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Depletion of Glycogen Storage in swimmers during 400m, 800m and 1500 m Swimming Events

Sports Science

KEYWORDS: body glycogen, swimming, bio-impedance analyzer

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ABSTRACT

Body glycogen depletion was studied in swimmers(N=10, mean age 23+3) during 400meters, 1500 meters and 800 meters swimming comparative treatments at self-selected maximal effort. The treatments were given on three separate days with the gap of 48 hours under identical conditions (temp 28-34°c). The body glycogen level of the subjects was taken at the beginning and just after the completion of the 1500meter, 800meters and 400meter event with the help of bio-electrical impedance method. Significant difference in the amount of body glycogen depletion among swimmer during 400m,800m and 1500m swimming events (OF=16.7>3.35TF at 0.05) was found. Further post hoc test shows higher depletion of body glycogen in 1500 meter event (bg. Avg. depletion=37.5gm) compared to the mean depletion to 800mts (bg. Avg. depletion=22.20gm) and 400mts (bg. Avg. depletion=13.5gm) swimming event reflecting that there is significant effect of swimming distance with self paced maximum intensity on depletion of body glycogen in different distance swimming events.

Introduction

The great study by Christensen and Hansen in 1939 set up the impact of a high starch diet upon continuance time, and that pre-exercise glycogen levels applied an impact so as to fatigue. In this way, it was found that if a competitor, subsequent to draining glycogen saves, expended a high starch diet for a few days before an athletic occasion, there would in actuality higher glycogen levels than preceding activity. This "super-compensation" impact turned into the premise for starch stacking attempted by perseverance competitors (Wuest & Bucher, 1992).

In this way, the grouping of muscle and liver glycogen before activity assumes a vital part in continuance exercise limit. In thorough activity numerous studies have watched critical exhaustion of both liver and muscle glycogen. It is fascinating to perceive that the purpose of weariness appears to happen upon the consumption of liver glycogen. Then again, muscle glycogen saves; however fundamentally lower is just 65-85% exhausted, versus the 85-95% consumption showed for liver glycogen. This ought to make it promptly clear that liver glycogen is an essential deciding variable in a competitor's a great opportunity to depletion. It takes after those perseverance competitors who keep up a day by day regimen of continuance preparing without glycogen repletion may extremely drain their glycogen holds (Wilmore & Costill, 2008).

Glycogen, the real store of starch in the body, is included long chain polymers of glucose particles. The body stores roughly 450-550 grams of glycogen inside the muscle and liver for use amid activity. At higher activity forces, glycogen turns into the principle fuel used. Exhaustion of liver glycogen has the outcome of decreasing liver glucose yield, and blood glucose focuses likewise. Since glucose is the key vitality hotspot for the sensory system, a significant decrease in blood glucose brings about volitional depletion, because of glucose lack to the mind. It creates the impression that the proof exhibited in the writing all around backings the idea that the more prominent the exhaustion of skeletal muscle glycogen, then the more grounded the boost to renew stores upon the end of activity, gave sufficient sugar is supplied. Though early writing seemed to show that the time course of glycogen recharging after activity initiated consumption was 48 hours or all the more, later information have contested this idea. One study reported that a starch consumption totaling up to 550-625 grams for each day was found to reestablish muscle glycogen stores to pre-exercise levels inside the 22 hours between activity sessions. The discoveries of this study were bolstered by second study in which a sugar admission of 3100 kcal brought about complete re-synthesis of glycogen inside 24 hours. Normally, 2% of glycogen is resynthesized every hour after the underlying 2 hours promptly after activity. With organization of 50 grams of starch at regular intervals, the rate rose to 5% every hour, except did not rise when extra sugar was controlled. Organization of .7grams for each kg body weight at regular intervals is another technique that seems to boost the rate of glycogen re-synthesis. There is additionally some proof that considerably littler burdens (28 grams like clockwork) may prompt significantly more prominent repletion rates the rule of glycogen re-synthesis and super-compensation has extraordinary pragmatic ramifications, in sports.

Methodology

Selection of Subjects

Ten swimmers of swimming practice group of Lakshmibai National Institute of Physical Education, Gwalior were randomly select as subjects for the study and they consented for the study.

Tools and technique

- Bio- electrical impedance analyser was used to measure the body glycogen store in swimmers.

Collection of Data

Subjects were given three different treatments i.e. 400 meters, 800 meters and 1500 meters swimming. The treatments were given on three separate days with the gap of 48 hours under identical conditions. The temperature remained between 28-32°c for all experiments. The body glycogen level of the subject was taken before the start and after the end of the swimming events by the help of bio-electrical impedance analyzer.

