

Comparing Pre-Competition Carbohydrate Consumption in Female Collegiate Gymnasts to Consumption Recommended by Current Literature

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ABSTRACT

The goal of the research is to identify current pre-competition carbohydrate consumption trends in female collegiate gymnastics. Pre-competition carbohydrate consumption has a large impact on athletic performance and overall health. Two position statements regarding pre-competition carbohydrate consumption have been published by: The International Society of Sports Nutrition, The American Dietetic Association, Dietitians of Canada, and The American College of Sports Medicine. A modified 24-hour diet recall survey was used to assess the pre-competition carbohydrate intake of competing female gymnasts from six division one teams and two division three teams. Food and beverage consumed in the three to four hours prior to competition was used in this research. Sixty-three surveys were analyzed by the Nutritionist Pro Diet Analysis software and determined that the mean carbohydrate consumption was 42 grams. Division one gymnasts consumed a mean of 38.6 grams while division three consumed a mean 59.4 grams. Sixty-two surveys were analyzed to compare grams of carbohydrates consumed to the gymnasts' body weight (kg). This analysis revealed a mean consumption of 0.71-g/kg bodyweight while the division one and three means were 0.65- and 0.99-g/kg respectively. This research indicated that female collegiate gymnasts are not consuming enough pre-competition carbohydrates to meet the recommendations made by current literature.

INTRODUCTION

This study focuses on the pre-competition consumption of female collegiate gymnasts. This group of athletes is often labeled as having poor nutrition because they are under a lot of societal and cultural pressure to maintain a lean body. Gymnastics is a physically demanding sport that requires its athletes to be in excellent health to perform well and avoid injury. For this reason, gymnasts must consume a sound pre-competition meal that accomplishes all of the following goals: 1) give the athlete enough energy (contain enough kilocalories) to complete the task, 2) contain enough fluid to maintain hydration, 3) be low in fat and fiber to avoid gastrointestinal distress, and 4) high in carbohydrates to maintain blood glucose and maximize glycogen stores.¹⁻⁵ Food included in the pre-competition meal should be familiar to the athlete and may be important to the athlete's psychology or superstitions.^{1,5} This nutritional preparedness may be the difference between victory and defeat. More importantly, this nutritional preparedness may be the difference between sickness and health.

Literature indicates that carbohydrate and fluid consumption are the two most influential factors on anaerobic performance. This study will focus exclusively on carbohydrate consumption. Carbohydrate consumption is very important for anaerobic gymnasts who rely heavily on type IIa and type IIb muscle fibers.⁶ These fibers have a poor capillary supply and low oxidative capacity; therefore, they are unable to use fat as an energy source.⁶ Recently two position statements were published that addressed the issue of pre-competition carbohydrate consumption. The International Society of Sports Nutrition (ISSN) Position Statement on Nutrient Timing was published in 2008 and states that "General guidelines recommend ingestion of 1-2 grams of carbohydrate per kilogram body weight, three to four hours prior to competition."⁷ "Nutrition and Athletic Performance" was published in 2009 as a joint position statement by the American Dietetic Association (ADA), The Dietitians of Canada (DC) and the American College of Sports Medicine (ACSM) and states "Amounts of carbohydrate shown to enhance performance have ranged from approximately 200-300 grams of carbohydrate for meals consumed three to four hours prior to competition."¹ These published recommendations should nutritionally prepare athletes for competition and decrease the incidence of flawed performance, injury or illness that resulting from poor nutrition practices.

Based on athletic training experience with female collegiate gymnasts the hypothesis of this research is that this population is not consuming enough carbohydrates to meet the pre-competition published recommendations. A secondary hypothesis is that division one gymnasts are closer to complying with the recommendations than division three gymnasts. This hypothesis is based on the principal that division one gymnasts have more access to nutrition education and need a strong nutritional foundation to compete at a higher level.

METHODS

The Institutional Review Board at the University of Wisconsin-La Crosse approved the following protocol. A modified version of the standard 24-hour diet recall survey was created to gather information about the gymnasts' food and beverage consumption in the 24 hours prior to competition. The 24-hour diet recall survey method has been shown to be useful in gaining generalized nutrition information from a specific population.

Attempts were made to contact every collegiate gymnastics coach in the United States through email. Email addresses were gathered from the Coaches' Directory at collegegymnast.com. Thirteen gymnastics coaches agreed to allow their teams to participate in the research. These coaches were sent the modified 24-hour diet recall surveys, survey administration instructions, informed consent forms and a self addressed stamped envelope. Surveys were administered by a member of the coaching or the athletic training staff after one gymnastics meet during the 2009-2010 competitive season.

