200 m Breast Stroke Swimming in Relation to Stroke Length, Stroke Frequency and Partial Distance Performances

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ABSTRACT

The aim of the present study was to analyse 200 m Freestyle Swimming performance in relation to partial distance performance, stroke length and stroke frequency. A group of 15 trained swimmers were selected as subjects for this study. The 200 m Breast Stroke Swimming performance (Total Time), PD1 (0-50 m time), PD2 (50-100 m time), PD3 (100-150 m time), PD4 (150-200 m time), stroke length and stroke frequency was recorded.

Mean, SD, 'F' and 'r' value was calculated to for the interpretation of results. Findings suggest that there is a significant relationship between stroke length and stroke frequency, partial distance performances and stroke frequency. 'F' value indicates a significant difference among partial distance performances (5.806), stroke length during partial performances (5.497) and stroke frequency during partial performance (2.872). Stroke length and stroke frequency during last 50 meter is recorded to be higher and significantly different than other partial distance performances.

INTRODUCTION

Swimming seems to be one of the most studied sports in the sport sciences community. Researchers are constantly trying to identify and understand the factors that can better predict Swimming performance. However, the majority of the studies in Swimming have a strong focus on physiological and biomechanical issues and less on the Swimming performance itself. Swimming performance is expressed by the time spent to cover the event distance. Testing of stroke length and stroke frequency and partial distance performances can provide an insight to the 200 m swimmers current specific fitness level and its relationship to competition performance.

Stroke length is the distance covered by a swimmer with one stroke cycle in Swimming direction and stroke frequency is the number of movement cycles performed in one minute. Craig et al (1985) state that there is a decrease

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in distance per stroke by increasing stroke rate.

Hay (1985) studied that as the distance of the race increases the stroke length increases, stroke frequency decreases and the speed decreases. In a study conducted on 200m yard event swimmers, he found that except Back Stroke, all other strokes i.e., Freestyle, Breast Stroke and Butterfly Stroke, had a significant co-relation with speed and stroke length. But, no co-relation was found between speed and stroke frequency. So, he advised to focus the attention in training on increasing the stroke lengths and maintaining the stroke frequencies.

Zahnig (1983) advised that for long term development, the age groupers should mainly concentrate on increasing the stroke length, while keeping the stroke length within reasonable parameters dictated by experience. Older, more elite, swimmers should try to further optimize stroke distance while increasing the stroke frequency.

As most of the studies are related to stroke length and stroke frequency in relation to various events, partial distance performance studies are exceptional. The aim of the present work was to study the split timing, total time, stroke length and stroke frequency for each 50 m split time of 200 m Breast Stroke Swimming event.

Partial distance performance (PD) is considered to be under distance timings like 0 to 50m (PD1), 50m to 100 m (PD2), 100m to 150m (PD3) and 150 to 200m (PD4) times, for 200m Swimming events.

METHODOLOGY

The subjects for the present study were 15 male swimmers attending Diploma in Sports Coaching (Swimming) and Pay and Play scheme, at NIS, Patiala

The following variables were selected for the present study:

1. 200m (Freestyle Swimming)
2. PD1 (0-50 m time)
3. PD2 (50-100 m time)
4. PD3 (100-150 m time)
5. PD4 (150-200 m time)
6. Stroke length
7. Stroke frequency

The length of the pool is 50 m and for 200 m 4 laps were completed and the timing for each lap as partial distance (PD) performance and complete 200 m (TT) was recorded.

Stroke frequency (SF) and stroke length (SL) were calculated by the following formulas.

SF = 4 * 60 / 4 strokes =

No. of strokes per minute

SL = speed * 60 / SF = meters / stroke

Mean SD was calculated and ANOVA was applied to find out the statistical difference among partial distance performances, stroke length during partial distance performances and stroke frequency during partial distance performances; and LSD post hoc test was used to study difference between paired means. 'r' value was

calculated to find out relationship among partial distance performances, stroke length during partial distance performances and stroke frequency during partial distance performances. Relationship between partial distance performance and stride length and stride frequency was also calculated. The change in partial distance, stroke frequency and stroke length was also calculated during 200 m Breast Stroke Swimming.

RESULTS & DISCUSSION

Table-1: Mean and SD of Partial Distance performance, Stroke Length, Stroke Frequency, during partial distances.

	Partial distance performances		Stroke Length		Stroke Frequency	
	Mean	SD	Mean	SD	Mean	SD
PD 1	46.81	4.83	1.94	0.27	30.49	5.14
PD 2	53.05	6.08	1.81	0.25	30.44	4.97
PD 3	54.31	5.93	1.78	0.27	30.77	5.04
PD 4	53.53	5.25	1.57	0.22	35.16	5.86

The average height and weight of the subjects was calculated 169.56 + 5.118 and 71.067 + 9.043, respectively. Mean values presented in Table 1 indicate that the performance deteriorates with the increase in distance up to 150 meter and improves during last 50 meter Swimming. Stroke length mean values given in Table 1 indicate a continuous decrease in stroke length during 200 m breast stroke Swimming. Whereas, an increase in stroke frequency during 100, 150, 200 m Swimming has been observed. As the distance of the race increases the stroke length increases and stroke frequency decreases and the speed decreases (Hay, 1985). Throughout an event, the decrease of v is mainly related to the decrease of SL in all swim strokes (Hay & Guimaraes, 1983). There is a "zig-zag" pattern for SF during inter-lap.

The maximum SF on regular basis happens at the final lap (Letzelter & Freitag, 1983). The reason behind variation in results may be that performance/ strategy, in an event may, differ from partial distance performance of similar distance.

