Effect of Six-Week Technique Training Programme on 100m Breast Stroke Performance

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ABSTRACT

The aim of the present study was to see the effect of technique training through progressive drills on selected variables of 100 m breast stroke swimmers. The study was conducted on 36 boys of 14-17 age range, randomly divided in to two groups and randomly assigned to experimental and control groups. The subjects were tested in 100 m breast stroke and the results in terms of time of start, time of the turn, stroke frequency, stroke length and 100 m breast stroke performance was recorded before and after 6-week technique training 't' test was applied to compare and find out statistically significant difference between the pre and post test values. The analysis of data revealed a statistically significant improvement in turning time (t=2.59), 50 m breast stroke performance (t=3.329) and 100 m breast stroke performance (4.135). The control group did not record a significant difference in any of the selected variables. It was also found that stroke length decreases and stroke frequency increases with the increase in breast stroke swimming distance from 50 m to 100 m.

KEY WORDS

Breast Stroke, Stroke Length, Stroke Frequency, Turn Time, Start Time

INTRODUCTION

In each sport certain tasks have to be fulfilled or tackled during competition. Each task can be tackled in one or more ways. The best motor procedure of tackling the task has to be determined and consequently technique training is an important aspect of training process (Singh, 1991).

For more than four decades competitive swimming comprises four major strokes, Freestyle, Breaststroke, Backstroke, and Butterfly. Of these strokes the **Breaststroke** is the least efficient, because high water resistance is created due to body position and an underwater arm recovery. FINA rules stipulate that the arms (i.e. defined by the position of the elbows) must remain underwater during the recovery movement (FINA, 2009). Even though some swimmers recover the hands slightly above the surface, the forward movement of the arms is primarily underwater, and thus resistance is high. It is also a valuable survival stroke.

Swimming is the only international sport where performances are stagnant or regressing. World records have been established in swimming over the past decade. However, many improvements in swimming have resulted from rule changes

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(e.g., front crawl turn in backstroke, complete submersion in breaststroke); innovations that reduce the number of strokes in an event (e.g., underwater swimming in backstroke and butterfly); and/or the use of performance-enhancing drugs . Occasionally, there have been "clean" swimmers who have demonstrated a new level of athleticism (Brent, 1998).

As per literature, the most used and important muscles in the breaststroke technique are the biceps brachii, triceps brachii (Conceiçao et al 2010), supraspinatus, teres minor, trapezius and deltoid (Ruwe et al, 1994), biceps brachii, subscapular, teres major, pectoralis major, supraspinatus, infraspinatus, serratus anterior and deltoid (Nuber, et al, 1986). Thompson, et al, (2000) suggested that coaches should place emphasis on all of the kinematic components in training and that they should attempt to identify the stroke rate to stroke length ratio most appropriate for the individual. Notably, characteristic differences do exist between the 100m and 200m events, which have implications for the way swimmers might train for each event. Maglischo (2003) explained that swimmers accelerated their bodies for a longer time with their arms than they did with their legs; but, the kick is clearly a dominant propulsive force in the breaststroke. Jagomagi & Jurimae (2005) in an investigation on 125 female swimmers found that the swimming velocity in a 100 m breaststroke by using a kickboard and legs was significantly influenced by the flexibility of the hip, knee and ankle. This swimming velocity was also significantly related to the body height and body mass and to the standing broad jump.

Level of skill determines the economical use of energy. According to Mackenzie (2003) an efficient stroke will significantly reduce wasted energy output through less drag in the water and enable a cleaner execution of various phases of a stroke.

A skill drill is an important component of swimming training. It facilitate new skill acquisition, helps improve already learnt skills and improves performance. Training sessions require efficient management so as to gain mastery over the game and bring about required physical and mental adaptations.

Studies abound in biomechanical variables determining the competitive swimmer's performance. For instance, some of those are kinematics variables (e.g., stroke length, stroke frequency, speed fluctuation, limbs' kinematics, kinetics variables (e.g., propulsive drag, lift force, drag force) and neuromuscular variables but not many related to technique training. Hence, keeping in mind the need of information related to technique training effects, present study was taken up to see the effect of progressive technique training drills on Breast Stroke performance variables.

METHODOLOGY

The study was conducted on 40 boys with 14-17 age range, having participation in state level swimming competition. The subjects were equally divided into two groups and randomly assigned to experimental and control groups.

At the outset, the subjects were tested for 100 m breast stroke test and the results of time of start, time of the turn, stroke frequency, stroke length and 100 m breast stroke performance were recorded. The performance variables measured were as follows:

- Time for the area, i.e. 7.5 m from the starting end.
- Stroke frequency: measuring area time, i.e. from20 m to 40 m.
- Speed area time for calculating the stroke length, i.e.20m to 40 m.
- The time for the turn area, i.e 45 m to 55 m (10 m).
- 50 m time.
- Stroke frequency: measuring area time, i.e. from70 m to 90 m.
- Speed area time for calculating the stroke length, i.e.70m to 90 m.
- 100 m time.

