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ANALYSIS OF THE CHANGES ON SPEED RESPONSE TO UNILATERAL AND BILATERAL COMPLEX TRAINING AMONG YOUNG ATHLETES

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Abstract:

The purpose of the present study was to analysis of the changes on speed response to unilateral and bilateral complex training among young athletes. To achieve the purpose of the study, forty-five young athletes aged between 15 and 18 years were selected as subjects and randomly divided into three equal groups of fifteen each. Group-I underwent unilateral complex training, Group-II underwent bilateral complex training, and Group-III served as the control group. The training programme was conducted for a period of twelve weeks following a two-week familiarization programme. Speed was selected as the dependent variable and assessed before and after the training programme. The collected data were statistically analyzed using paired 't' test and Analysis of Covariance (ANCOVA). The results revealed significant improvements in speed among the experimental groups compared to the control group. The obtained paired 't' values for unilateral complex training and bilateral complex training groups were 18.581 and 5.504 respectively, which were greater than the required table value of 2.20 at 0.05 level of significance. The ANCOVA results also indicated significant differences among the groups, as the obtained adjusted post-test 'F' value (18.774) was higher than the required table value of 2.82 at 0.05 level of confidence. Further, Scheffe's post hoc test confirmed significant mean differences between the groups. The percentage of improvement in speed was 4.48% for the unilateral complex training group and 4.88% for the bilateral complex training group. The study concluded that both unilateral and bilateral complex training significantly improved speed among young athletes. However, bilateral complex training was found to be more effective in improving speed performance.

Key Words: Unilateral Complex Training, Bilateral Complex Training, Speed, Young Athletes and Plyometric Training.

Introduction:

High sports performance can be achieved through sports training through the scientific and systematic application of training methods. Training refers to a variety of physical exercises as well as other objects, methods, and procedures used to improve, maintain, and recover performance capacity and performance readiness (Singh, 1991). The Scientific Training Program is now universally recognized as one of the most important factors in the pursuit of high-level athletic performance. As a result, all sports have attracted the attention of a large number of scientists and coaches in order to develop new training methods in order to achieve peak performance. As a result, different approaches to designing training loads have been adopted, resulting in a situation in which comparable levels of performance have been achieved. As a result, it is necessary to clearly define the scope of each training system, as well as the potential benefits of developing a training program schedule for the development of various systems. Training causes physiological changes in almost every system of the body, most notably the skeletal muscles and cardiopulmonary system. Training-induced changes are influenced by the frequency, duration, and intensity of the training program, as well as by heredity. Training has different effects depending on the type of exercise performed, the muscle groups involved, and the type of training program used. Training and exercise have two broad physiological bases: metabolic and neuromuscular. After several weeks of detraining, the effect of training is lost. Maintenance programs consisting of one or two days of exercise per week can keep training effects going. Previous training has no effect on the magnitude or rate of gain of training effects caused by a subsequent training program (Edward, 1984).

Training has different methods of application with varying durations and intensities that promote different stimuli, both mechanical and metabolic (Ozaki et al., 2014). Aerobic and anaerobic training are highlighted and defined among the various classifications of physical training based on their metabolic dominance. Aerobic training is low-intensity and long-duration, as opposed to anaerobic training, which is high-intensity and short-duration (Castoldi et al., 2013). The goal of the sports training program is to produce metabolic, physiological, and psychological adaptations that will allow the athlete to perform at a high level. When training increases the demand for aerobic energy, the size of muscle mitochondria increases, resulting in larger and more numerous chemical factories where aerobic metabolism occurs. These will assist athletes in producing more energy through aerobic metabolism. The first step in the adaptation process is to create a need for more aerobic energy. Training must be sufficient in terms of both duration and intensity. The second step is to supply nutrients for the formation and repair of mitochondrial tissues. Third, the athlete must be given enough rest to regain energy as a form of super compensation. There are various types of training available to help one achieve the necessary development.

Importance of Unilateral and Bilateral Plyometric Training:

Plyometric exercises are commonly used in soccer training because they can be easily performed and combined with other sport-specific explosive activities, while they do not require a lot of space, time and equipment (Faigenbaum et al., 2007; Michailidis et al., 2013). Competitive soccer performance requires high levels of agility, power and efficient usage of the stretch-shortening cycle, during short-duration maximal efforts (Thomas et al., 2009; Ramirez-Campillo et al., 2018; Ribeiro et al., 2019). In high-level soccer, a research study showed that elite players selected for the national team, were superior in the above variables than the non-selected players (Ramirez-Campillo et al., 2015). Plyometric exercises improve these physical abilities and consequently could fit into soccer training organization to improve performance in movements such as changes of direction, accelerations and decelerations (Michailidis et al., 2013).

