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

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Abstract

The objective of the study was to find out the effect of high volume 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 volume 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 volume strength training is significantly effective in improving the measures of physical performance taken in the study.

Keywords: volume, strength training, amateur

Introduction

Strength training is a vital component of physical fitness and has been shown to improve measures of physical performance. Studies examining the influence of physical training on measures of physical performance have found that both high volume strength training and high intensity strength training can lead to improvements in maximal strength, power, and muscular endurance. However, the specific effects of high volume strength training and high intensity strength training may differ. High volume strength training, which involves performing a large number of repetitions or sets with moderate to low intensity, has been shown to primarily lead to increases in muscular endurance and hypertrophy. On the other hand, high intensity strength training, which involves performing a lower number of repetitions or sets with high intensity, has been shown to primarily lead to improvements in maximal strength and power. Source:

Intensity is the major stimulus related to changes observed in measures of strength, muscle size, and local muscular endurance. Therefore, individuals who are looking to improve overall muscular endurance and size may benefit from high volume strength training, while those aiming to increase maximal strength and power.

High volume strength training has been a popular approach among amateur athletes looking to enhance their physical performance. The increased focus on this type of training is due to its potential to improve muscular strength, power, and endurance.(Carvalho et al., 2014) By incorporating high volume strength training into their regular workout routines, amateur athletes aim to enhance their overall athletic abilities and achieve peak performance in their respective sports.(Medicine, 2015)

One of the key benefits of high volume strength training is its impact on muscular strength. This type of training involves performing a higher number of sets and repetitions with a moderate to high intensity, leading to muscular adaptation and development.(Information, 2023)(Carvalho et al., 2014) As a result, amateur athletes can experience significant improvements in their strength levels, enabling them to generate more force and power during athletic movements such as sprinting, jumping, and lifting.(Carvalho et al., 2014) Furthermore, high volume strength training also plays a crucial role in enhancing muscular endurance (Mangine et al., 2015).Through consistent training at high volumes, the muscles are subjected to repeated stress and fatigue, which promotes increased muscular endurance.

Additionally, high volume strength training can also contribute to improvements in muscular endurance. By repeatedly engaging the muscles in extended and intense training sessions, athletes can enhance their ability to sustain performance over prolonged periods. This can be particularly beneficial for sports that require sustained physical effort, such as endurance running, cycling, or swimming.(Morici et al., 2016)

Incorporating high volume strength training into their workouts can also have a positive impact on the overall physical performance of amateur athletes. By targeting multiple muscle groups and energy systems, this training approach can lead to comprehensive improvements in athletic abilities, including speed, agility, and overall power output.

Overall, the effects of high volume strength training on measures of physical performance among amateur athletes are significant and multifaceted. By dedicating themselves to this form of training, athletes can unlock their full potential and elevate their performance to new heights.

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In conclusion, the research suggests that high volume strength training has a distinct dose-response relationship with improvements in physical performance among amateur athletes. These improvements include increases in strength, power, rate of force development, muscular endurance, and overall athletic abilities (Mangine et al., 2015).

Therefore, the purpose of the study is to investigate the effects of high volume 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 volume 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.

