

RELATIONSHIP OF PERFORMANCE IN 50 METRE SPRINT OF DIFFERENT SWIMMING STROKES AND SELECTED ANTHROPOMETRIC VARIABLES AMONG THE BOYS OF UNDER 14 YEARS OF AGE

PARMINDER PAL SINGH

Swimming Coach, Post Graduate Government College, Chandigarh, India

ABSTRACT

Swimming is one of the most exciting of Olympic sports as it offers many challenges and attractions for sport and recreation purposes. Swimming is also an attractive pastime, its cardiovascular benefits being realised all the more now and is also promoted for health and general fitness. Nowadays a considerable body of knowledge about swimming is available to sports scientists. This has resulted from ingenuities in extrapolating backwards from observations made after all-out swimming efforts, design of instrumentation for obtaining good quality data during activity in the swimming pool, and development of swim simulators and swimming tanks with good fidelity to realistic conditions. The present investigation attempts to find out the relationship between performance in 50 metre sprint of different swimming strokes and selected anthropometric variables among the boys of fewer than 14 years of age. The sample was selected from School National Competition. The chosen strokes for the study were Free Style Stroke, Butterfly Stroke, Back Stroke and Breast Stroke. Anthropometric Variables used for the study were Weight, Height, Arm Span, Biacromial Diameter, Upper Arm Circumference, and Calf Circumference. ANOVA and Correlation were applied to compare the performance. Post Hoc Test was used if the 'F' value was found to be significant. The study reveals that all the four strokes i.e., Freestyle Stroke, Butterfly Stroke, Back Stroke and Breast Stroke were found to have same type of Weight, Height, Arm span, Biacromial diameter, Hand length, Upper arm circumference and Calf circumference. It is further revealed that in Freestyle stroke, performance has significant relationship with height, arm span and hand length whereas performance has no significant relationship with Weight, Biacromial Diameter, Upper Arm circumference and Calf circumference. In Butterfly Stroke, performance has significant relationship with Height, Weight, Hand length, Upper arm circumference, Arm span and Calf circumference, whereas, performance has no significant relationship with Biacromial diameter. In Back stroke, no significant relationship has been seen between the performance and selected anthropometric variables. In Breast stroke, performance has significant relationship with Height, Arm span and Hand length whereas performance has no relationship with Weight, Biacromial diameter, Upper arm circumference and Calf circumference. Hence, this investigation comes up with certain authentic facts about the swimming as sport that may prove helpful to make further research in this thrust area. The primary data collected during the research can be used to determine the potential of success of the game in National as well as International Championships under this age group.

KEYWORDS: *Free Style Stroke, Butterfly Stroke, Back Stroke and Breast Stroke; Anthropometric Variables used for the study were Weight, Height, Arm Span, Biacromial Diameter, Upper Arm Circumference, and Calf Circumference*

INTRODUCTION

Swimming is one of the most exciting of Olympic sports as it offers many challenges and attractions for sport and recreation purposes. Swimming is also an attractive pastime, its cardiovascular benefits being promoted for health and general fitness. Nowadays a considerable body of knowledge about swimming is available to sports scientists. This has resulted from ingenuities in extrapolating backwards from observations made after all-out swimming efforts, design of instrumentation for obtaining good quality data during activity in the swimming pool, and development of swim simulators and swimming tanks with good fidelity to realistic conditions. It is an empirical study based on scientific testing and practical experiences of the thrust area –Anthropometrical approach to decipher physical capabilities leading to proficiency. The state and art of swimming in India is deplorably dismal. Our achievement at International level is hardly praiseworthy. The sports performance is a highly complex process and is a product of several internal and external factors encompassing all aspects of human personality (Singh, 1991). The competitive swimming events comprise two symmetric strokes (butterfly stroke and breast stroke) and two asymmetrical strokes (back stroke and front crawl). The competition level at National and International level is becoming very intense and complex that testifies that if sportspersons intend to excel in this sport, they need to know the dynamics of this sport thoroughly. To have improvement in performance one has to take support of various science disciplines in the preparation of sports training process. Anthropometry is the study of human size, shape, proportion, composition, maturation and gross function in order to help understand growth, exercise, performance and nutrition (Ross et al., 1980).