Administration of test

Administration of the test involves the placement of electrodes on the subject right hand and right foot. Subject height, weight, age was input into the analyzer and then the low level, imperceptible electrical current is sent through the body. The flow of the current is affected by the amount of water in the body. As bio-electrical impedance analyzer determines the resistance to flow of the current as it passes through the body, it provides estimates of body water from which body glycogen content is calculated using selected equations (BIA manual 2012).

Data Analysis & Statistical Technique

To test the hypothesis and to find out the objectives of this study one way ANOVA was used. The level of significance was set at .05.

Results

Table 1: Analysis of variance for data on loss of Body Glycogen for 3 different distance of swimming i.e 400,800 and 1500 meters

Variances	SS	df	MS	F ratio
Within sets	2376.6	27	88.022	16.77*
Between sets	2952.6	2	1476.3	

*Significant at 0.05 level $F_{0.05}(2, 27) = 3.35$

The analysis of data in table 1 clearly reveals that the F ratio of 16.77 is more than the table value of 3.35 with 2 and 27 degree of freedom which is statistically significant at 0.05 level of confidence. F ratio is statistically significant at 0.05 level of confidence, Post hoc test (Scheffe test) was employed in order to find out which distance of swimming event resulted in greater depletion of body glycogen.

Table 2: Post Hoc Test for means of Loss of body Glycogen for three different distance of Swimming:

(I)swimming	(J) swimming	Mean Difference (I-J)	Std. Error	p value
400m swim	800m swim	8.70*	4.19577	.048
	1500m swim	24.00*	4.19577	.000
800m swim	400m swim	8.70*	4.19577	.048
	1500m swim	15.30*	4.19577	.001
1500m swim	400m swim	24.00*	4.19577	.000
	800m swim	15.30*	4.19577	.001

*. The mean difference is significant at the 0.05 level.

The analysis of data in table 2 reveals that the loss of body glycogen in 800 meters continuous swimming is significant higher then continuous swimming for 400 meters. The table also shows that loss of body glycogen in 1500 meter Swimming is significantly more as compare to 400 meter and 800 meters swimming. The means of body glycogen utilized in 3 different duration of swimming i.e. 400 meters, 800 meters and 1500 meters are graphically presented in figure 1.

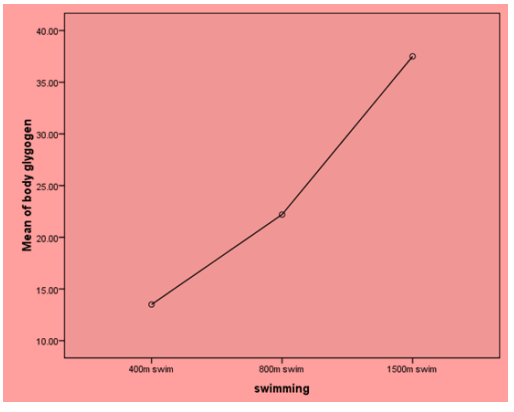

Figure 1 Means of body glycogen utilized in 3 different duration of swimming i.e. 400 meters, 800 meters and 1500 meters

Discussion of Findings

The analysis of data using analysis of variance clearly reveals that loss of body glycogen in 400 meter continuous swimming is significantly less as compared to 800 meter and 1500 meter continuous swimming and that continuous swimming for 1500 meter. Results are in-significantly greater in loss of body glycogen as compared to 400 meter and 800 meter continuous swimming. From the physiological point of view it is obvious that any physical activity done at a moderate intensity results in proportionately greater consumption of energy in case there is a gradual increase in the distance of exercise. In as much as the distance of continuous swimming for 800 meters and 1500 meters is comparatively much higher than swimming for 400 meters, this could be the main reason for loss of body glycogen being higher in 800 meters and 1500 meters continuous swimming as compared to 400 meters swimming. Continuous swimming thus resulting in greater loss of body glycogen as similar results were found by Paul J. Arciero et.al 1998 and Brooks G.A et. al,1983.

Discussion of Hypothesis

The hypothesis stated earlier in the research study stating that with the increase of distance of swimming exercise performed with self-paced maximum intensity there will be an increase in the utilization of body glycogen has been accepted.

Implications of the study

- The findings of this study are very useful for the coaches to train there swimmer for different distance with proper replacement of glycogen amount
- The finding of this study helps the coaches to re think on their training schedule and recovery process.
- The finding of this study reveals the fact that intensity and distance is the main factor for training and fat reduction.

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