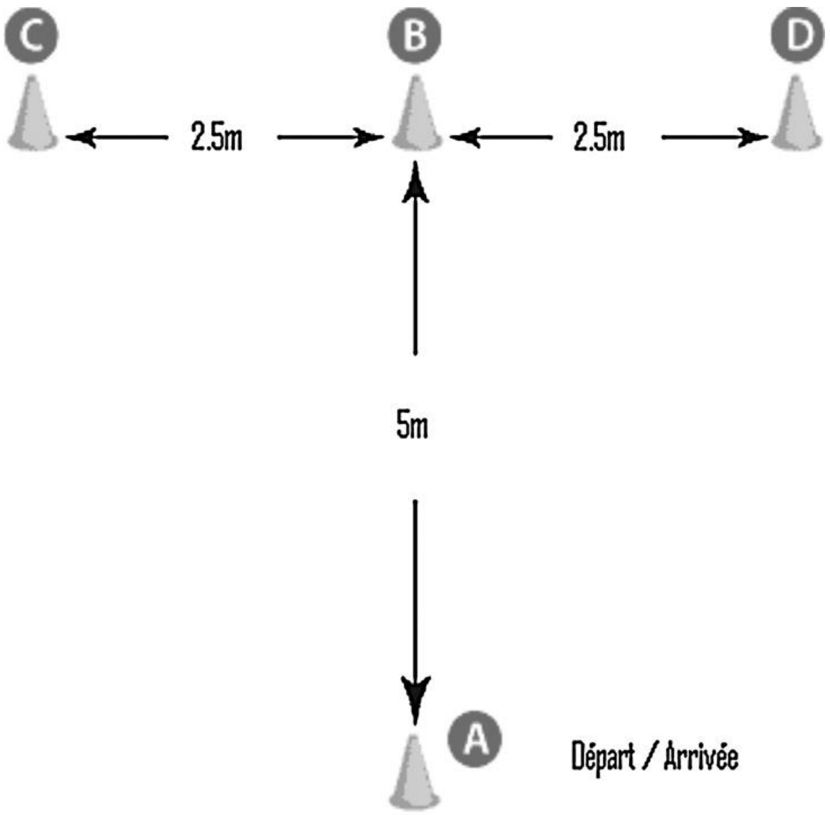

Figure: Illustration of Modified Agility T-test

Training Program

The duration of training program was six weeks. The experimental group was given the below mentioned training program of high volume 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 70 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 20 reps
2	Stiff Leg Deadlift	4 sets of 20 reps
3	Leg Extension	4 sets of 20 reps
4	Squat	3 sets of 20 reps
5	Leg Press	4 sets of 20 reps
6	Lunges	3 sets of 20 reps

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tatistical 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	165.32 ± 19.65	171.97 ± 18.64	163.98 ± 17.83	152.05 ± 19.30
SBJ Test	2.23 ± 0.16	2.29 ± 0.16	2.36 ± 0.28	2.25 ± 0.29
30-m Sprint	6.19 ± 0.69	6.11 ± 0.69	6.25 ± 0.52	6.35 ± 0.59
MAT Test	6.76 ± 0.59	6.70 ± 0.59	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			

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					Lower	Upper			
Pair 1	RM_Pre - RM_Post	-6.650	1.23401	.39023	-7.53276	-5.76724	-17.041	9	.000
Pair 2	SBJ_Pre - SBJ_Post	-.064	.02171	.00686	-.07953	-.04847	-9.324	9	.000
Pair 3	Speed_Pre - Speed_Post	.076	.01776	.00562	.06329	.08871	13.529	9	.000
Pair 4	Agility_Pre - Agility_Post	.063	.02003	.00633	.04867	.07733	9.947	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 volume 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 volume 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 the world of strength training, there are various approaches and methods that individuals can use to improve their overall strength, explosive power, agility, and speed. One highly effective approach is high volume strength training (Mangine et al., 2015).High volume strength training involves performing a large number of repetitions and sets with relatively lighter loads. One reason why high volume strength training is beneficial for improving maximum strength, explosive strength, agility, and speed is that it leads to hypertrophy. Hypertrophy refers to the increase in muscle size and is a result of high volume training. When you perform a high volume of reps and sets with lighter loads, it puts your muscles under more tension for a longer period of time. This increased tension stimulates muscle growth and leads to greater hypertrophy, which in turn improves maximum strength.

In addition to hypertrophy, high volume strength training also improves explosive strength. This is because the high volume of repetitions and sets helps to enhance muscle fiber recruitment and firing rates, leading to more explosive movements. Furthermore, high volume strength training also improves agility and speed. This is due to the fact that high volume training helps to improve muscle endurance and fatigue resistance. By performing a large number of repetitions and sets, your muscles become accustomed to continuous contractions and are able to sustain intense movements for longer periods of time without experiencing as much fatigue. Therefore, when it comes to activities that require quick and explosive movements, such as sprinting or changing directions rapidly, high volume strength training can improve agility and speed by improving muscle endurance and fatigue resistance. Overall, high volume strength training is a highly effective approach for improving maximum strength, explosive strength, agility, and speed.

Conclusion

In conclusion, high volume strength training is a highly effective and beneficial approach for improving various aspects of physical fitness including maximum strength, explosive strength, agility, and speed. Through the stimulation of hypertrophy, enhancement of muscle fiber recruitment, and improvement of muscle endurance and fatigue resistance, high volume strength training leads to significant improvements in overall athletic performance. It is a valuable training method for individuals looking to enhance their strength and athleticism.

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