In addition to this, age, height and weight values were also recorded.

The 6-week training, as a treatment measure, comprised the following skill drills which were staggered as shown in the matrix bellow

Drill	Ist week	2nd Week	3rd week	4th week	5th week	6th week
Kick with kick board	8x50m	8x50m	6x50m	6x50m	4x50m	4x50m
Kick and scull pull	8x50m	8x50m	6x50m	6x50m	4x50m	4x50m
Two kick on pull	4x50m	4x50 m	6x50m	6x50m	8x50m	8x50m
Kick and timing drill	4x50m	4x50m	6x50m	6x50m	8x50m	8x50m
Strong kick development (in standing manner)			60secx4	0secx4	0secx4	90secx6
Distance per Stroke (DPS)		2X200m	3x200m	8x100m	3x200m	2x200m
Breast stroke pul l and flutter kick			10x25m	10x35m	6x50m	8x50m
Breast stroke pull and dolphin kick			10x25m	10x35m	6x50m	8x50m
Pull and Timing drill			6x100m	8x100m	6x200m	8x200m
Heads up swim			10x25m	20x15m	10x35m	20x25m

A post-training measurement of the targeted variables was made as per requirement of the study.

The data obtained was compiled and statistically analyzed with the help of a computer. 't' test was applied to compare and find out whether Mean Difference, between the pre and post test values, was statistically significant. The change in performance in selected variables was also calculated in %.

Results & Discussion

The average height and weight of the subjects of experimental group and control group was 166.26±9.92, 59.86±11.83 and 167.13±8.18, 57.0±6.34, respectively. The average age of the experimental and control group was 15.4±1.30, and 15.6±1.30 respectively.

Table -1 : Comparison of Pre and Post Mean and SD values in respect of Experimental Group

	Pre		Post		Change
Variables	Mean	SD	Mean	SD	(%)
Start Time	3.789	0.827	3.689	0.822	3.25
Stroke Length	1.339	0.24	1.383	0.264	2.36
Stroke frequency	41.439	8.446	40.789	8.577	**1.12**
Turning time	10.372	1.524	10.106	1.414	1.5
50 m Time	52.65	6.694	51.15	6.671	0.12
Stroke length ll	1.272	0.242	1.289	0.249	6.14
Stroke frequency ll	41.03	8.048	39.9	7.473	**2.51**
100 m time	113.072	13.689	108.944	13.524	0.71

The results presented in Table 1 indicate that there is a positive change in performance in start time, stroke length, turning time, 50 m performance and 100 m breast stroke performance, but deterioration in stroke frequency during 20 to 40 m swimming and 70 to 90 m swimming.

Table -1 : Comparison of Pre and Post Mean an and SD values, in respect Control Group

	Pre		**Post**		**Change**
Variables	Mean	SD	Mean	SD	(%)
Start Time	3.083	0.65900	2.983	0.659	2.64
Stroke Length	1.267	0.2	1.244	0.134	**3.29**
Stroke frequency	45.689	5.286	46.2	4.881	1.57
Turning time	9.967	1.404	9.822	1.409	2.56
50 m Time	48.5	4.995	48.444	5.462	2.85
Stroke length ll	1.139	0.238	1.211	0.191	1.34
Stroke frequency ll	44.594	6.205	43.467	4.91	**2.75**
100 m time	103.967	15.471	104.711	12.3474	3.65

Results presented in Table 2 indicate performance in start time; stroke frequency during 20 to 40 m swimming; turning time; 50 m performance 100 m breast stroke performance; deterioration in stroke length during 20 to 40 m swimming; and stroke frequency during 70 to 90 m swimming.

Table-3 : Means, Standard Deviation, Mean Difference and 't' ratio of the Pre and Post test on Starting time (7.5 m)of Experimental and Control groups.

	Pre	Post	Mean Difference	SE	't'
Experimental Group	3.789	3.689	.10	0.05	1.931
Control Group	3.083	2.983	.10	.0646	1.546

Table-4 : Means, Standard Deviation, Mean Difference and 't' ratio of the Pre and Post test on stroke length(between 20 40m) of Experimental and Control groups.

	Pre	Post	Mean Difference	SE	't'
Experimental Group	1.339	1.383	0.044	0.02	2.045
Control Group	1.267	1.244	0.0222	0.0249	-0.89

Table-5 : Means, Standard Deviation, Mean Difference and 't' ratio of the Pre and Post test on stroke Frequency (between 20-40m) of Experimental and Control groups.

