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Glycogen Loading and its Effect on Athletic Performance

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Abstract

Various studies and modalities have been screened and adopted in improving athletic performance in recent times. One of the most widely studied parameter was the addition of dietary carbohydrate to increase endurance capability. The present study was conducted to ascertain the effects of glycogen loading on performance among healthy male athletes in Navi Mumbai region. The study reported that there was a significant relationship between increased performance and glycogen loading regime in the selected study population.

Keywords: *Athletes, glycogen loading, Performance.*

Introduction

Christiansen and Hansen were the first to explore systematically the link between diet and exercise capacity. Their study clearly showed the benefits of utilizing a high carbohydrate diet before prolonged exercise and was the first to establish the importance of carbohydrate content in diets of athletes preparing for competition. [(1)]

A high carbohydrate diet increases the stores of liver and muscle glycogen [(2, 3)]. The focus of these studies was the influence of dietary carbohydrate loading on endurance capacity rather than on endurance performance. Capacity is the time to fatigue when performing a particular exercise.

During repeated bouts of short-duration high-intensity exercise performed over a prolonged period of time, it could be expected that glycogen availability may become a limiting factor for the ability to sustain a high-power output and thus affect the performance. The importance of muscle glycogen during prolonged exercise was also confirmed in subsequent studies [(4, 5)], which showed that fatigue occurs when muscle glycogen concentrations are reduced to low values.

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It is well established that the concentration of glycogen in skeletal muscle can be manipulated by changes in the carbohydrate content of the diet and/or depleting exercise [(6, 7)], with this in mind, the present study was conducted to assess the effects of glycogen loading on performance capacity of healthy male athletes.

Methodology: The present was an experimental study was conducted among young healthy male Athletes at Dr D Y Patil Medical College, Navi Mumbai. A total of 10 subjects were selected for the pilot study. Institutional ethical clearance was obtained prior to the resumption of data collection and written informed consent was obtained from all the candidates. A proper glycogen loading protocol of 7 days were given to the subjects under consultation and supervision of a dietician. Detailed Exercise program of 7 days for glycogen depletion and loading is also provided along with diet and was monitored by sports specialist. Fasting blood glucose levels (FBG) and Leg press test were elicited from the subjects in both pre and post glycogen loading regime.

Results: The observations revealed that the mean age of the subjects was 19.4 years with a standard deviation of 1.83 years. The subjects were having a mean BMI of 21.68 ± 1.49 at the commencement of study period. Fasting blood glucose estimations revealed a mean value of 88.6 ± 4.11 mg/dl in the pre administration phase. The leg press results displayed a mean value of 186 ± 26.43 kgs prior to administration of glycogen loading in the selected study population.

Table 1: Comparison of Parameters pre and post administration of Glycogen

Parameters	Pre (Mean)	Post (Mean)	P Value	Signi-ficance
BMI	21.68±1.49	21.76±1.45	0.25	NS
FBG (mg/dl)	88.6±4.11	86.6±2.95	0.17	NS
Leg Press (Kg)	186±26.43	2015±26.45	<0.01	S

NS: Not Significant; S: Significant

The data revealed no statistically significant change in the fasting blood glucose levels of the subjects before and after administration of glycogen. In terms of performance in the leg press exercises, it was observed that the subjects exhibited improvement in weight as detailed in table 01. A non significant increase was also noted in their BMI.

Discussion

It is documented that during repeated bouts of short-duration high-intensity exercise performed over a prolonged period of time, it could be expected that glycogen availability may become a limiting factor for the ability to sustain a high-power output. [9] We observed in our study that a high glycogen diet among the subjects lead to an increase in exercise output, which is concurrent with the studies reported by Maughan, R. J. & Poole, D. C. [10]. It is well established that the concentration of glycogen in skeletal muscle can be manipulated by changes in the carbohydrate content of the diet and/or depleting exercise [11], and in our study we increased the glycogen concentration by systematically administering dietary glycogen to our subjects. Our study reports that our subjects were better able to maintain a high-power output after glycogen loading as compared to their previous regime, which is again in concurrence with study by Jenkins et al [12], who reported that dietary carbohydrate increase led to an increase in supramaximal intermittent exercise standards of their selected study subjects.

Conclusion

In conclusion we can state that dietary carbohydrate loading can improve performance in athletes and that such supplements can be used as an effective means of supplementing the normal carbohydrate intake in preparation for endurance activities. A limiting factor in our study remains the small sample size as this was a pilot study, and a lack of a control sample. A wider sample distribution and a larger sample size may be effective in providing a more sustainable and reproducible conclusion.

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