Foods consumed in the three to four hours prior to competition were inputted into the Nutritionist Pro Diet Analysis Software. This software totaled the grams of carbohydrates consumed by each gymnast and this information was inputted into the Statistical Package for the Social Sciences (SPSS) for statistical analysis.

RESULTS

Surveys were completed and returned from six division one and two division three gymnastics teams, which totaled 92 completed surveys. Data from 29 surveys could not be used for the purposes of this research. Eight surveys were returned from gymnasts who did not compete on the day that the survey was taken. Twenty surveys stated that the pre competition meal recorded on the survey was unusual. One survey could not be analyzed by the Nutritionist Pro diet analysis software because there was no nutrient data on the particular food consumed. Sixty-three surveys were analyzed for total grams of carbohydrate consumed in the three to four hours prior to competition. The minimum grams of carbohydrate consumed were zero while the maximum was 172.3. The mean carbohydrate consumption was 42 grams. The division one mean was 38.6 grams while the division three mean was 59.4 grams. A t-Test performed by SPSS showed no significant difference (at the .05 level) in the number of carbohydrates consumed between division one and division three gymnasts. Sixty-two surveys were analyzed for the grams of carbohydrate consumed per kilogram body weight (g/kg). One survey was not analyzed because the subject did not disclose her weight. The minimum carbohydrate consumption was zero g/kg while the maximum was 3.5 g/kg. The overall mean consumption was 0.71 g/kg while the division one and three means were 0.65 and 0.99 g/kg respectively. A t-Test completed by SPSS showed no significant difference in the g/kg consumption (at the .05 level) between the two divisions. It should be noted that 32% of the 63 surveys analyzed reported consuming 0 grams of carbohydrates in the three to four hours prior to competition. All of those that reported consuming zero grams of carbohydrate were division one gymnasts.

DISCUSSION

By revisiting the recently published position statements from the ISSN, ADA, DC, and ASCM we can determine female collegiate gymnasts' compliance to published pre-competition carbohydrate recommendations. The Nutrition and Performance Position Statement made by the ADA, DC and ASCM recommends consuming 200-300 grams of carbohydrate in the three to four hours prior to competition. This research shows that gymnasts are consuming an average of 42 grams of carbohydrates, which is well below the recommendation. The ISSN position statement regarding Nutrient Timing recommends 1-2 grams of carbohydrates per kilogram body weight in the three to four hours prior to competition. This research shows that the mean carbohydrate consumption is 0.71 g/kg, which is also well below the recommendation. These two statistics show that the first hypothesis is correct in its statement that female collegiate gymnasts are not meeting current carbohydrate recommendations.

Further data analysis illustrated the consumption trends between division one gymnasts and division three gymnasts. Division one gymnasts consumed an average of 38.6 total grams of carbohydrates and 0.65 g/kg in the three to four hours prior to competition. Division three gymnasts consumed an average total of 59.6 total grams of carbohydrates and 0.99 g/kg in the three to four hours prior to competition. This research disagrees with the

secondary hypothesis and shows that division three gymnasts are much closer to meeting the recommendations made by the ISSN, ADA, DC and ASCM.

One key finding in this research was that nearly one-third of female collegiate gymnasts reported zero carbohydrates consumed in the three to four hours prior to competition. Acute side effects of under consumption of carbohydrates include nausea, muscle depletion, fatigue, electrolyte loss and dehydration. If a gymnast is experiencing any of these symptoms during a gymnastics meet they are at an increased risk of injury. Effects of chronic under consumption of carbohydrates include ketosis, elevated levels of blood triglycerides, several vitamin and mineral deficiencies, and cancer. All of these side effects have a negative effect on performance and overall health.

Average female collegiate gymnast participating in this study weighed approximately 58.2 kilograms (128 lbs). According to the International Society of Sports Nutrition Position Statement these gymnasts should consume 58.2-116.4 grams of carbohydrates three to four hours prior to competition. The Nutrition and Athletic Performance Position Statement recommends that these same gymnasts consume 200-300 grams of carbohydrates in the three to four hours prior to competition. There is obviously disagreement between these two position statements that questions the validity of these recommendations for female collegiate gymnasts. Further research is needed to explore the validity of these recommendations with regard to the female collegiate gymnast population.

The 24-hour diet recall survey is certainly a useful tool for obtaining general nutrition trends among a population. Now that this trend has been exposed, research needs to be done using interviews and primary observations by registered dietitians. These methods of data collection will produce more precise data regarding the quantity of foods and beverages consumed.

ACKNOWLEDGEMENTS

I wish to acknowledge the participating gymnastics teams, coaching staffs and athletic training staffs that were involved in the successful completion of the 24-hour diet recall surveys. A University of Wisconsin-La Crosse Undergraduate Research Grant supported this research.

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