METHODOLOGY

In the present study, the focus was on the male swimmers of 50 metre event in all four strokes for the age group of fewer than 14 years. Performances at the School Nationals and State level competitions were considered for this research work. Total number of subjects for the study was 55 male swimmers. The performance in 50 metre in the following swimming strokes were recorded during the competitions were Butterfly Stroke, Back Stroke, Breast Stroke, Free Style Stroke. The Anthropometrical Variables used for the study were Weight, Height, Arm Span, Biacromial Diameter, Upper Arm Circumference, and Calf Circumference. Correlation and ANOVA were applied to find the relationship and to compare the performance. Post Hoc Test was used if the 'F' value was found to be significant.

OBSERVATIONS

Within the limitations and delimitations of the study the following results are drawn after interpreting and analysing the data.

Table 1: Group Wise Mean, SD, SEM of Weight in 50 Metre Sprint in Swimming

Group	N	Mean	SD	SEM
Freestyle	17	49.97	14.63	3.54
Butterfly Stroke	14	45.00	10.80	2.88
Back Stroke	08	43.06	14.83	5.24
Breast Stoke	16	48.65	14.24	3.56

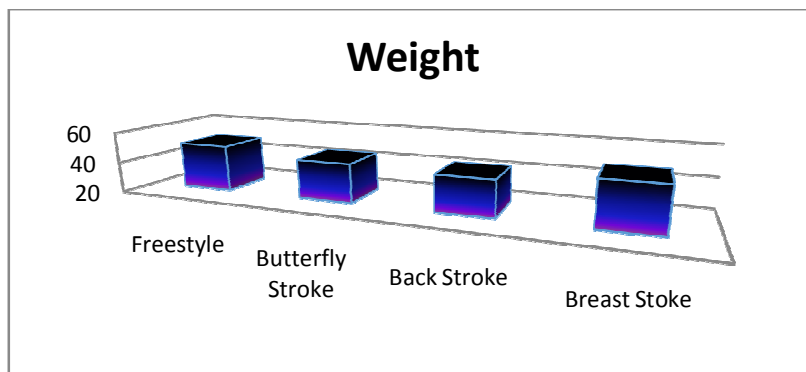


Figure 1: Graph Showing Mean Values of Four Groups in the Variable of Weight

Table 2: Summary of Analysis of Variance of Weight in 50 Metre Sprint in Swimming

	Sources of Variance	df	Sum of Square	MSS	F
MSS _{weight}	Weight	3	368.36	122.78	0.657
	With in Group (error)	51	9531.31	186.88	
MSS _{error} =SS _{error} / Df _{error}	Total	54	9899.68		

From table 2, it can be seen that the F-value is 0.657 which is not significant. It shows that the mean scores of weight of the four groups i.e., Freestyle, Butterfly Stroke, Back Stroke and Breast Stroke do not differ significantly. Thus the null hypothesis that there is no significant difference in the mean score of weight of the four groups is not rejected. It may therefore, be said that all the four groups were found to have same weight.

Table 3: Group Wise Mean, SD, SEM of Height in 50 Metre Sprint in Swimming

Group	N	Mean	SD	SEM
Freestyle	17	162.00	11.68	2.83
Butterfly Stroke	14	158.43	12.40	3.31
Back Stroke	08	152.81	10.95	3.87
Breast Stoke	16	160.56	10.19	2.54

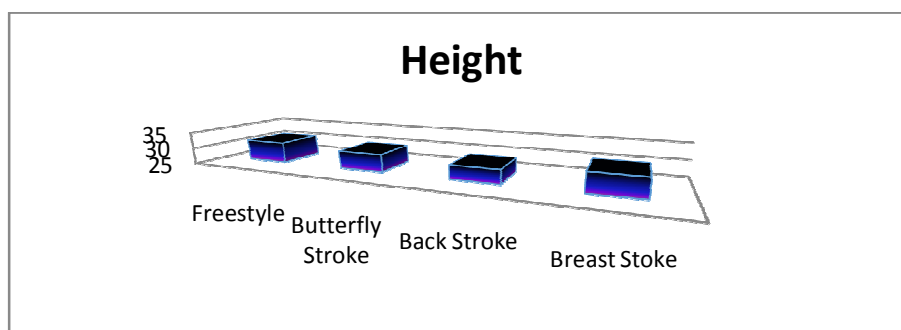


Figure 2: Graph Showing Mean Values of Four Groups in the Variable of Height

Table 4: Summary of Analysis of Variance of Height in 50 Metre Sprint in Swimming

