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Effects of Calisthenics Training on Explosive Strength and Strength Endurance in Handball Players

Dr. Shailesh Kumar Singh*

Assistant Professor, LNIPE, NERC, Guwahati, Assam

Abstract – The study was conducted with the aim of finding effect of calisthenics training on explosive strength and strength endurance in handball players. For conducting this study, a total of 30 male Handball players who were pursuing physical education course in LNIPE, NERC, Guwahati were selected as subjects. The subjects age ranged between 18 to 23 years during the start of training program.

The variables selected for this study were explosive strength and strength endurance. The explosive strength was measured with the help of standing broad jump, while the strength endurance was measured using number of sit-ups completed in a duration of one minute. The study was conducted for a period of six weeks on a pre-test and post-test basis, where a pre-test measurement was conducted before the start of the training program and post-test measurement were conducted after the completion of training program. The measurements were conducted by the same researchers to maintain consistency during data collection.

A paired sample t-test was used to investigate the effects of calisthenic training on strength and strength endurance. The results of the study indicated a significant difference in both strength (p = 0.0471) and strength endurance (p = 0.0032) in the subjects after a training intervention of 6 weeks. This significant improvement shows that calisthenics can be used to improve strength and strength endurance in male undergraduate students.

Keywords: Training, Power, Jumps, Stamina

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INTRODUCATION

Training is a program of exercises designed to improve the skills and increase the energy capacities of an athlete for a particular event (Edward 1984). The term 'Training' is widely used in sports. Some experts especially belonging to sports medicine understand sports training as doing physical exercise. Training is the total process of preparation of a sportsman through different means and forms for better performance.

The very purpose of the training program is an aid in the development of acceptable levels of health – and health related physical fitness and promote the acquisition of basic movement skills. To achieve these things, training should have some basic principles. Of these, the most basic principle of training is overload. Most physiological systems can adapt to functional demands that exceed these encountered in normal daily life. Training often systematically exposes selected physiologic systems to intensities of work or function that exceed those to which the system is already adapted. The required frequency of training however depends on the season, the athlete, activity and the specific component of fitness. There is no substitute for consistency in a training program. The athlete might participate in endurance training six times a week and resistance training three times a week. Specificity means the effects of training that are highly specific to the participation of the physiologic system overloaded, to the particular muscle groups used, and to the particular muscle fibres performing the work progression. The training program must progress over several years of participation, so that the appropriate physiological systems will continue to be overloaded. However, too rapid an increase of the training stress may lead to exhaustion and impaired performance. Factors such as age, sex, maturity, current fitness level, years of training, body size, and psychological characteristics of the individual should be considered by the coach in designing each athlete's training regimen. In large groups in which absolute individualization of training programs may be impractical, the coach should strive for individualization by homogeneously grouping the athletes. Success in competitive sports and games can be attributed to many factors and training being

one of the most important factors. Different training methods have been commonly used to improve physical fitness and it is related to the standards of performance of athletes. The common training methods are Weight training, Hypoxic training, Aerobic training, Anaerobic training, Circuit training, and Fartlek training. Out of these trainings, the researcher has investigated the “Circuit training program among university sportsmen”. Circuit training includes high knee action, Push-ups, Squat jump, Sit-ups, Split jump, medicine ball exercise.

Intensity refers to the quantitative, rather than the qualitative aspect of stimulation and experience. For example, the magnitude or amplitude of sound waves as distinguished from their frequency (Hawely, J 2008). Circuit training is a “series of exercises performed in a sequence or a circuit with one exercise at each station. You move from one exercise to the next, performing one set of each exercise until you have completed every exercise in the circuit once. The entire circuit may then be repeated. A circuit usually is completed one to three times during a training session”. Studies show that circuit training helps to achieve goals and maintain longer than other forms of exercise or diet.

Circuit training is a fast-paced class in which you do one exercise for 30 seconds to 5 minutes and then move on to another exercise. It’s like a game of musical chairs: Everyone begins at a station (that is, a place where an exercise is done), and when the instructor yells “Time!” everyone moves to the next free station. Some classes alternate an aerobic activity (like stepping or stationary cycling) with a muscle-strengthening activity (like using weight machines). Others focus exclusively on muscle toning or aerobic exercise.

METHOD

For the purpose of this study thirty (30) male Handball players of age ranging between 18-23 years were selected from LNIPE, NERC, Guwahati. The collection of Explosive Strength and Strength Endurance data were selected randomly. The subjects were randomly assigned to the groups.

Standing Broad Jump: The subject stand behind the take-off line and asked subject to bend backward before the execution of jump. Then the subject jumped forward by extending the knees and swings the arms forward and upward simultaneously. Measurement will be taken from the heel impression closest to the take-off line to the inner edge of the take-off line. The subject executed take off from both the feet and jumped as ahead as possible and landed on both the feet. Three trials were permitted. The score in the best of the three distances will be recorded in meters.

