Research Article

Pre-exercise glucose drink and muscle performance by bicycle ergography

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Abstract

Background: There is a natural linkage between nutrition and exercise physiology. When a skeletal muscle fiber is repeatedly stimulated, the tension developed by the fiber eventually decreases even though the stimulation continues. This decline in muscle tension as a result of previous contractile activity is known as fatigue. Carbohydrate supplementation during exercise delays fatigue by 30–60 min. Ingestion of glucose drink half an hour prior to the exercise improves the muscular performance and delays the occurrence of fatigue.

Objective: To study the effect of pre-exercise glucose drink on muscle performance by bicycle ergography and time to fatigue in non-athletes.

Materials and Methods: A total of 30 male medical students with mean age of 18.6 ± 1.56 years were recruited for the study. Subjects were made to perform exercise on bicycle ergometer in two sessions each session separated by 1 week. In second session, subjects were given glucose drink half a hour prior to exercise. Work done was calculated and the time for fatigue, total distance traveled was noted in both the sessions.

Result: There was a significant difference in the time to fatigue (12.09 ± 7.42 min), work done (6964.00 ± 4517.96 J), total distance travelled in the first session is (2.12 ± 1.54 km) in the second session having greater values than in the time to fatigue (7.09 ± 4.96 min), work done (4305.33 ± 3065.19 J), and total distance traveled (3.55 ± 2.42 km) in the first session.

Conclusion: The performance is better and time to fatigue is delayed in exercise performed after taking glucose drink.

KEY WORDS: Pre-exercise glucose drink, bicycle ergography, fatigue, work done.

Introduction

Nutrition is an important tool within the exercise practice. There is a natural linkage between nutrition and exercise physiology. Once well oriented it may reduce fatigue, which allows the person to exercise longer or recover better after the exercise session. Carbohydrate (CHO) serves as an immediate energy fuel particularly during exercise.[1] CHO ingestion during exercise, leads to performance benefits during prolonged submaximal and variable intensity exercise. Euglycemia and oxidation of blood glucose at high rates late in exercise and a decreased rate of muscle glycogen utilization (i.e., glycogen 'sparing') have been proposed as possible mechanisms underlying the ergogenic effect of CHO ingestion.[2]

When a skeletal muscle fiber is repeatedly stimulated, it produces fatigue. Many factors contribute to fatigue of skeletal muscle, such as a local increase in inorganic phosphate resulting from breakdown of creatine phosphate, accumulation of lactic acid that may inhibit key enzymes in the energy-producing pathways or excitation contraction coupling process, and depletion of energy reserves.[3] With low intensity, long-duration exercise, a number of processes have been implicated in fatigue, but it appears that depletion of fuel substrates may be more important. CHO supplementation during exercise delays fatigue by 30–60 min, but do not prevent fatigue.[4] The energy derived from breakdown of blood-born glucose, liver, and muscle glycogen is ultimately used to power the

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contractile elements of muscles as well as other forms of biological work.[5] Previous researchers have consistently shown that there are many exercise occasions when a sports drink provides benefits superior to water.

Materials and Methods

Ethical clearance certificate was obtained from the institutional research ethical committee (Human).

A total of 30 active male subjects underwent two testing sessions. Following an explanation of all procedures, risks and benefits associated with the experimental protocol, each subject gave his written consent prior to participate in this study and completed a medical history/physical activity questionnaire to determine eligibility. Subjects were also required to have been free from any nutritional supplements or ergogenic aids for 6 weeks preceding the study and were asked to refrain from taking any additional supplements during the course of the study. Basal parameters such as height, weight, blood pressure, and pulse were recorded.

The subjects were made to do the exercise in two sessions at a standardized time of the day. Each session was separated by 1 week. During the first visit subjects were seated for 10 min. Then basal parameters were recorded. In the first session, the subjects were asked to perform exercise on bicycle ergography till fatigue occurs. During the second session, the subjects were given a glass (200 ml) of glucose drink (Glucon-D). The supplement was given according to the manufacturer's serving recommendation (35 g of glucose mixed in 200 ml water). Half an hour after the drink, the subjects were asked to perform exercise on bicycle ergography till they get fatigued.

Blood pressure and pulse were recorded at zero, second, and fifth minute after exercise in both the sessions. Work done and time to fatigue were calculated in both the sessions and finally BMI was calculated.

Result

An interventional study consisting of 30 male subjects was undertaken. The mean age (mean±SD) was 18.6 ± 1.56 years.

Comparison of Time to Fatigue

The mean value of time to fatigue in the first session (without glucose drink) was 7.09 ± 4.96, and in second session (after glucose drink) it was 12.09 ± 7.42. The time for fatigue was significantly high in second session.

Comparison of Work Done

The mean values of the work done in first session were 4305.33 ± 3065.19 J and in the second session it was 6964.00 ± 4517.96 J. The work done in the second session was significantly higher.

Comparison of the Total Distance Traveled

The mean value of the distance traveled in the first session was 2.12 ± 1.54 km and in the second session it was 3.55 ± 2.42 km. The distance traveled in the second session was significantly higher than in the first session [Table 1].

Discussion

The findings of our study show that the fatigue is delayed and the work done is higher in the second session when exercise was performed after having the glucose drink. Glucose drink given 30 min prior to the exercise delays fatigue and improves the performance. These findings are consistent with other published literature where the CHO was given along with the electrolytes and drinks containing ergogenic substances.[6]

A study designed to determine the effect of glucose drink on marathon running showed that 80% subjects covered more distance with glucose drink than without the glucose drink, and they concluded that CHO intake prior to exercise may enhance exercise performance and spares glycogen and lipid utilization.[7] Our study also showed that the distance traveled in the exercise by bicycle ergography was more after taking the glucose drink.

The ingestion of CHO (except fructose) at a rate of >45 g/h, accompanied by a significant increase in plasma insulin levels, could lead to decreased muscle glycogen utilization (particularly in type I fibers) during exercise. Endurance training and alterations in pre-exercise muscle glycogen levels do not seem to affect exogenous glucose oxidation during submaximal exercise. Thus, at least during low intensity or intermittent exercise, CHO ingestion could result in reduced muscle glycogen utilization in well-trained individuals with high resting muscle glycogen levels.[2]

Conclusion

Ingestion of glucose drink half an hour prior to the exercise improves the muscular performance and delays the occurrence of fatigue, possibly by increasing the availability of glucose in blood and thus sparing the muscle glycogen.

Table 1: Study characteristics

Study Characteristics	First session	Second session	T	*P*-value	Remark
Time to fatigue (in min)	7.09 ± 4.96	12.09 ± 7.42	5.00	<0.001	Highly significant
Work done	4305.33 ± 3065.19	6964.00 ± 4517.96		<0.001	Highly significant
Total distance traveled	2.12 ± 1.54	3.55 ± 2.42	4.51	<0.001	Highly significant

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