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Relation of Slow Twitch and Fast Twitch Muscle Fibres in Selection of Swimming Events

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Abstract - This study was to understand the effect of 'Slow-twitch and fast-twitch muscle fibers in swimming' and an attempt to guide swimmers which event to choose, according to their muscle fibers. Swimming requires both endurance and strength in the equal amount to become a great swimmer. Basic information of 20 swimmers was collected through questionnaire. Inclusion criteria for subjects were state level medals winner and within 15 to 25 years. Therefore data of both boys and girls were collected for total of 20 participants. The use of dumbbells to test the hands Slow-twitch and fast-twitch muscle fibers a test invented by Dr F. Hatfield (Hatfield, 2013) was used, The test was conducted with the help of dumbbells in which the correct number of lifts with the 80% of weight capacity were counted. In order to test the legs Slow-twitch and fast-twitch muscle fibers the Vertical Jump test (Sargent, 1921 , 2013) was used. Result of this study was that most of swimmers have opted for correct event according to their muscle fibre type. The study is also able to find that 19 swimmers have opted the correct event and only one participant was suggested to change their main and second events.

Keywords - Cardiovascular fitness, Muscular system, Endurance, Myoglobin, Hemoglobin

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INTRODUCTION

Physical education is related to the wholesome development of the personality of students. It helps in developing overall personality of the human being. It helps in keeping the body fit and healthy by choosing healthier choices which are good for all sports persons. Swimming is a great sport for the full body workout (Healthline, 2006). It is an aerobic exercise by which the person gets fitter and healthier. It also helps in reducing stress, toning the muscles, it improves cardiovascular fitness, improving the posture of the body, improving flexibility and also helps in making the heart and lungs stronger which decreases the risk of diseases like asthma, heart problems etc. When we are preparing for the national level competition we need to focus on the various systems of the body like Muscular system, Skeletal system, Digestive system etc

(D., Shook, & Varacallo., 2022).The Muscular system plays very important role to control the movement of the body and internal organs. Muscle tissue also contains muscle fibers. These muscle fibres contain single muscle cells which help in controlling the physical forces within the body. There are 3 types of muscle tissues in our body which are - Skeletal muscle, smooth muscle and cardiac muscle (Maves, 2016). Skeletal muscles are made up of individual muscle fibres. There are basically 2 types of skeletal muscle fibers, fast-twitch and slow-twitch (D., Shook, & Varacallo., 2022), each of them have different functions. Slow-twitch muscle fibers are fatigue resistant, and focused on small movements and postural control. These muscle fibres contain more mitochondria and myoglobin, myoglobin is a red pigment similar to the hemoglobin in red blood cells, which helps in good oxygen delivery to slow-twitch muscle fibres. These muscle fibres are aerobic in nature. Slow-twitch muscle fibers support long distance races which have more endurance in it. Slow-twitch fibers are also sometimes called type I or red fibers because of their blood supply. Fast-twitch muscle fibres provide bigger and more powerful forces but only for short duration of time. They are anaerobic in nature as there is less blood supply in fast-twitch muscle fibres. Fast-twitch muscle fibres are good for powerful movements such as sprint races for example for 50 mts. These are

sometimes called as white fibers or type II. The number of slow and fast-twitch fibers which are there in the body are greatly determined by a person's genetics. Swimmer whose performance is good at endurance events tend to have higher number of slow twitch fibers, whereas swimmer whose performance is better in sprint events tend to have higher numbers of fast twitch muscle fibers.

STATEMENT OF PROBLEM

This study was to identify the effect of slow twitch and fast twitch muscle fibers in swimming events.

METHDOLOGY

Selection Of Subjects

For the purpose of this survey research total 20 participants/subjects were selected out of which 25 male and female each by purposive sampling of the age group of 15 to 25. Swimmers Inclusion criteria for subjects were state level medals winner and within 15 to 25 years.

Administration Of Data Collection

The data collection of this research was divided into 2 segments, as follows

- The ***first segment*** was related with circulation of google forms comprising of questions related to personal information and details related with first and second events of the swimmers was collected.
- The ***second segment*** was related with data collection of slow twitch and fast twitch muscle fibers of hands and legs. It was further assessed in two parts hands and legs. For data collection of hands Dr F Hatfield test was used and the test required the use of dumbbells in which first calculation of one repetition maximum (1RM) of the swimmers was done (Topend sports, 2013). Then after taking 15 mins of rest. The scoring was done by calculating repetitions possible at 80% of the 1RM For calculating 1RM of swimmers the calculator given by topend sports (Topend sports, 2013) was used. Graphical representation is used to make data more visible and simplified understanding.

Tools Used

- Stage 1 was to circulate questionnaires comprising of questions related with personal details and the main and second main events of the swimmers.
- Stage 2 was to conduct a test by Dr F. Hatfield (Topend sports, 2013) for data collection of hands with the help of dumbbells in which determining one repetition maximum (1RM) was done. Then after taking 15 minutes of rest. Performing as many repetitions as possible at 80% of the 1RM was counted as total number of lifts. Vertical jump test (Sargent, 1921 , 2013) was used for data collection of legs. Scoring of which was done by the position of the athlete at the start of the jump has been seen where slow twitch muscle fibre athlete would tend to take slow dip in to the squat position before jumping. And fast twitch muscle fibre athlete would use a forceful dip to create more speed for the jump.

