



THE EFFECTS OF HIGH AND LOW GLYCEMIC INDEX MEALS ON ENDURANCE PERFORMANCE.

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Abstract

Methods

Results

INTRODUCTION: The description of carbohydrates as either simple or complex is an insufficient way of classifying them. A metabolically more informative way of describing carbohydrates is the degree to which they raise blood glucose concentrations and this is expressed in terms of glycemic index (GI). Carbohydrates which produce a large increase in blood glucose concentration, in response to a standard amount of carbohydrate (50g), are classified as having a high glycemic index. The metabolic response during exercise is different as a consequence of the glycemic indices of the carbohydrates consumed preceding the exercise, and so the choice of carbohydrate in pre-competition meals could have an effect on performance. **PURPOSE:** The purpose of this study was to determine the effects of a High vs. Low glycemic Index meal on endurance and time to exhaustion during a maximal exercise test (VO₂max). **METHODS:** 5 athletic men with ages ranging from 21 – 28 yrs (24.5±2.7) participated in this study. Each subject was given a questionnaire prior to the study regarding nutritional intake. Each participant was then tested 2 different times within a one week time frame and asked to perform a VO₂max using the Bruce Protocol. Prior to one exercise test each subject consumed a Low Glycemic meal (LG = 40) consisting of Kashi® GOLEAN Crunch® (Kashi®) and prior to the other exercise test they consumed a High Glycemic meal (HG = 72) consisting of Cornflakes (Kelloggs' Co.) with low fat milk 45 min prior to the VO₂max test. All participants were encouraged to consume carbohydrate rich meals during the two days prior to the first trial and record all types and quantities of food and fluid ingested during this time period. This diet was replicated for the subsequent trial to minimize the variation in initial intramuscular glycogen stores between trials. Each subject was asked to avoid alcohol, caffeine, tobacco and strenuous exercise in the preceding 24 hours before the study. Respiratory quotient (RER) was calculated for every stage during the test along with RPE. Time to exhaustion was recorded at the end of each test. A mouthpiece was used to measure expired air and calculate oxygen consumption. **RESULTS:** The results showed there was a statistically significant difference between the trials of the High Glycemic (12:05±0.05) and Low glycemic meals (13:57±0.03) in the time to exhaustion (p=.008). However, there were no significant differences in maximal RPE, RER, and VO₂max, between the two conditions (p>0.05). **CONCLUSION:** These results indicate that G.I contents of two different meals had a significant, positive effect on time to exhaustion and ability to maintain greater amount of effort on a VO₂ max test. The time differences between the two trials indicate Future studies should include women as well as add more participants, both physically fit and unfit to provide a wider view of what the differences might be in maintenance of blood glucose and performance.

Subjects

- 5 athletic men with ages ranging from 21 – 28 yrs (24.5±2.7) participated in this study. Each subject was given a questionnaire prior to the study regarding nutritional intake.
- Each subject was asked to avoid alcohol, caffeine, tobacco and strenuous exercise in the preceding 24 hours before the study.



Food Values: Glycemic Index/Glycemic Load

	Low GI	Med GI	High GI
Low GL	All-bran cereal (8,42) Apples (6,38) Carrots (3,47) Peanuts (1,14) Strawberries (1,40) Sweet Corn (9,54)	Beets (5,64) Cantaloupe (4,65) Pineapple (7,59) Sucrose, i.e. table sugar (7,68)	Popcorn (8,72) Watermelon (4,72) Whole wheat flour bread (9,71)
Med GL	Apple juice (11,40) Bananas (12,52) Fettuccine (18,40) Orange juice (12,50) Sourdough wheat bread (15,54)	Life Cereal (16,66) New potatoes (12,57) Wild rice (18,57)	Cheerios (15,74) Shredded wheat (15,75)
High GL	Linguine (23,52) Macaroni (23,47) Spaghetti (20,42)	Couscous (23,65) White rice (23,64)	Baked Russet potatoes (28,85) Cornflakes (21,81)

