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Effect of High Intensity Strength Training on Measures of Physical Performance among amateur athletes

Kuldeep Singh Yadav[1], Dr. Sangeeta Gupta[2]

[1]PhD Scholar, Shri Venkateshwara University Gajraula, Amroha (U. P.)

[2]Assistant Professor, Shri Venkateshwara University Gajraula, Amroha (U. P.)

Corresponding Author Kuldeep Singh Yadav

Abstract

The objective of the study was to find out the effect of high intensity strength training on selected measures of physical performance. A total of 20 male amateur athletes were selected as subjects for the study age ranging from 25 to 35 years. All the selected subjects were equally divided into two group – experimental group and control group. The experimental group underwent six weeks of high intensity strength training while the control group was not any sort of training during the intervention period. The data of four measures of physical performance – maximum strength (1-Repetition Maximum), explosive strength (standing broad jump), speed (30-m sprint), and agility (modified agility T-test), was collected before and after the completion of training. Descriptive statistics and paired t-test was used to analyse the collected data. The result showed that high intensity strength training is significantly effective in improving the measures of physical performance taken in the study.

Keywords: intensity, strength training, amateur

Introduction

It has been demonstrated that strength training enhances physical performance metrics, making it an essential part of physical fitness. Maximal strength, power, and muscular endurance can all be increased with high volume and high intensity strength training, according to studies looking at how physical training affects performance metrics. On the other hand, there might be differences in the precise outcomes between high volume and high intensity strength training. It has been demonstrated that the main benefits of high volume strength training are gains in muscle endurance and hypertrophy. High volume strength training entails executing a

large number of repetitions or sets at moderate to low intensity. Conversely, it has been demonstrated that maximal strength and power are the main outcomes of high intensity strength training, which entails completing fewer repetitions or sets at a high intensity. Source: The main factor influencing improvements in strength, muscle growth, and localised muscular endurance is intensity.

High-intensity resistance training has been found to stimulate greater improvements in measures of strength and hypertrophy in resistance-trained men over a short-term training period. This investigation compared the effects of high-volume versus high-intensity resistance training on muscle size and strength in resistance-trained men (Mangine et al., 2015). Participants were randomly assigned to either a high-volume or high-intensity training group for an 8-week period. Pre- and post-training assessments included measurements of lean tissue mass, muscle cross-sectional area and thickness, and 1RM strength in specific exercises. Blood samples were also collected to assess the hormonal response to training. The findings of the study indicated that high-intensity resistance training resulted in greater improvements in strength and hypertrophy compared to high-volume training. In conclusion, this study suggests that high-intensity resistance training may be more effective for stimulating muscle size and strength gains in amateur athletes over a short-term training period. Furthermore, the study also suggests that focusing on training intensity rather than volume may provide an advantage for accelerating muscle growth and strength gains in a short-term training cycle.

Additionally, research by Schoenfeld et al. supports the notion that high-intensity resistance training may lead to greater increases in muscle size and strength compared to high-volume training. This aligns with the findings of a study by Goto et al. which demonstrated that focusing on training intensity rather than volume may provide an advantage for accelerating muscle growth and strength gains in a short-term training cycle. Therefore, the aim of this paper is to delve deeper into the effects of high-intensity strength training on measures of physical performance among amateur athletes.

Therefore, the purpose of the study is to investigate the effects of high intensity strength training on selected measures of physical performance among amateur athletes.

Methodology

Selection of Subjects

For the purpose of the study, a total of 20 subjects were selected of age ranging from 25 to 35 years. All the subjects were male and amateur athletes who were involved in regular strength training / weight training from at least last 3 years. The subjects were free from any sort of injury or musculo-skeletal disorder which can limit their ability to perform any test or give their best during testing or training. The selected subjects were equally randomly divided into two groups – Experimental Group and Control Group. The experimental group was given high intensity strength training while the control group was not involved in any sort of training during the intervention period.

Selection of Variables and Administration of Tests

The following measures of physical performance were selected as dependent variables for the study: maximum strength, explosive strength, speed, and agility. Maximum strength was tested using 1-repetition maximum (1-RM) test, explosive strength using standing broad jump (SBJ) test, speed using 30-m sprint test, and agility using Modified Agility T-test (MAT). The subjects were tested for these variables before the start of the training period i.e. pre-test and after the completion of the training i.e. post-test.

1-RM Back Squat Testing: Warm-up exercises were performed by the participant using a self-selected load that enabled them to accomplish at least 6–10 repetitions (around 50% of the expected 1RM). The test administrator determined the subject's recovery period, which might range from one to five minutes. After that, participants choose a weight that permits them to complete three repetitions (around 80% of estimated 1RM) depending on their prior effort. To enable the patient to give it his all in each set, full recovery is provided in between. At this point, participants start going for their 1RM while increasing the weight. You should perform a series of single tries until you reach a 1RM.

