Research paper

KINEMATICAL COMPARISON OF TRACK START AND GRAB START OF SWIMMING AMONG PROFESSIONAL SWIMMERS

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ABSTRACT Introduction: Starting techniques are major disciplines in swimming to get extra advantage while taking the start, especially in freestyle, butterfly, and breaststroke. After reviewing various research articles and studies, a study was conducted on a kinematical comparison of two different starting techniques in swimming among professional swimmers. **Method:** Five male swimmers of dolphin academy, Hoshangabad who have participated at the national level were selected as subjects of the study. The videography technique through Canal D camera was used with 30 frames frequency/ second and examined in the horizontal plane (sagittal plane) from the left side was employed to gather the performance in track and grab starts. **Analysis:** In order to photographic sequence, selected kinematic variables were obtained and analysed through Kinovea Software (Suggested Hey J. G., 1999) to assess the centre of gravity of the body during set position and releasing time. **Statistical Technique:** T-test (23rd edition of SPSS 2.0 version) was administered at 0.05 level of significance to find out the better outcome of the study. **Result:** All the selected angular kinematic variables found significant differences in angles of left knee joint (2.917), left hip joint (3.498), and left ankle joint (2.821) greater than the tabulated value (t=1.860). Selected linear kinematic variables centre of gravity (72.798) at set position and block releasing rear leg (62.296) were greater than the tabulated value (t=1.860). **Findings:** Significance differences were revealed in linear and angular kinematic variables in different starting techniques in swimming due to the association of these variables with the consistency of the variety of dominating factors that influence the swimmer's performance to the extent.

Keywords: Kinematic variables, Grab Start and Track Start
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INTRODUCTION

Swimming is an individual or team racing sport that requires the use of one's entire body to move through water where each stroke requires a set of specific techniques; in competition, there are distinct regulations concerning the acceptable form for each individual stroke. Swimming is the action of self-support and propulsion in the water. The best exercise for the symmetrical development of the whole body, it is enjoyed by millions and is often a means of protecting and saving life swimming is an art that must be acquired. As an exercise, it has considerable recreational qualities, and the value of swimming as a therapeutic exercise in case of severe disability has been widely recognized. The royal lifesaving society and the various national swimming associations actively promote the life-saving and personal

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survival aspects of swimming as well as competitions swimming may also serve as a means of a lot. There are various starts in swimming and each start has its own specialty and benefits during training and competition. This study comprises two start techniques namely grab and track starts. Grab start in which the swimmer will have both feet at the front of the block. All the start begins with a solid foundation or footing. Get a firm grip on the starting platform by wrapping your toes over the edge and track start, one foot at the front on the block and the other towards the back, you might associate a track start with a starting block that has an adjustable footrest toward the back. Studies from Juan Paulo Vilas (2003), M Holthe (2001), H. Galbraith (2008), David Allen (1997), etc. were studied as a review for smooth research procedure and methodology.

METHODOLOGY

05 national level male swimmers were selected as subjects of the study and their ages ranged from 18-25 years. All subjects were trained at Dolphin Academy, Hoshangabad. It is assumed that the player possesses a good level of technique and required skills. The following kinematic variables namely Linear Kinematic (Centre of Gravity at the set position & Centre of Gravity at the movement where the rear leg releases the block) and Angular Kinematic (Knee Joint Angle, Hip Joint Angle & Ankle Joint Angle) were selected to reach up to the valid conclusion. Videography methods were used by professional photographers with steel tape camera and Kinovea software for more reliable data. Other instruments which were used for the purpose were a tripod stand, video camera, geometric instruments, etc. All instruments were provided by the research laboratory, Dolphin Academy, Hoshangabad. Guidance and supervision were also ensured from time to time on a and when need basis with the eminent experts from LNIPE Gwalior. A standard 70D canal camera (with a motor drive) was used with a mounted tripod stand at the height of 2.10 meters, placed perpendicularly at the center in the line of the inner bar and parallel to the sagittal plane at the distance of 6 meters. The distance of the camera from the center of the filming zone was 6 meters. The frequency of the camera was 30 frames/second.

After video recording, the CD was played with the help of a computer, and the final position of each selected phase was obtained on the screen by trial-and-error method and kept on pause. Further, the stick figures of each phase i.e., 2 centers of gravity and 3 angles, were converted into photographs, and recorded on transparency by the joint point method for all selected subjects. The center of gravity of each body segment and the whole body was determined by Kinovea software as suggested by James G. Hay. The relationship of selected kinematic variables with the grab and track start were obtained by employing the t-test and for testing, the hypothesis the level of significance was set at 0.05.

(Fig. A)   **(Fig. B)**   **(Fig. C)**   **(Fig. D)**
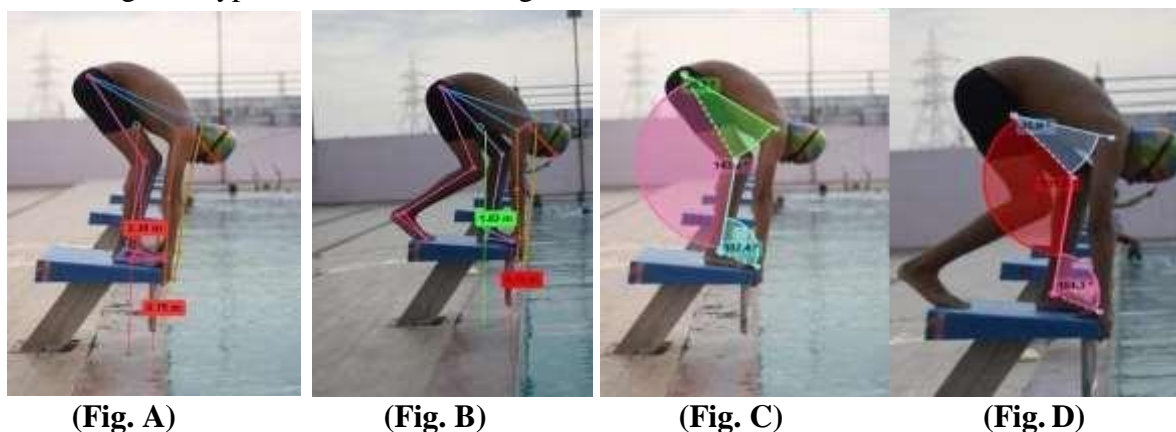
ANALYSIS OF DATA