Sit-ups: Clean floor mat or dry turf and stopwatch. Description: The pupil lies on his back with his knees bent feet on the floor and heels not more than 12 inches from the buttocks. The angle at the knees should be less than 90 degrees. The pupil puts his hands on the back of his neck with fingers clasped and places his elbows squarely on the mat floor or turf. His feet am held by his partner to keep them in touch with the surface. The pupil tightens his abdominal muscles and brings his head and elbows forward as he curls up. finally touching elbows to knees. This action constitutes one sit-up. The pupil returns to the starting position with his elbows on the surface before he sits up again. The timer gives the signal "ready-go." and the sit-up performance is started on the word "go." Performance is stopped on the word "stop." The number of correctly executed sit-ups performed in 60 seconds shall be the score. Only one trial shall be allowed unless the teacher believes the pupil has not had a fair opportunity to perform. 2. No resting between sit-ups is permitted. 3. No sit-ups shall be counted in which the pupil does not (a) keep the fingers clasped behind the neck. (b) bring both elbows forward in starting to sit up without pushing off the floor with an elbow: or (c) return to starting position. with elbows flat on the surface, before sitting up again.

Table 1. Description of callisthenic exercises per week

1st Week	2nd Week	3rd Week
1. Alternative leg movement. 2. Crouch sit position with hop. 3. Trunk forward bending and back 4. Trunk bending and sideway (left and right) 5. Push – ups	1. Squat 2. Front kick 3. Spot marching with arm swing 4. Sit ups straight legs 5. Power plank	1. Jumping jack 2. Crouch sit position with a hop 3. Back curling 4. Trunk forward bending and back 5. Power plank
4th Week	**5th Week**	**6th Week**
1. Squat 2. Front kick 3. Back curling 4. Sit ups straight legs 5. Spot marching with swing	1. Alternate leg movement. 2. Crouch sit position with hop. 3. Trunk forward bending and back 4. Trunk bending and sideway (left and right) 5. Push ups	1. Squat 2. Front kick 3. Back curling 4. Sit ups straight legs 5. Power plank

Statistical Analysis

For the purpose of the study paired sample “t” test was used to determine the effects of calisthenics training on explosive strength and strength endurance in Handball players.

RESULTS

Means and standard deviations of variables are presented below. The table-1 gives different statistics which may be used by the readers for their reference and review work, while Table 2 shows the t-test on standing broad jump

Table 1. Paired Samples Statistics for standing broad jump

	Mean	N	Std. Deviation	Std. Error Mean
SBJ_Pre	2.4693	30	.21340	.03896
SBJ_Post	2.5787	30	.22743	.04152

Table 2. Paired Samples Test for standing broad jump

	Paired Differences					t	Df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
SBJ_Pre - SBJ_Post	-.0093	.08925	.01629	-.04266	.02399	-.573	29	.0471

From the above table it can be seen that the p-value for paired sample t test is 0.0471 which is less than 0.05, hence there is a significant difference in the pre-test and post-test standing broad jumps.

Also, table 3 shows the sample statistics of subjects in sit-ups during 1 minute's duration, while table 4 shows the t test results of sit-ups.

Table 3. Paired Samples Statistics for sit-ups in 1 minute

	Mean	N	Std. Deviation	Std. Error Mean
Situps_Pre	52.9345	30	3.4352	1.896
Situps_Post	58.7845	30	4.2246	1.152

Table 2. Paired Samples Test for sit-ups

	Paired Differences					t	Df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Situps_Pre - Situps_Post	-5.8500	3.2342	1.6921	-1.0021	3.0929	-.765	29	.0032

From the above table, it can be seen that the p-value of paired sample t-test is 0.0032 which is less than 0.05, and hence, there is a significant difference in pre-test and post-test measurements in sit-ups as well.

DISCUSSION

In the present study both the standing broad jump and sit-ups per minute significantly improved following the calisthenics training program. One of the reasons for this significant improvement may be due to the fact that, calisthenics training used in this study involved exercises which replicated the standing broad jump and sit-ups. Also, majority of the exercise were designed such that it improved lower body power and develop the core strength. Previous studies have also found similar improvements in physical performance through circuit training programs (Alcaraz et al. 2008; Dean et al. 2000; Hofstetter et al. 2012)

CONCLUSION

Based on the analysis and within the limitations of the study, the following conclusions can be drawn:

1. Improvement of lower body strength can be done using calisthenics training program as used in this study.

2. Also, improvement of strength endurance can be achieved using high intensity calisthenics training program as used in this study.

3. Six weeks intervention is sufficient to improve both the variables selected in this study.

4. Requirement of heavy and costly equipments is not necessary if a systematic periodized calisthenics training program is used.

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Corresponding Author

Dr. Shailesh Kumar Singh*

Assistant Professor, LNIPE, NERC, Guwahati, Assam