Standing Broad Jump: The subject placed their feet slightly apart and stood behind a line drawn on the ground. The forward drive is produced by bending the knees and swinging the arms during the two-footed take-off and landing. The participant aimed to leap as far as they can and land on both feet without tripping over. A total of three trials were given to each subject. From the take-off line to the closest point of touch on the landing (the back of the heels), the measurement is made. Out of three attempts, record the longest distance leaped.

Agility (Modified Agility T-test): The subjects were told to remain with both feet behind cone A's beginning line. Every participant sprinted over to cone B and, using their own discretion, placed a hand on its base. They turned to face forward and did not cross their feet as they approached cone C, placing their left hands on the cone's base. The participants then proceeded to cone D to make a right-handed contact. They turned back to the left as they got closer to the base of cone B. The competitors finally dashed back to cone A. A repeat of the exam was required for any participant who did not touch the base of the cone, place one foot in front of the other, or face forward the entire time. The best of the three trails was considered as the final score.

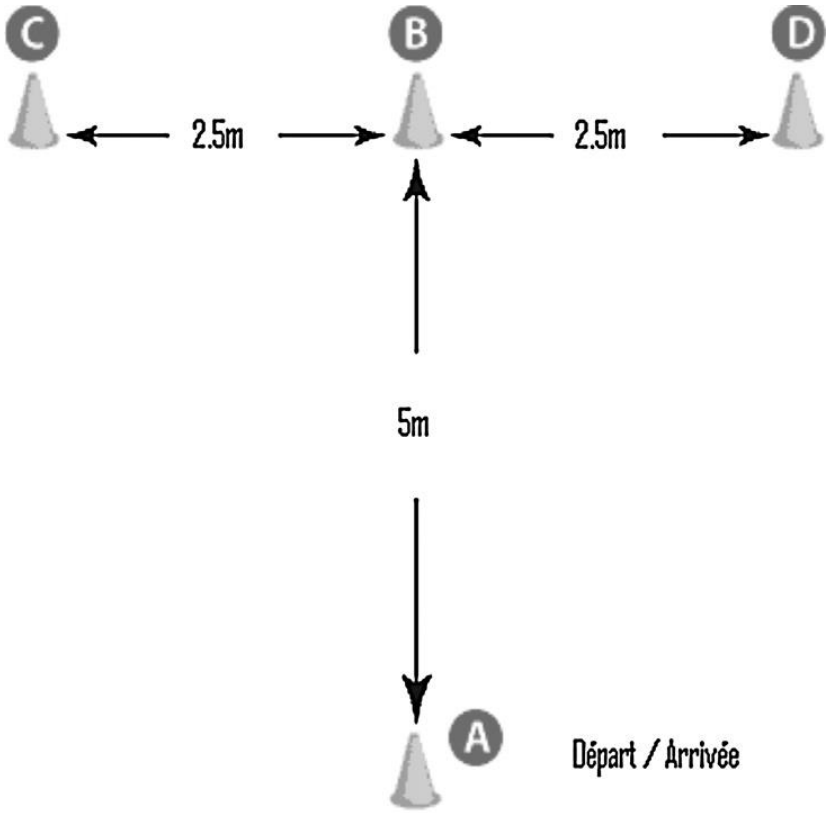

Figure: Illustration of Modified Agility T-test

Training Program

The duration of training program was six weeks. The experimental group was given the below mentioned training program of high intensity nature for six weeks, while the control group was not involved in any training during the same time. The intensity of the training was kept at 80 percent of 1-RM and was increased by 5 percent after every two weeks.

S. No.	Exercise	Sets and Repetitions
1	Prone Leg Curl	4 sets of 10 reps
2	Stiff Leg Deadlift	4 sets of 00 reps
3	Leg Extension	4 sets of 10 reps
4	Squat	3 sets of 10 reps
5	Leg Press	4 sets of 10 reps
6	Lunges	3 sets of 10 reps

Statistical Analysis

For the analysis of the collected data, descriptive statistics i.e. mean and standard deviation were firstly used to understand the nature of the data. Next, the normality of the data was tested using Shapiro-Wilk Test. The data was found to be normal and lastly, to find the effect of different training regimes on selected dependent variables, paired t-test was used at 0.05 level of significance.

Results

This section of the article shows the statistical output of the data analysis.