	Pre	Post	Mean Difference	SE	't'
Experimental Group	41.439	40.789	0.65	0.631	1.03
Control Group	45.689	46.2	0.511	.732	-0.698

Table-6: Means, Standard Deviation, Mean Difference and 't' ratio of the Pre and Post test on Time of Turn(10m) of Experimental and Control groups.

	Pre	Post	Mean Difference	SE	't'
Experimental Group	10.372	10.106	0.267	.1029	2.59*
Control Group	9.967	9.822	.145	.1175	-1.229

*Significant 't' at .05 level with df; 19

Table-7 : Means, Standard Deviation, Mean Difference and 't' ratio of the Pre and Post test on 50 m Breast Stroke performance of Experimental and Control groups.

	Pre	Post	Mean Difference	SE	't'
Experimental Group	52.65	51.15	1.5	0.45	3.329*
Control Group	48.50	48.44	.056	.6295	0.088

*Significant 't' at .05 level with df; 19

Table 8 : Means, Standard Deviation, Mean Difference and 't' ratio of the Pre and Post test on stroke length (between 70-90m) of Experimental and Control groups.

	Pre	Post	Mean Difference	SE	't'
Experimental Group	1.272	1.289	0.017	0.528	.644
Control Group	1.139	1.211	0.072	0.0368	1.958

Table 9 : Means, Standard Deviation, Mean Difference and 't' ratio of the Pre and Post test on stroke Frequency (between 70-90m) of Experimental and Control groups.

	Pre	Post	Mean Difference	SE	't'
Experimental Group	41.03	39.9	1.128	0.6124	1.84
Control Group	44.594	43.467	1.1278	0.988	1.141

Table 10 : Means, Standard Deviation, Mean Difference and 't' ratio of the Pre and Post test on 100 m Breast Stroke of Experimental and Control groups.

	Pre	Post	Mean Difference	SE	't'
Experimental Group	113.072	108.944	4.128	0.998	4.135*
Control Group	103.967	104.711	0.744	2.667	-0.279

*Significant 't' at .05 level

The results of the study are presented in Table 1 to 10. The analysis of data presented in Table 3 to 10 revealed a statistically significant improvement in turning time (t=2.59), 50 m breast stroke performance (t=3.329), 100 m breast stroke performance (4.135); but the starting time (t=1.931), stroke length between 20 m to 40 m (t=2.045) (similar results by Dietrick,1973), stroke frequency between 20 to 40 meter (t=1.03), stroke length between 70 to 90 m (t=0.644) and stroke frequency between 70 to 90 m(t=1.84) did not yield a significance difference in experimental group.

The control group pre and post test value of starting time (t=1.546), stroke length between 20 to 40 m (t= -0.89), stroke frequency between 20 to 40 m (t= -.698), time of the turn (t= -1.229), 50 m breast stroke performance (t=.088), stroke length between 70 to 90 m (t=1.958), stroke frequency between 70 to 90 m (t=1.141) and 100 m breast stroke performance (t=-0.279), did not record a significant difference.

The results presented in Table 1 & 2 indicate that there is a relationship between stroke length and stroke frequency, in breast stroke swimming. Experimental group showed an improvement in stroke length and deterioration in stroke frequency. Similarly, an improvement in stroke frequency caused deterioration in stroke length during 20 to 40 m swimming and an improvement in stroke length during 70 to 90 m swimming lead to deterioration in stroke frequency in control group. McMurray (1990) also verified that a reduced number of strokes, for a given swimming velocity, during a period of competition preparation, will be able to lead to increase of stroke length and consequently to improvement in sports performance. Thompson et al (2004) presented results which evidenced that both increase in SF and SL leads to increase in SV in national and international athletes in 200m breaststroke events.

It has also been observed that stroke length during the first half of 100m is more than the second half of the 100 m swimming. Similarly, the stroke frequency shows decline during the second half of 100 m breast stroke swimming.

The reason behind a non-significant improvement, in various 100m performance variables, may be the duration of training. Secondly, the technique training drills are used for beginners and may not be an effective tool of training in trained group.

Though the difference between the pre and post values of various 100 m breast stroke performance variables are not significant, but the performance in 50m and 100 m showed that a miner change in performance factors can lead to significant improvement in performance.

The result of the present study could be attributed to the fact that the technique training improves the technique of stroke which affects the performance

CONCLUSIONS

1. Technique training drills lead to significant improvement in 50 meter and 100 m breast stroke performance.
2. 6 weeks technique training does not lead to significant change in starting time, stroke length between 20 m to 40 m, stroke frequency between 20 to 40 meter, stroke length between 70 to 90 m, stroke frequency between 70 to 90 m in 100 m breast stroke swimming performance.
3. Regular swimming after a break leads to significant improvement in 100 m breast stroke performance.
4. The stroke length during the first half of the race is more than the second half of the 100 m breast stroke swimming.
5. The stroke frequency decreases during the second half of 100 m breast stroke swimming.

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