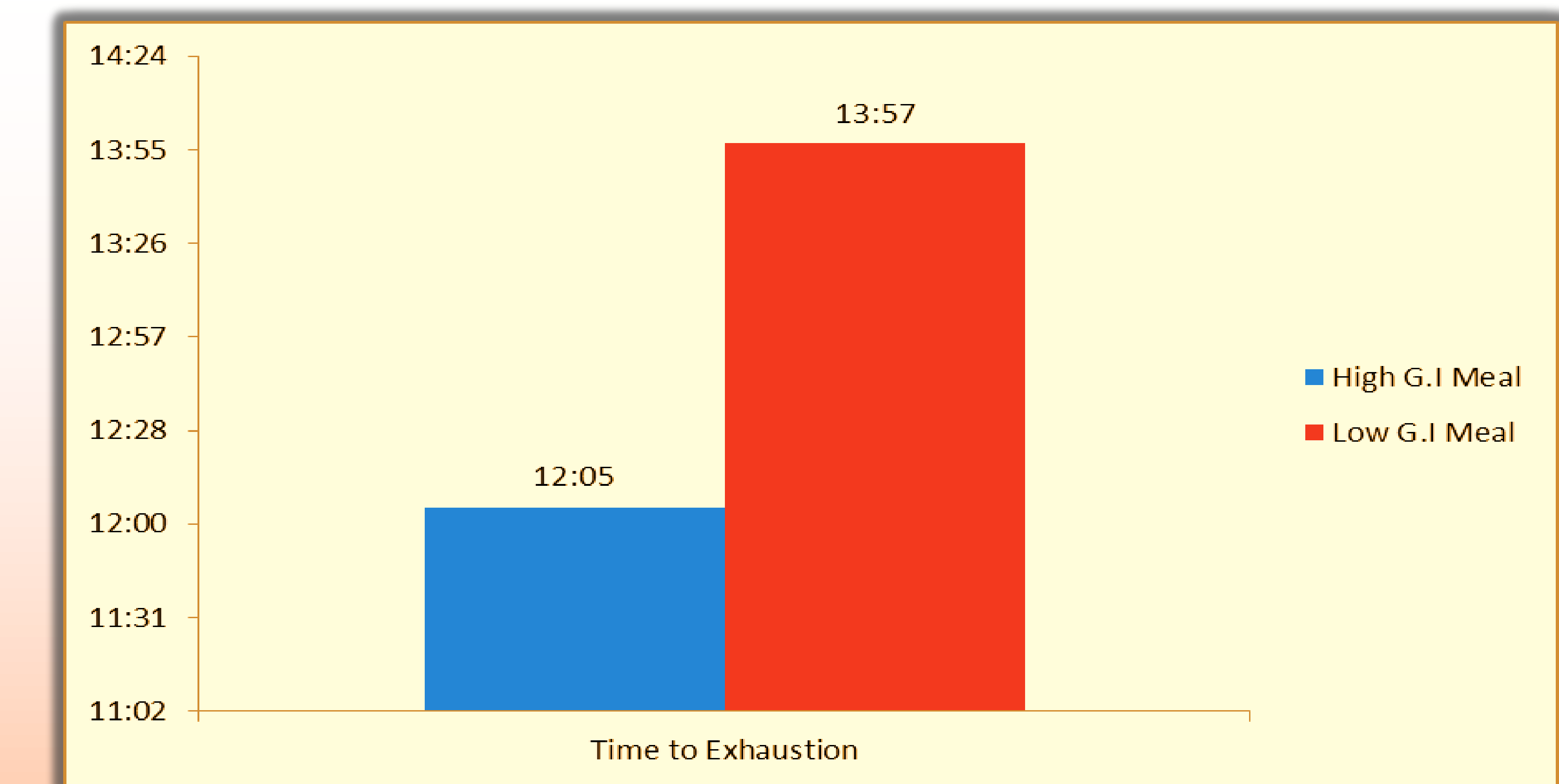
Source: Revised International Table of Glycemic Index (GI) and Glycemic Load (GL). *The American Journal of Clinical Nutrition*, July 2002

Protocol

- Each participant was tested 2 different times within a one week time frame and asked to perform a VO₂max test using the Bruce Protocol.
- Prior to one exercise test each subject consumed a Low Glycemic meal (LG = 40) consisting of Kashi® GOLEAN Crunch® (Kashi®) and prior to the other exercise test they consumed a High Glycemic meal (HG = 72) consisting of Cornflakes (Kelloggs' Co.) with low fat milk 45 min before testing.
- All participants were encouraged to consume carbohydrate rich meals during the two days prior to the first trial and record all types and quantities of food and fluid ingested during this time period.
- This diet was replicated for the subsequent trial to minimize the variation in initial intramuscular glycogen stores between trials.
- Respiratory quotient (RER) was calculated for every stage during the test along with recording of the rate of perceived exertion (RPE). Time to exhaustion was recorded at the end of each test and a mouthpiece was used to measure expired air and calculate oxygen consumption.

Table 1: Related Variables

Variable	Mean ± Standard Deviation		P-Value (p<.05)
	High GI	Low GI	
VO ₂ max	45.76±6.14	46.92±5.56	.015
Time	12:05±.06	13:57±.04	.003
RPE	10.85±.46	10.7±.62	.252
RER	.92±.01	.95±.02	.160



The results showed there was a statistically significant difference between the trials of the High Glycemic (12:05±0.05) and Low glycemic meals (13:57±0.03) in the time to exhaustion (p=.008). However, there were no significant differences in maximal RPE, RER, and VO₂max, between the two conditions (p>0.05).

Conclusions

These results indicate that G.I. contents of two different meals had a significant, positive effect on time to exhaustion and ability to maintain a greater amount of effort when ingesting a Low Glycemic Meal on a VO₂max test.

Purpose

The purpose of this study was to determine the effects of a High vs. Low glycemic Index meal on endurance and time to exhaustion during a maximal exercise test (VO₂max).