	Sources of Variance	df	Sum of Square	MSS	F
MSS _{height}	Height	3	497.04	165.68	0.290
MSS _{error} =SS _{error} / Df _{error}	With in Group (error)	51	6582.30	129.06	
	Total	54	7079.35		

From table 4, it can be seen that the F-value is 0.290 which is not significant. It shows that the mean scores of Height of the four groups i.e., Freestyle, Butterfly Stroke, Back Stroke and Breast Stroke do not differ significantly. Thus the null hypothesis that there is no significant difference in the mean score of height of the four groups is not rejected. It may therefore, be said that all the four groups were found to have same height.

Table 5: Group Wise Mean, SD, SEM of Arm Span in 50 Metre Sprint in Swimming

Group	N	Mean	SD	SEM
Freestyle	17	170.65	13.29	3.22
Butterfly Stroke	14	166.92	12.25	3.27
Back Stroke	08	158.35	13.25	4.68
Breast Stoke	16	167.93	12.44	3.11

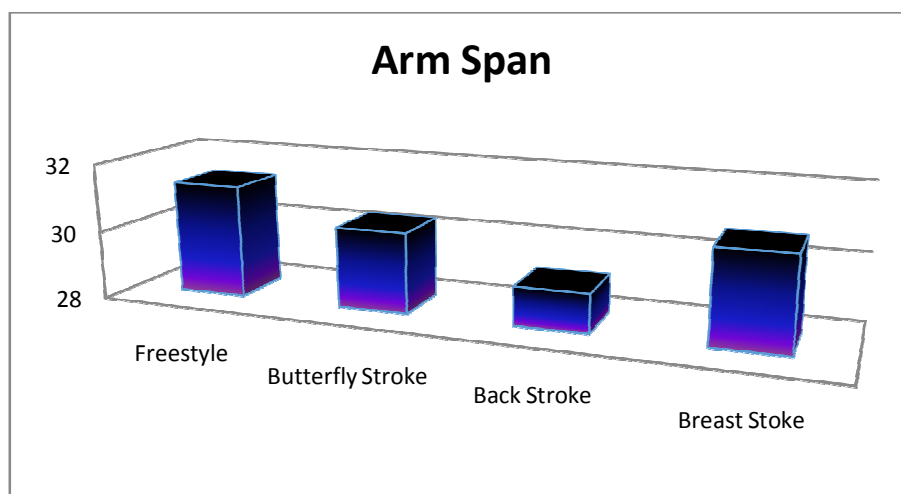


Figure 3: Graph Showing Mean Values of Four Groups in the Variable of Arm Span

Table 6: Summary of Analysis of Variance of Arm Span in 50 Metre Sprint in Swimming

	Sources of Variance	df	Sum of Square	MSS	F
MSS _{Arm Span}	Arm Span	3	838.73	279.57	1.711
MSS _{error} =SS _{error} / Df _{error}	With in Group (error)	51	8333.42	163.40	
	Total	54	9172.15		

From table 6, it can be seen that the F-value is 1.711 which is not significant. It shows that the mean scores of arm span of the four groups i.e., Freestyle, Butterfly Stroke, Back Stroke and Breast Stroke do not differ significantly. Thus the null hypothesis that there is no significant difference in the mean score of arm span of the four groups is not rejected. It may therefore, be said that all the four groups were found to have same arm span.