STATISTICAL PROCEDURE

The data of slow twitch and fast twitch muscle fibers was collected with the help of test named as Dr F. Hatfield and the scoring of slow twitch and fast twitch muscle fibers is done according the following table :

Table -1 Scoring of Dr F. Hatfield test

Number of Repetition at 80%	Muscle Fibre Types
<7	Mostly fast twitch (FT) dominant
7 and 8	Mixed fibre type
>8	Slow twitch (ST) dominant

RESULTS

Table-2 Data of muscle fiber types

		HANDS		LEGS	
S No.	Name	Fast twitch muscle fiber type	Slow twitch muscle fiber type	Fast twitch muscle fiber type	Slow twitch muscle fiber type
1.	A.	Yes	No	Yes	No
2.	B.	Yes	No	Yes	No
3.	C.	Yes	No	Yes	No
4.	D.	Yes	No	Yes	No
5.	E.	No	Yes	No	Yes
6.	F.	No	Yes	No	Yes
7.	G.	Yes	No	Yes	No
8.	H.	Yes	No	Yes	No
9.	I.	Yes	No	Yes	No
10.	J.	Yes	No	Yes	No
11.	K.	Yes	No	Yes	No
12.	L.	Yes	No	Yes	No

13.	M.	Yes	No	Yes	No
14.	N.	Yes	No	Yes	No
15.	O.	No	Yes	No	Yes
16.	P.	Yes	No	Yes	No
17.	Q.	Yes	No	Yes	No
18.	R.	No	Yes	No	Yes
19.	S.	Yes	No	Yes	No
20.	T.	No	Yes	No	Yes

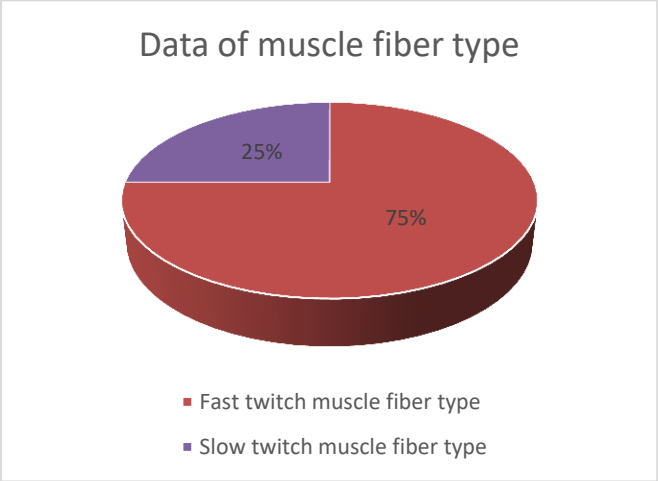

Figure 1 Data of muscle fiber types

DATA OF INITIAL AND SUGGESTED EVENTS FOR PARTICIPANTS

Table-3 Data of initial and suggested events

		PRESENT EVENTS		SUGGESTED EVENTS	
S No.	Name	1st Event	2nd Event	1st Event	2nd Event
1.	A.	100m Butterfly	50m Butterfly	100m Butterfly	50m Butterfly
2.	B.	200m Freestyle	400m Freestyle	50m Freestyle	100m Freestyle
3.	C.	50m Backstroke	100m Backstroke	50m Backstroke	100m Backstroke
4.	D.	50m Butterfly	50m Freestyle	50m Butterfly	50m
5.	E.	100m Backstroke	50m Freestyle	100m Backstroke	50m Freestyle
6.	F.	100m Backstroke	100m Freestyle	100m Backstroke	100m Freestyle
7.	G.	50m Breast stroke	100m Breast stroke	50m Breast stroke	100m Breast stroke
8.	H.	100m Breast stroke	50m Breast stroke	100m Breast stroke	50m Breast stroke
9.	I.	50m Freestyle	100m Freestyle	50m Freestyle	100m Freestyle
10.	J.	100m Backstroke	200m Backstroke	100m Backstroke	200m Backstroke
11.	K.	50m Butterfly	100m Butterfly	50m Butterfly	100m Butterfly
12.	L.	50m Freestyle	50m Backstroke	50m Freestyle	50m Backstroke
13.	M.	50m Freestyle	100m Freestyle	50m Freestyle	100m Freestyle
14.	N.	50m Backstroke	100m Backstroke	50m Backstroke	100m Backstroke
15.	O.	200m Individual medley	400m Individual medley	200m Individual medley	400m Individual medley
16.	P.	50m Breast stroke	100m Breast stroke	50m Breast stroke	100m Breast stroke
17.	Q.	100m Freestyle	50m Freestyle	100m Freestyle	50m Freestyle
18.	R.	200m Freestyle	200m Backstroke	200m Freestyle	200m Backstroke
19.	S.	50m Butterfly	100m Butterfly	50m Butterfly	100m Butterfly
20.	T.	400m Freestyle	800m Freestyle	400m Freestyle	800m Freestyle

According the table out of 20 participants only 1 participant was suggested to change their first and second event**.**

CONCLUSION

he purpose of the study was to see the effect of slow twitch and fast twitch muscle fibres in swimming for this data of 20 elite swimmers 10 male and female each was collected. The result of this study showed that only 1 swimmer was suggested new events, other swimmers had opted for correct event according to their muscle fiber type. This research will be helpful for the swimmers for better performance in competitions.

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