# Effect of Six-Week Plyometric Training Programme on Selected Variables of Free Style Swimming Performance

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## ABSTRACT

*Aim of the present study was to see effect of plyometric training on free style Swimming performance and performance variables. The study was conducted on 30 swimmers of 14 to 17 year age group. The subjects were divided in to two equal groups as control and experimental groups. The average height and weight, of the control and experimental group, was 161.13+8.18, 57.0+6.34 and 166.26+9.92, 59.86+11.83, respectively. Upper and lower body plyometric exercises were used for the experimental group, for 6 weeks; and control group, participated in routine Swimming activities. Pre and post test values for speed of the start (m/s), speed of the turn (m/s), stroke frequency, stroke length (m) and performance of 50m free style (sec) were recorded. 't' test was applied to find out the significant difference between pre and post training values. The analysis of data revealed a significant improvement in speed of start (t=2.667), stroke frequency (t=4.111), speed of the turn (t=2.197), performance (t=.721); but, the stroke length didn't yield a significant difference (t=1.504) in treatment group. The control group showed a significant difference in stroke frequency (t=3.350), and speed of turn (t=3.079) and the rest didn't yield a significant difference between pre and post values. The findings from the statistical analysis conclude that plyometric training programme results into significant improvement in various performance variables in free style young swimmers.*

## INTRODUCTION

In competitive Swimming, the fundamental goal is to cover a set distance in the least amount of time (Adrain & Cooper, 1995). The new standard of the Swimming records, at the pool, are mainly a result of research being conducted by scientists and coaches for the decrease in amount of time variable. The qualities required for good performance are identified in all the events and these qualities (motor abilities) are improved, leading to better performance.

Bucher (1972) said that learning of a skill that must be developed if an individual is to succeed in sports competition and the main physical qualities considered relevant to achieve success are strength, endurance, speed, agility and flexibility.

To develop strength, speed and endurance effectively various sports scientists have chalked out different

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training methods. Some of them prefer resistance training, some like training without weights and few like combination of both (Hooks,1973).

Strength is considered to be an important motor component in achieving better performance in short duration events. The importance of start and achieving quick acceleration and turning cannot be underestimated in free style Swimming events. Although, all the race distances start with a competition start; but, the free style events start from the starting block; and this skill requires explosiveness for a good start.

A "good" start off the Swimming starting block requires fast reaction time; explosive power generated in both the vertical and horizontal axes; and low resistance (drag), during the water entry/underwater gliding phase. In the 50-meter freestyle race, the start, off the blocks, accounts for approximately 30 percent of the entire race time. Improvements in a swimmer's start can lead to significant improvements in race time and overall performance. One way to improve a swimmer's start is to increase lower body strength and power generation capabilities. This can be accomplished through the addition of plyometric drills to the team's dry land training regimen.

In addition to start and turn, the stroke length and stroke frequency are the other important variables, determining 50 m free style Swimming performance.

Phil (1994) said that Plyometric training is an excellent method of developing of body explosive strength. It offers rich variation of exercise and load structure. Any activities that activate the strength reflex mechanism is plyometric exercise. Plyometric exercise is based upon the belief that a rapid lengthening of a muscle, just prior to the contraction, will result in much stronger contraction. The present study was an effort to see the effect of plyometric exercises on free style Swimming performance variables.

**METHODOLOGY**

The subjects, for the present study, were 30 male swimmers of 14 to 17 years of age. The subjects were divided in to two equal groups as control and experimental groups. The average height and weight of the control and experimental group was 161.13+8.18, 57.0+6.34 and 166.26+9.92, 59.86+11.83, respectively.

The 57.5m Swimming test was conducted to collect the information regarding speed of the start, speed of the turn, stroke frequency and stroke length performance variables. In addition to this, 50 meter timing was also recorded.

A training programme consisting of six plyometric exercises was designed and executed, twice a week, for six weeks.

The 't' test was applied to find out the statistical difference between pre and post test values and 0.05 level of significance.