Table 7: Group Wise Mean, SD, SEM of Biacromial Diameter in 50 Metre Sprint in Swimming

Group	N	Mean	SD	SEM
Freestyle	17	30.21	2.45	0.595
Butterfly Stroke	14	30.05	2.50	0.670
Back Stroke	08	29.38	2.15	0.762
Breast Stoke	16	31.72	2.81	0.703

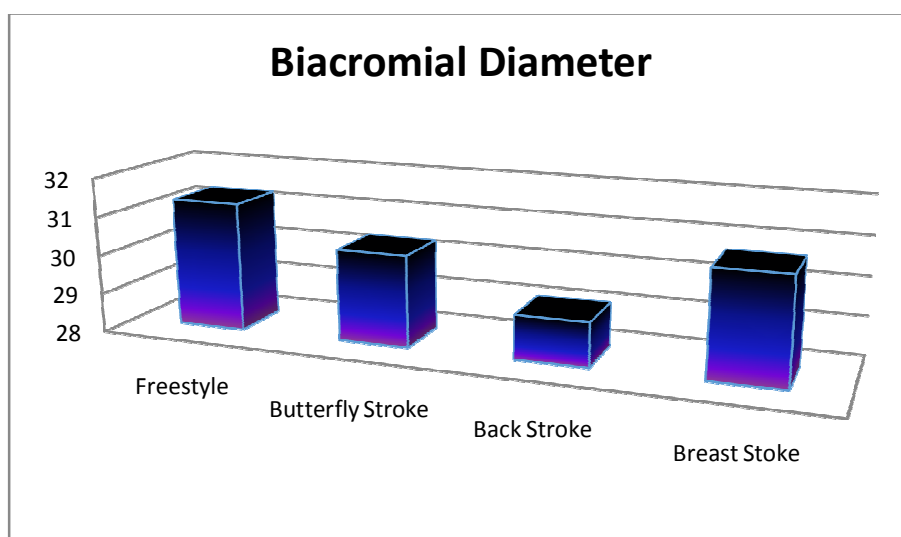


Figure 4: Graph Showing Mean Values of four groups in the Variable of Biacromial Diameter

Table 8: Summary of Analysis of Variance of Biacromial Diameter in 50 Metre Sprint in Swimming

	Sources of Variance	df	Sum of Square	MSS	F
MSS _{BiacromialDiametre}	BiacromialDiametre	3	38.09	12.70	1.966
	With in Group (error)	51	329.51	6.46	
MSS _{error} =SS _{error} /Df _{error}	Total	54	367.61		

From table 8, it can be seen that the F-value is 1.966 which is not significant. It shows that the mean scores of Biacromial Diameter of the four groups i.e., Freestyle, Butterfly Stroke, Back Stroke and Breast Stroke do not differ significantly. Thus the null hypothesis that there is no significant difference in the mean score of Biacromial Diameter of the four groups is not rejected. It may therefore, be said that all the four groups were found to have Biacromial Diameter to the same level.

Table 9: Group Wise Mean, SD, SEM of Hand Length in 50 Metre Sprint in Swimming

Group	N	Mean	SD	SEM
Freestyle	17	19.22	3.53	0.857
Butterfly Stroke	14	18.76	3.69	0.987
Back Stroke	08	18.00	1.58	0.559
Breast Stoke	16	19.32	1.51	0.379

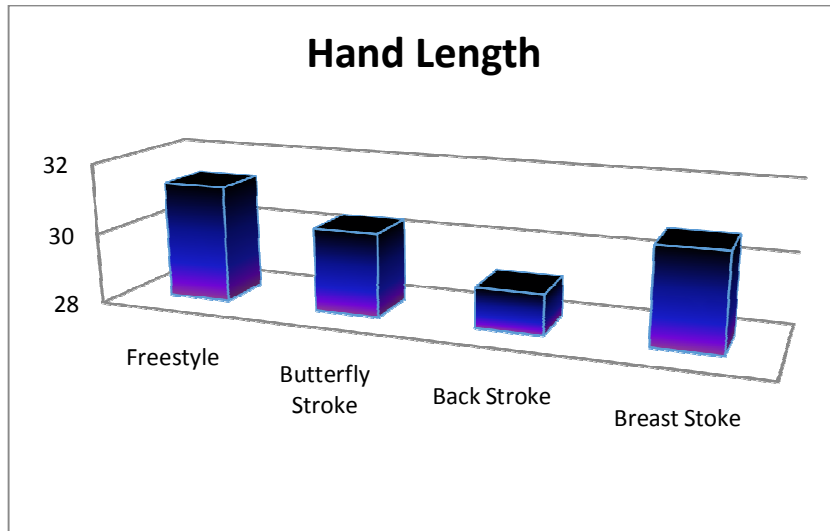


Figure 5: Graph Showing Mean Values of Four Groups in the Variable of Hand Length