Table 1: Descriptive statistics (Mean ± standard deviation) for experimental and control group

Variable	Experimental Group		Control Group	
	Pre	Post	Pre	Post
1-RM Test	173.32 ± 16.08	189.22 ± 14.44	163.98 ± 17.83	152.05 ± 19.30
SBJ Test	2.36 ± 0.37	2.61 ± 0.35	2.36 ± 0.28	2.25 ± 0.29
30-m Sprint	5.92 ± 0.49	5.66 ± 0.48	6.25 ± 0.52	6.35 ± 0.59

MAT Test	6.57 ± 0.45	6.39 ± 0.44	6.26 ± 0.42	6.54 ± 0.41

Table 2: Paired t-test analysis for experimental group

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	RM_Pre - RM_Post	-15.90000	4.22979	1.33758	-18.92581	-12.87419	-11.887	9	.000
Pair 2	SBJ_Pre - SBJ_Post	-.25100	.31028	.09812	-.47296	-.02904	-2.558	9	.031
Pair 3	Speed_Pre - Speed_Post	.25700	.15456	.04888	.14643	.36757	5.258	9	.001
Pair 4	Agility_Pre - Agility_Post	.17900	.03985	.01260	.15050	.20750	14.206	9	.000

The above shows that there is significant difference in the pre-test and post-test mean values of experimental group for all dependent variables as the p-value is less than 0.05.

Table 3: Paired t-test analysis for control group

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	RM_Pre - RM_Post	11.93	6.30732	1.99455	7.41801	16.44199	5.981	9	.000
Pair 2	SBJ_Pre - SBJ_Post	.113	.05334	.01687	.07484	.15116	6.699	9	.000
Pair 3	Speed_Pre - Speed_Post	-.096	.08072	.02553	-.15374	-.03826	-3.761	9	.004
Pair 4	Agility_Pre - Agility_Post	-.295	.25088	.07933	-.47447	-.11553	-3.718	9	.005

The above table shows that there is significant difference in the mean values of pre-test and post-test for 1-RM, standing broad jump, and speed as their p-values are less than 0.05. While the p-value of agility is not less than 0.05, hence there is no difference in the pre and post mean values for control group.

Discussion

The study was conducted with the purpose to find out the effects of high intensity strength training on maximum strength, explosive strength, speed, and agility. The duration of the training was six weeks. The collected data was analysed with the help of paired t-test. The results of the study showed that high intensity strength training is significantly effective in improving the maximum strength, explosive strength, speed, and agility, as the experimental group showed significant improvement in the performance of these variables. While the control group's performance significantly declined for maximum strength, explosive strength, and speed, but the agility performance remain unchanged.

In strength training, various methods enhance overall strength, explosive power, agility, and speed, with high volume strength training being notably effective (Mangine et al., 2015). This approach involves performing many repetitions and sets with relatively lighter loads. The primary benefit of high volume strength training is its capacity to induce hypertrophy, the increase in muscle size. When muscles are subjected to extended periods of tension through high reps and sets, this stimulates muscle growth, leading to hypertrophy. Enhanced muscle size from hypertrophy subsequently contributes to improvements in maximum strength, explosive power, agility, and speed.

High-intensity strength training has been shown to be an effective method for improving various aspects of fitness, including maximum strength, explosive strength, and agility. One of the key elements to effective resistance training is the proper prescription of program variables, such as progressive overload, variation, and specificity. Studies have demonstrated that training regimes involving high-intensity exercises, with more than 15 sessions over less than 10 weeks and more than 40 jumps per session, can maximize the probability of obtaining significantly greater improvements in physical performance (Villarreal et al., 2010). Qualified supervision is also essential to ensure the appropriate design and implementation of the training program (Kraemer et al., 2002).

Regarding the specific benefits of high-intensity strength training, research has indicated that it can lead to significant improvements in maximal isometric strength, rate of force development, and postural sway in healthy adults (Prieske et al., 2018). These enhancements in muscular strength and power are associated with corresponding improvements in physical function and athletic performance (Kraemer et al., 2002). Additionally, the combination of different types of plyometric exercises with weight-training has been recommended as an effective strategy for optimizing strength gains (Villarreal et al., 2010).

Conclusion

In conclusion, the available evidence suggests that high-intensity strength training, when properly designed and supervised, can be a highly effective approach for improving various aspects of fitness, including maximum strength, explosive strength, and agility. These benefits are likely due to the specific training stimuli provided by high-intensity exercises, which can lead to adaptations in muscle strength, power, and neuromuscular function. Incorporating high-

intensity strength training into a comprehensive fitness program may be a valuable strategy for individuals seeking to enhance their overall physical capabilities.

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