## Training Programme for 6 Weeks

| 1st Week (Mon. & Fri.) | 2nd Week (Mon. & Fri.) | 3rd Week (Mon. & Fri.) | 4th Week (Mon. & Fri.) | 5th Week (Mon. & Fri.) | 6th Week (Mon. & Fri.) |
|---|---|---|---|---|---|
| 1. PUSH UP (5 Reps x 2 set x 4 min rest between sets) | 1. PUSH UP (5 Reps x 2 set x 4 min rest between sets) | 1. INCLINED PUSH UP (5 Reps x 2 set x 4 min rest between sets) | 1. INCLINED PUSH UP (5 Reps x 2 set x 4 min rest between sets) | 1. INCLINED PUSH UP WITH (5 Reps x 2 set x 4 min rest between sets) | 1. INCLINED PUSH UP WITH DEPTH JUMP (5 Reps x 3 set x 4 min rest between sets) |
| 2. BACK RAISE (5 Reps x 2 set x 4 min rest between sets) | 2. BACK RAISE (5 Reps x 2 set x 4 min rest between sets) | 2. LOWER BACK RAISE (LIFT BOTH LEGS) (5 Reps x 2 set x 4 min rest between sets) | 2. LOWER BACK RAISE (LIFT FROM HEIGHT) WITH PARTNER HOLDING LEGS (5 Reps x 2 set x 4 min rest between sets) | 2. LOWER BACK RAISE WITH PARTNER HOLDING LEGS (5 Reps x 3 set x 4 min rest between sets) | 2. LOWER BACK RAISE FROM HEIGHT WITH PARTNER HOLDING LEGS (5 Reps x 3 set x 4 min rest between sets) |
| 3. MEDICINE BALL THROW (5 Reps x 2 set x 4 min rest between sets) | 3. MEDICINE BALL THROW (5 Reps x 2 set x 4 min rest between sets) | 3. MEDICINE BALL THROW (5 Reps x 2 set x 4 min rest between sets) | 3. MEDICINE BALl THROW (5 Reps x 2 set x 4 min rest between sets) | 3. MEDICINE BALL FORWARD THROW (5 Reps x 3 set x 4 min rest between sets) | 3. MEDICINE BALL FORWARD THROW (5 Reps x 3 set x 4 min rest between sets) |
| 4. SIT UPS (5 Reps x 2 set x 4 min rest between sets) | 4. SIT UPS (5 Reps x 2 set x 4 min rest between sets) | 4. SIT UPS (5 Reps x 2 set x 4 min rest between sets) | 4. SIT UPS HANDS HANDS HOLDING BEHIND NECK (5 Reps x 2 set x 4 min rest between sets) | 4. SIT UPS CURLING (5 Reps x 3 set x 4 min rest between sets) | 4. SIT UPS LEG CURLING (5 Reps x 3 set x 4 min rest between sets) |
| 5. ALTERNATIVE LEG RAISE (5 Reps x 2 set x 4 min rest between sets) | 5. ALTERNATIVE LEG RAISE (5 Reps x 2 set x 4 min rest between sets) | 5. LEG RAISE (BOTH) (5 Reps x 2 set x 4 min rest between sets) | 5. LEG RAISE (BOTH) (5 Reps x 3 set x 4 min rest between sets) | 5. LEG RAISE (BOTH) (5 Reps x 4 set x 4 min rest between sets) | 5. LEG RAISE (BOTH) (5 Reps x 3 set x 4 min rest between sets) |
| 6. DOUBLE LEG SPOT JUMP (5 Reps x 2 set x 4 min rest between sets) | 6. ALTERNATIVE STEPING ON STEPS (10 Reps x 2 set x 4 min rest between sets) | 6. DOUBLE LEG SPOT JUMP ON STEP (5 Reps x 2 set x 4 min rest between sets) | 6. SINGLE LEG SPOTJUMP RT. & LT. (5 Reps x 2 set x 4 min rest between sets) | 6. HOPPING (Rt. & Lt.) (5 Reps x 2 set x 4 min rest between sets) | 6. HOPPING (Rt. & Lt.) (5 Reps x 2 set x 4 min rest between sets) |

Note:1.1 kg medicine ball was used 2. Both legs in air during sp[illegible]mp 5 Minimum 12 inch leg lift during Leg Raise

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## RESULTS & DISCUSSION

**Table-1: Mean, SD and 't' value difference between pre and post test in speed of start, stroke frequency, speed of turn, stroke length and 50 m performance (Experimental Group)**

| Variable | Pre | Post | SD | 't' | Sig. |
|---|---|---|---|---|---|
| Speed of start | 2.1367 | 2.2293 | .13456 | *2.667 | .018 |
| Stroke frequency | 49.0740 | 51.4280 | 2.21768 | *4.111 | .001 |
| Speed of turn | 1.3033 | 1.3513 | .08462 | *2.197 | .045 |
| Stroke length | 1.4967 | 1.4380 | .15108 | 1.504 | .155 |
| 50 m Performance | 36.5433 | 36.1673 | 2.01962 | .721 | .483 |

*significant, 't' ratio required at .05 level with 14 df was 2.145.