Table 10: Summary of Analysis of Variance of Hand Length in 50 Metre Sprint in Swimming

	Sources of Variance	df	Sum of Square	MSS	F
$MSS_{Hand\ Length}$	Hand Length	3	11.27	3.75	0.446
$MSS_{error} = SS_{error} / Df_{error}$	With in Group (error)	51	429.35	8.41	
	Total	54	440.63		

From table 10, it can be seen that the F-value is 0.446 which is not significant. It shows that the mean scores of hand length of the four groups i.e., Freestyle, Butterfly Stroke, Back Stroke and Breast Stroke do not differ significantly. Thus the null hypothesis that there is no significant difference in the mean score of hand length of the four groups is not rejected. It may therefore, be said that all the four groups were found to have hand length of the same level.

Table 11: Group Wise Mean, SD, SEM of Upper Arm Circumference in 50 Metre Sprint in Swimming

Group	N	Mean	SD	SEM
Freestyle	17	24.95	4.05	0.986
Butterfly Stroke	14	24.22	2.61	0.698
Back Stroke	08	25.01	3.05	1.081
Breast Stoke	16	25.37	3.65	0.913

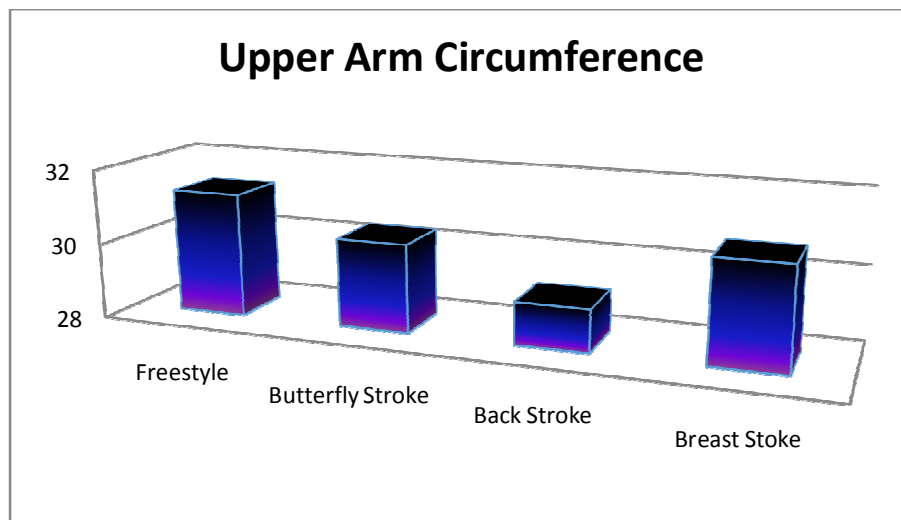


Figure 6: Graph Showing Mean Values of Four Groups in the Variable of Upper Arm Circumference

Table 12: Summary of Analysis of Variance of Upper Arm Circumference in 50 Metre Sprint in Swimming

	Sources of Variance	df	Sum of Square	MSS	F
MSS _{Upper Arm Circumference}	Upper Arm Circumference	3	10.07	3.35	0.277
MSS _{error} =SS _{error} /	With in Group (error)	51	618.15	12.12	
Df _{error}	Total	54	628.22		

From table 12, it can be seen that the F-value is 0.277 which is not significant. It shows that the mean scores of upper arm circumference of the four groups i.e., Freestyle, Butterfly Stroke, Back Stroke and Breast Stroke do not differ significantly. Thus the null hypothesis that there is no significant difference in the mean score of upper arm circumference of the four groups is not rejected. It may therefore, be said that all the four groups were found to have upper arm circumference of the same level.