Table-2: ANOVA for Partial Distance performance

	Sum of Squares	df	Mean Square	F
Between Groups	535.45756	3	178.48586	5.806195*
Within Groups	1721.4731	56	30.74059	
Total	2256.9306	59		

*Significant at 5%

Table-3: Post HOC Test for Partial Distance Performance

PD1	PD2	PD3	PD4	Mean diff.	Sig.
46.81	53.05			-6.238	*
46.81		54.31		-7.5	*
46.81			53.53	-6.722	*
	53.05	54.31		-1.262	
	53.05		53.53	-0.484	
		54.31	53.53	0.777	

*Significant at 5%

The values presented in Table 2 show a statistically significant difference among partial distance performances with an F value of 5.806. Post hoc test (Table 3) concludes that there is a significant difference between PD 1 and PD 2 (-6.231), PD1 and PD3 (-7.5) and PD1 and PD4 (-6.772) and PD1 value is statistically higher than other 3 PD performances. The reason behind this may be an explosive start and longer stroke length. No other combination showed a statistically significant difference.

F value 5.497 presented in Table 4 indicates a statistically significant difference among stroke length values during PD performances. Post hoc values show a significant difference between 1st 50 m and last 50 m distance, 2nd 50 m and last 50 m and between 3rd 50 m and 4th 50 m stroke length values. It is being established that last 50 m stroke frequency is shorter in comparison to other and indicates that swimmers are trying to improve timing by increasing frequency and decreasing the stroke length.

Table-4: ANOVA for Stroke Length during Partial Distances

	Sum of Squares	Df	Mean Square	F
Between Groups	1.0589917	3	0.3529972	5.497074*
Within Groups	3.5960667	56	0.0642155	
Total	4.6550583	59		

*Significant at 5%

Table-5: Post HOC Test for Stroke Length during Partial Distance Performances

PD1	PD2	PD3	PD4	Mean diff.	Sig.
1.943	1.811			0.132	
1.943		1.778		0.164	
1.943			1.572	0.37	*
	1.811	1.778		0.032	
	1.811		1.572	0.238	*
		1.778	1.572	-0.206	*

*Significant at 5%

F value 2.872 presented in Table 6 indicates a statistically significant difference among stroke frequency values during PD performances. Post hoc values show a significant difference between 1st 50 m and last 50 m distance, 2nd 50 m and last 50 m and between 3rd 50 m and 4th 50 m stroke frequency values.

It is being established that swimmers show better timing during the last lap by increasing the stroke frequency and compromising the stroke length.

Table-6: ANOVA for Stroke Frequency during Partial Distance Performances

	Sum of Squares	Df	Mean Square	F
Between Groups	238.87483	3	79.624942	2.872867*
Within Groups	1552.1071	56	27.716198	
Total	1790.9819	59		

*Significant at 5%

Table-7: Post hoc test for Stroke Frequency during Partial Distance Performances

PD 1	PD 2	PD 3	PD 4	Mean diff.	Sig.
30.49	30.44			0.041333	
30.49		30.77		-0.28	
30.49			35.16	-4.67867	*
	30.44	30.77		0.321333	
*Significant at 5%	30.44		35.16	4.72	*
		30.77	35.16	4.398667	*

*Significant at 5%

Table-8: Relationship of Partial Performance with Stroke Length and Stroke Frequency and between Stroke Length and Stroke Frequency

	50 m	50-100 m	100-150 m	150-200 m
PD sv SL	-0.175	-0.199	-0.09	0.017
PD sv SF	-0.384	-0.478	-0.482	-0.514
SL vs SF	-.829	-0.751	-0.807	-0.852
Velocity	1.068	0.9425	0.9206	0.934

Values presented in Table 8 indicate that partial distance performance shows a negative relationship with stroke length. The only positive relationship or deteriorating effect between PD4 and stroke length has been observed. Whereas, a statistically significant and negative relationship exists between partial distance performances and stroke frequency. The result indicates that performance in Swimming can be improved with the improvement in stroke frequency. As the distance of the race increases the stroke length increases, stroke frequency decreases and the speed decreases. Bhullar (1993) found a negative correlation between stroke length and stroke frequency and an insignificant relationship between stroke length and performance. Craig et

al (1985) found that improvement in velocity of Swimming events for men between 1976 to 1984 was due to the increased distance per stroke and due to the decrease in stroke rate. The faster swimmers were able to compensate for this change by maintaining or increasing stroke rate more than did their slower competitors. Older, more elite, swimmers should try to optimize stroke distance while increasing the stroke frequency.

The results also indicate that there is a negative but significant relationship between stroke length stroke frequency. Similar conclusions were made by Craig et al (1985) and Bhullar (1993).

CONCLUSION

1. There is a significant but negative relationship between SL and SF during 200 m Breast Stroke Swimming.
2. There is a non-significant relationship between PD performances and stroke length during 200 m Breast Stroke Swimming.
3. A negative and significant correlation exists between partial distance performances and stroke frequency.
4. There is a statistically significant difference among various partial distance performances and PD 1performance is significantly better than other PD performances
5. There is a statistically significant difference among stroke length during various partial distance performances and stroke length during PD 4 is significantly shorter than the stroke length during other PD performances
6. There is a statistically significant difference among stroke frequency during various partial distance performances and stroke frequency during PD 4 is significantly higher than other PD performances.
7. The result concludes that increase in frequency leads to decrease in stroke length and vice versa and one can improve the performance by maintaining stroke length and increasing the stroke frequency.

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