The collected score of each selected angular and linear kinematic variable of both the starts grab and the track was compared, since the data did not deviate from the normality assumptions as shown by the Shapiro-Wilk test, therefore the parametric t-test was applied. The level of significance was set at 0.05.

TABLE – 1 Descriptive Statistics of Angular Kinematic Variables of Grab and Track Start Performance with the Three Angles

Variables	Start	N	Mean	SD	Std. Error Mean
LKJ	Track	5	122	5.24	2.34
	Grab	5	132.76	6.36	2.84
LHJ	Track	5	32.80	1.92	.86
	Grab	5	27.54	2.75	1.23
LAJ	Track	5	103.14	1.45	.65
	Grab	5	104.26	2.68	1.19

N – number of subjects, SD – Standard deviation, LKJ – Left Knee Joint, LHJ – Left Hip Joint, LAJ – Left Ankle joint.

TABLE – 2 Calculation of t-test for Angular Kinematic Variables of Grab and Track Start Performance with the Three Angles

	Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
	F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Equal variances assumed	.19	.67	**-2.91**	8	.01	10.76	3.68	-19.26	2.25
Equal variances not assumed			**-2.91**	7.71	.02	10.76	3.68	-19.32	2.19
Equal variances assumed	.49	.50	**3.49**	8	.00	5.26	1.50	1.79	8.72
Equal variances not assumed			**3.49**	7.14	.01	5.26	1.50	1.71	8.80
Equal variances assumed	2.67	.14	**2.82**	8	.43	-1.12	1.36	-4.26	2.02
LAJ Equal variances not assumed			**2.82**	6.16	.44	-1.12	1.364	-4.43	2.19

t (0.05) 8=1.860, N = 5

TABLE – 3 Descriptive Statistics of Linear Kinematic Variables the Grab and Track Start Performance with Different Centre of Gravity

Variables	Start	N	Mean	SD	Std. Error Mean
CG at Set Position	Track	5	1.81	0.01	0.00
	Grab	5	0.88	0.01	0.00
CG at Block Position	Track	5	1.80	0.01	0.00
	Grab	5	0.88	0.02	0.01

N – number of subjects, SD – Standard deviation, CG – Centre of Gravity.

TABLE – 4 Calculation of t-test for Angular Kinematic Variables of Grab and Track Start Performance with Different Centre of Gravity

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
CG at set position	Equal variances assumed	.15	.70	**72.79**	8	.00	.92	.01	.89	.94
	Equal variances not assumed			**72.79**	7.71	.00	.92	.01	.89	.94
CG at block position	Equal variances assumed	.68	.43	**62.29**	8	.00	.92	.01	.88	.95
	Equal variances not assumed			**62.29**	7.22	.00	.92	.01	.88	.95

t, (0.05)8= 1.860, N = 5

FINDINGS

The findings show the angular kinematics significant difference in all the case of the left knee joint the calculated value is (2.91) greater than the tabulated value (t=1.86) and the significant difference in the case of the left hip joint the calculated value is (3.49) are greater than the tabulated value (t=1.86) and the significant difference in case of left ankle joint the calculated value is (2.82) are greater than the tabulated value (t=1.86) with the analysis of the swimmer in both the starts at 0.05 level of significant.

The findings show the linear kinematics are significant difference in case the center of gravity at set position in both the starts grab and track the calculated valve (72.79) are greater than the tabulated value (t=1.86) and in the case of center of gravity at the movement where the rear leg release the block time in both the start grab and track the calculated valve (62.29) are greater than the tabulated value (t=1.86) at 0.05 level of significant.

The finding shows the linear and angular kinematic variables showed significant differences in the case of all the variables linear and kinematics with both the start techniques. Similar types of studies were undertaken by other research scholars also and mostly the relationships of selected kinematic variables with the independent variables were showed insignificant except for very less kinematic variables in their area of specialization. The main reason for significant results in their sports was that the performance of any games and sports depends upon multidimensional factors such as physical factors, physiological factors, psychological factors, and so many other factors. Only due to the sunlight association in the selected kinematics variables, the performance of the athlete cannot vary directly.

All other linear and angular kinematic variables show a significant difference with the start techniques of the swimmer. Because in swimming, these linear and angular kinematic variables are associated with the techniques of the skills and techniques consist of the variety of dominating factors that influence the swimmer's performance to the extent. Not even in swimmers, these findings may be supported in all games and sports.

CONCLUSION

All the selected angular kinematic variables showed significant differences with the performance of grab and track start techniques, in angular variables, the finding shows significant differences in angles left knee joint, left hip joint, and left ankle joint because the calculated value of the left knee joint is (2.91), left hip joint is (3.49), left ankle joint is (2.82) greater than the tabulated value is (t=1.86).

All the selected linear kinematic variables showed significant difference with the performance of grab and track start techniques, in linear variables, the finding shows a significant difference in center of gravity at the set position and at the movement where the rear leg release the block because the calculated value at set position is (72.79) and at the movement where the rear leg release the block is (62.29) greater than the tabulated value is (t=1.86).

Acknowledgement

Conflict Of Interests

The authors declares that there is no conflict of interests.

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