Table 13: Group Wise Mean, SD, SEM of Calf Circumference in 50 Metre Sprint in Swimming

Group	N	Mean	SD	SEM
Freestyle	17	31.30	3.37	0.819
Butterfly Stroke	14	30.34	3.11	0.831
Back Stroke	08	29.12	4.65	1.646
Breast Stoke	16	30.69	3.47	0.868

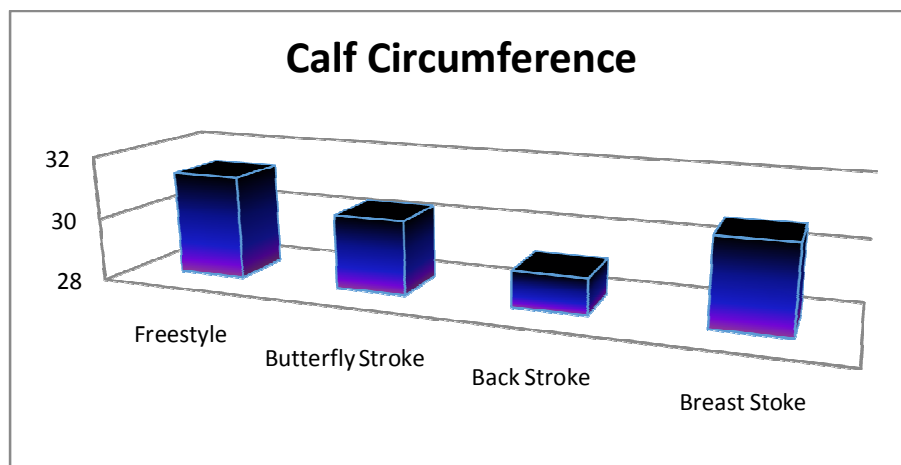


Figure 7: Graph Showing Mean Values of Four Groups in the Variable of Calf Circumference

Table 14: Summary of Analysis of Variance of Calf Circumference in 50 Metre Sprint in Swimming

	Sources of Variance	df	Sum of Square	MSS	F
MSS _{Calf Circumference}	Calf Circumference	3	28.01	9.33	0.742
	With in Group (error)	51	641.45	12.57	
MSS _{error} =SS _{error} / Df _{error}	Total	54	699.47		

From table 14, it can be seen that the F-value is 0.742 which is not significant. It shows that the mean scores of calf circumference of the four groups i.e., Freestyle, Butterfly Stroke, Back Stroke and Breast Stroke do not differ significantly. Thus the null hypothesis that there is no significant difference in the mean score of calf circumference of the four groups is not rejected. It may therefore, be said that all the four groups were found to have calf circumference of the same level.

Table 15: Relationship of Performance in 50 Metre Freestyle Stroke Sprint in Swimming with Anthropometry Variables

Variable	N	Mean	Performance
Weight	17	49.97	0.372
Height	17	162.00	0.713**
Arm Span	17	170.65	0.671**
Hand Length	17	19.22	0.825**
Biacromial Diameter	17	30.21	0.265
Upper Am Circumference	17	24.95	0.285
Calf Circumference	17	31.30	0.216

**Significant at 0.01 level

From table 15, it is clear that there is significant relationship between the performance in 50 Metre freestyle sprint in swimming with Height, Arm Span and Hand Length. No significant relationship has been found with the rest of the anthropometry variables.

Table 16: Relationship of Performance in 50 Metre Butterfly Stroke Sprint in Swimming with Anthropometry Variables

Variable	N	Mean	Performance
Weight	14	45.00	0.716**
Height	14	158.43	0.687**
Arm Span	14	166.92	0.674**
Hand Length	14	18.76	0.775**
Biacromial Diameter	14	24.22	0.676**
Upper Am Circumference	14	30.34	0.563*
Calf Circumference	14	30.05	0.405

*Significant at 0.05 level, **Significant at 0.01 level

From table 16, it is clear that there is significant relationship between the performance in 50 Metre Butterfly event in swimming with weight, Height, Arm Span, Hand Length, Upper Arm Circumference and Biacromial Diameter. No significant relationship has been found between performance and Calf Circumference.