Jumping and hoping are fundamental skills in several sports and, therefore, plyometric training may be an appropriate training intervention for improving performance in preadolescent athletes (Johnson et al., 2011). It is recommended that young athletes should start plyometric training with their own body weight and avoid high impact plyometric exercises (depth jumps, because of the high injury risk for bones and tendons (Fatouros et al., 2000; Michailidis et al., 2013). In order to implement a complete plyometric training program, coaches should take into consideration athletes' age and the level of experience, as well as their injury records (Davies et al., 2015). In addition, the fundamental principle of progressiveness on sets and repetitions of strength training should always be followed in order to avoid training overload, especially in preadolescent athletes (Davies et al., 2015). Stretch-shortening cycle (SSC) muscle actions like plyometric training (PT) exercises do provide such training stimuli and are well-established techniques for enhancing athletic performance in strength and power events (Markovic, 2007; Saezde-Villarreal, Requena & Cronin, 2012; Saezde- Villarreal, Requena & Newton,2010). Here, the effectiveness of a plyometric method could be attributed to factors such as eccentric overloading, segmental coordination, muscle power, and specificity according to joint angle and angular velocities (Schmidtbleicher, 1992). However, to the best of the authors' knowledge, a limited number of studies have established optimum PT design for varied forceful and explosive actions, such as sprinting, jumping, kicking, turning, and changing pace (De-Villarreal, 2009).

Methodology:

Selection of the Subjects:

To achieve the purpose of the present study, forty-five young athletes in the age group of 15 to 18 years were selected as subjects. The selected subjects were randomly divided into three equal groups, each consisting of fifteen subjects. Group-I underwent unilateral complex training, Group-II underwent bilateral complex training, and Group-III served as the control group. Prior to the commencement of the twelve-week training programme, all subjects participated in a two-week familiarization programme consisting of resistance and plyometric training sessions. The purpose of the familiarization sessions was to acquaint the subjects with the exercises and training procedures used in the study.

Selection of Variables:

Independent Variables:

- Unilateral complex training (Resistance & Plyometric exercises).
- Bilateral complex training (Resistance & Plyometric exercises).

Dependent Variables:

- Speed

Research Design:

The purpose of the present investigation was to analysis of the changes on speed response to unilateral and bilateral complex training among young athletes.. To achieve the purpose of the study, forty-five young athletes in the age group of 15 to 18 years were selected as subjects. The selected subjects were randomly divided into three groups, each consisting of fifteen subjects. Group-I underwent unilateral complex training, Group-II underwent bilateral complex training, and Group-III served as the control group, which did not participate in any specific training programme apart from their regular activities. Prior to the commencement of the twelve-week training programme, all subjects participated in a two-week familiarization training programme. During this period, the subjects performed four resistance and plyometric training sessions in every two weeks, including two bilateral and two unilateral exercise sessions. The purpose of the familiarization programme was to acquaint the subjects with the exercises and training procedures used in the intervention programme. Pre-test measurements on speed were recorded before the administration of the training programme, and post-test measurements were taken after the completion of the twelve-week intervention period. The collected data were statistically analyzed by applying the Paired 't' Test and Analysis of Covariance (ANCOVA) to determine the significant differences among the groups.

Analysis of Speed:

The descriptive analysis of the data showing mean and standard deviation, range, mean differences, 't' ratio and percentage of improvement on speed of experimental groups are presented in table 1.

Table 1: Descriptive Analysis of the Pre and Post Test Data and 't' Ratio on Speed of Experimental Groups

Group	Test	Mean	Standard Deviation	Std. Error Mean	Mean Differences	't' Ratio	Percentage of Changes
Unilateral Complex Training	Pre Test	4.4413	.52052	.13440	0.164	18.581*	4.48%
	Posttest	4.2773	.50813	.13120			
Bilateral Complex Training	Pre Test	4.3847	.41816	.10797	0.370	5.504*	4.88%
	Posttest	4.0147	.36551	.09437			
Control Group	Pre Test	4.3833	.50457	.13028	0.013	0.334*	0.27%
	Post Test	4.3967	.51494	.13296			

Table t-ratio at 0.05 level of confidence for 14 (df) =2.20
*Significant

Table-I shows that the mean, standard deviation, range and mean difference values of the pre and post test data collected from the experimental group on speed. Further, the collected data was statistically analyzed by paired 't' test to find out the significant differences if any between the pre and post data. The obtained 't' values of performance determinants of Young athletes and control groups are 18.581, 5.504 respectively which are greater than the required table value of 2.20 for significance at 0.05 level for 14 degrees of freedom. It revealed that significant differences existed between the pre and post test means of experimental groups on speed. The result of the study also produced 18.581% of improvement due to unilateral complex training, 5.504% of improvement due to bilateral complex training. The pre and post test data collected from the experimental and control groups on speed is statistically analyzed by using analysis of covariance and the results are presented in table 2.

