajulu N. "The Importance of Health-related Physical Fitness Through Physical Activities", Paper Presented at the 3rd All India Physical Education Congress (Madras 8-11 October, 1991), 1991.
6. Harris C, *et al*. "Detraining in the older adult: effects of prior training intensity on strength retention.", J Strength Cond Res. 2007;21(3):813-8.