Table 17: Relationship of Performance in 50 metre Back Stroke Sprint in Swimming with Anthropometry Variables

Variable	N	Mean	Performance
Weight	8	43.06	0.473
Height	8	152.81	0.477
Arm Span	8	158.35	0.562
Hand Length	8	18.00	0.617
Biacromial Diameter	8	19.38	0.618
Upper Am Circumference	8	25.01	0.515
Calf Circumference	8	29.12	0.410

*Significant at 0.05 level, **Significant at 0.01 level

From table 17, it is clear that there is no significant relationship between performance and selected Anthropometric variables.

Table 18: Relationship of Performance in 50 Metre Breast Stroke Sprint in Swimming with Anthropometry Variables

Variable	N	Mean	Performance
Weight	16	48.65	0.339
Height	16	160.56	0.504*
Arm Span	16	167.93	0.579*
Hand Length	16	19.32	0.565*
Biacromial Diameter	16	31.72	0.482
Upper Am Circumference	16	25.37	0.298
Calf Circumference	16	30.89	0.408

*Significant at 0.05 level, **Significant at 0.01 level

From table 18, it is clear that there is significant relationship between the performance in 50 Metre Breast Stroke event in swimming with Height, Arm Span, and Hand Length. No significant relationship has been found between performance and rest of the anthropometric variables.

CONCLUSIONS

The study reveals that all the four groups i.e., Freestyle, Butterfly, Back Stroke and Breast Stroke were found to have same Weight, Height, Arm span, Biacromial Diameter, Hand length, Upper arm circumference and Calf circumference. It is further revealed that in Freestyle stroke, performance has significant relationship with height, arm span and hand length of the swimmers participating in this event. In backstroke, no significant relationship has been seen between the performance and selected anthropometry variables. In Butterfly, no significant relationship has been seen between performance in this style and Biacromial diameter. Significant relationship is been found among rest of the anthropometry variables with performance in this style. In Breast stroke, significant relationship has been seen among Height, arm span and hand length with performance. No significant relationship has been seen with rest of the anthropometry variables in this style. Though the chosen anthropometric variables are not exhaustive in our study yet these findings are reliable and can be used for further research and for the purposes of team-building.

REFERENCES

1. **Councilman, J.E., 1997:** "The Science of Swimming". Pelham Books Ltd., Bedford Square, London
2. **Curry I.J., 1975:** "Stroke Length, Stroke Frequency and Performance". Swimming Technique, fall, PP. 88-91.
3. **Hay J.G., 1987:** "Biomechanics: A Brief Review". Swimming Technique, Vol-23, No. 3, PP. 15-21.
4. **Khosla, T., 1984:** "Journal of the American Medical Association", Physique of female swimmers and divers from the 1976 Montreal Olympics, 252: 536-537.
5. **NayakAlkaAndGhai G.D., 2007:** "Arm speed and leg speed as predictors of swim speed". Journal of Sports Sciences, Vol-30, No. 1.
6. **Ross, W.D., Drinkwater. D.T., Bailey. D.A., Marshal. G.W., Leahy. R.M., 1980:** "Kin anthropometry-Traditions and New Perspectives, In: Kin anthropometry". Ostyn, M., Beunen, G., Simons. J., (eds). University, Park Press, Baltimore, Vol. II pp. 3-27.
7. **Schram E:** "Sports – Schwimmen", Sportverlag, Berlin, 1987.
8. **Singh, H., 1984:** "Sports Training: General Theory and Methods". N.I.S. Publication, Patiala.
9. **Singh, H., 1991:** "Science of Sports Training". D.V.S. Publication, New Delhi.
10. **Sodhi H. S., 1991:** "Sports Anthropometry" ANOVA Publications, Mohali, Punjab, India.
11. **Sodhi H.S. and Rajni, 1995:** "Anthropometric Profile of Elite Indian Male Swimmers" N.I.S. Scientific Journal, No.3.