Table 2: Analysis of Covariance on Speed of Experimental and Control Groups

	Unilateral Complex Training Group	**Bilateral Complex Training Group**	**Control Group**	**SoV**	**Sum of Squares**	**df**	**Mean squares**	**'F' ratio**
Pretest Mean	4.81	4.79	4.89	B	0.058	2	0.019	0.22
SD	0.30	0.39	0.24	W	3.947	57	0.090	
Posttest Mean	4.46	4.41	4.91	B	2.725	2	0.908	18.45*
SD	0.31	0.19	0.18	W	2.166	57	0.049	
Adjusted Posttest Mean	4.243	4.031	4.415	B	1.105	2	.553	18.774*
				W	1.207	41	.029	

Table F-ratio at 0.05 level of confidence for 2 and 57 (df) = 2.82, 2 and 56 (df) = 2.82

*Significant

Table 2 shows that the pre-test means and standard deviation on speed of unilateral complex Training and bilateral complex training and control groups are 4.81 + 0.30, 4.79 + 0.39, and 4.89 + 0.24 respectively. The obtained 'F' value 0.22 of speed is lesser than the required table value of 2.82 at 2, 57 df at 0.05 level of confidence, which proved that the random assignment of the subjects were successful and their scores on speed before the training were equal and there was no significant differences. The post-test means and standard deviation on speed of unilateral complex Training and bilateral complex training and control groups are 4.46 + 0.31, 4.41 + 0.19, and 4.91+ 0.18 respectively. The obtained 'F' value of 18.45 on speed is greater than the required table value of 2.82 at 3, 44 df at 0.05 level of confidence. It implied that significant differences exist between the three groups during the post test on speed.

The adjusted post-test means on speed of unilateral complex Training and bilateral complex training and control groups are 4.47, 4.44, and 4.87 respectively. The obtained 'F' value of 53.35 on speed is greater than the required table value of 2.82 of 3, 43 df at 0.05 level of confidence. Hence, it is concluded that significant differences exist between the adjusted post test means of unilateral complex Training and bilateral complex training and control groups on speed. Since, the obtained 'F' value in the adjusted post test means is found to be significant, the Scheffe's test is applied as post hoc test to find out the paired mean difference, and it is presented in table 3.

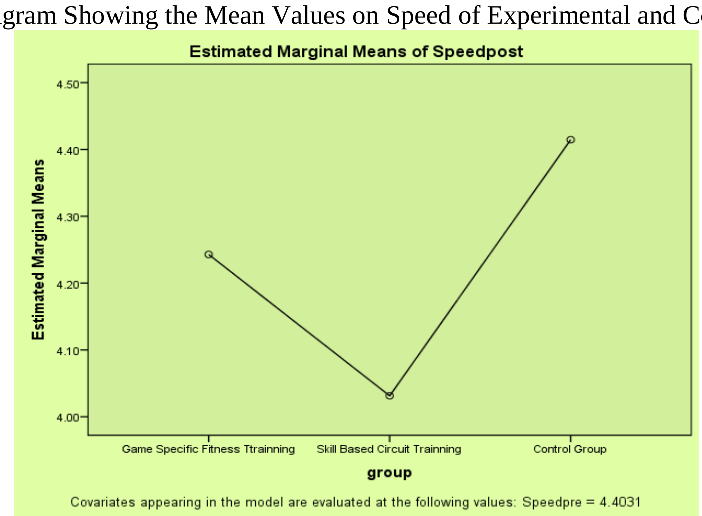
Table 3: Scheffe's Post Hoc Test for the Differences among Paired Means of Experimental and Control Groups on Speed

Unilateral Complex Training Group	**Bilateral Complex Training Group**	**Control Group**	**Mean Difference**	**Confidence Interval**
4.243	4.031		0.212*	0.15
4.243		4.415	0.172*	0.15
	4.031	4.415	0.383*	0.15

*Significant at .05 level

As shown in table 3 the Scheffe's post hoc analysis proved that significant mean differences existed between unilateral complex training and control groups, unilateral complex Training and bilateral complex training groups, bilateral complex training and control groups, on speed. Since, the mean differences 0.212 0.172, 0.383 were higher than the confident interval value of 0.15 at 0.05 level of significance. Hence, it is concluded that due to the effect of unilateral complex Training and bilateral complex training the speed of the subjects is significantly improved. However, bilateral complex training is better than unilateral complex Training. The pre, post and adjusted post test mean values of experimental and control groups on speed is graphically represented in figure 1.

Figure 1: Diagram Showing the Mean Values on Speed of Experimental and Control Groups



Conclusion:

It was concluded that due to the effect of unilateral complex Training and bilateral complex training the speed of the subjects is significantly improved. It is also concluded that bilateral complex training is better than specific fitness Training. The result of the study also produced 4.48% of improvement due to unilateral complex Training, 4.88% of improvement due to bilateral complex training.

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