**Table-2: Mean, SD and 't' value difference between pre and post test in speed of start, stroke frequency, speed of turn, stroke length and 50 m performance (Control Group)**

| Variable | Pre | Post | SD | 't' | Sig. |
|---|---|---|---|---|---|
| Speed of start | 2.6780 | 2.5667 | .24591 | 1.753 | .101 |
| Stroke frequency | 54.0547 | 58.2027 | 4.79580 | *3.350 | .005 |
| Speed of turn | 1.1707 | 1.0253 | .182 | *3.079 | .008 |
| Stroke length | 1.4480 | 1.3960 | .11675 | 1.725 | .107 |
| 50 m performance | 35.2627 | 35.4693 | .85312 | .938 | .364 |

*significant at .05 level with 14 df was 2.145.

Results presented in Table 1 & 2 show the difference between pre and post test values in the experimental group for the following variables, i.e, speed of start, speed of turn, stroke frequency, stroke length and 50 m free style Swimming performance.

The difference between the pre and post test in the speed of the start after six week plyometric training, with the obtained 't' value (2.667), was found to be greater than the. Table value (2.145) at .05 level. The result could be attributed to the fact that, when the swimmers trained on the

plyometric training, their leg muscles are frequently contracting against the resistance, forcefully. During the training, probably the swimmers got their leg muscles stronger and become agile, to follow the training programme. Similar studies were found in the Dutko,1993, and Tony,1965, where the leg explosive strength is improved through plyometric training.

Table value shows that there is a significant difference between pre test and post test in the stroke frequency, as the obtained 't' value (4.111) was greater than the Table value (2.145), at .05 level. Most probably, the improvement of arms and shoulder muscles lead to increase the stroke frequency of the swimmer. This improvement may also be due to increased frequency of the leg kick during the swim. Similar studies were found in Renner, 1963 and Eugen, 1968.

The 't' value (2.197) obtained shows that a significant difference exists between the pre and post test values on the speed of the turn. The result could be attributed to the fact that when the plyometric training or explosive strength training is carried out the leg muscles are the important group of muscles to be stronger and agile. The reason behind this may be the perfection in special, temporal and dynamic characteristics of skill. Similar results were found in studies by Phil, 1989, and Hilburn, 1964.

There is negative correlation between stroke length and stroke frequency (Bhullar,1993). A non-significant difference in stroke length, after the six-week plyometric training (1.504), may be due to increase in the stroke frequency. Because the plyometric training are special exercise for improving explosive strength, where the quick action and reflex action movement are involved. If there is no change in Swimming performance, even after improvement in stroke frequency, it indicates that there is deterioration in stroke length. Similar results were found by Dietrick, 1973.

The result of 50 m free style Swimming, after six week training, is found to be insignificant as the obtained 't' value (.721) is less than the Table value. Similar results were found in studies conducted by Tompkins, 1994 and Crowder, 1993.

The results presented in Table 2 show that a non-significant difference exists between pre and post test values of speed of start, stroke length and 50 meter performance of control group as the obtained 't' value 1.753, 1.725 and .938 respectively were less than the Table value (2.145), at .05 level.

Results of Table 2 show that there is a significant difference between pre and post test values on stroke frequency and speed of the turn of control group, as the obtained 't' value 3.35 and 3.079, respectively, are greater than the Table value (2.145). The result is attributed to the fact that regular Swimming training improves the variables predominantly, determined by technical aspect, i.e, stroke frequency and speed of the turn of the swimmers;and also, this improvement might be from the motivation and self confidence of the swimmers, during the testing (Sheldon & Declan, 2002).

## CONCLUSIONS

The findings from the statistical analysis conclude that 6-week plyometric training programme consisting of various teaching associated with encouragement and support, result into significant improvement of speed of start, stroke frequency, speed of turn and performance amongst the swimmers.

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