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Original Research

College Students' Knowledge of Recovery Beverage Serving Sizes

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ABSTRACT

International Journal of Exercise Science 10(3): 397-405, 2017. Previous research suggests that chocolate milk may be a beneficial recovery beverage, yet little is known about how athletes and students training for careers in sports science or health-related fields interpret recommended recovery beverage serving sizes. This study examined college students' ability to correctly apply serving size recommendations for chocolate milk and protein powder used during post-exercise recovery and assessed usual consumption of milk as a recovery beverage. College students (34 women, 39 men) poured the amount of chocolate milk they would consume within 90 minutes after exercise unaided and with the use of a serving size guide. They scooped the amount of protein powder they would use after exercising. Participants reported consuming about 1.3±1.8 glasses of milk and drinking a recovery beverage besides milk an average of 0.95±1.3 times in the past three days. The majority poured less than recommended. Student athletes poured significantly closer to the recommendation than non-athletes (436±128 ml versus 418±127 ml, p=0.016) and poured significantly closer to the recommendation after reviewing a serving size guide (p=0.038). Athletes and men served themselves significantly more protein powder than non-athletes (13.0±5.6 g versus 10.3±5.2 g, p=0.047) and women (12.5±6.0 g versus 9.8±4.4 g, p=0.041). Most participants reported that the serving size guide was easy to read and helpful. Nutrition education specific to post-exercise recovery beverages may help students improve accuracy when interpreting serving size recommendations.

KEY WORDS: Athletic training, portion size, fluids

INTRODUCTION

Though food label serving sizes provide valuable information for consumers, research suggests that consumers may not always use food labels to estimate portion size (18) and that estimates of a serving often vary from the recommended amount (5,8). In particular, there is limited research about how college students, who may be living away from home or making most of their food choices without parental supervision for the first time, estimate portion size. A study of 42 college students found that when they were not looking at food labels, 14 poured at least double the amount of the standard serving size of cereal (5). The lack of serving size awareness was even more evident for beverages. When asked to pour the amount of juice they would normally serve themselves, 25 students poured 200% of the recommended serving size. Research has demonstrated that environmental factors (14, 35), lack of knowledge (5, 24), body mass index (4) and many others may also influence portion size.

Despite the importance of nutrition for athletic performance and post-exercise recovery (1), student athletes and those training for careers in which they may be asked for nutrition advice (such as athletic training, coaching, sports medicine or health-science fields) may also know little about recommended serving sizes (15, 23, 26, 28, 31). In particular, they may lack knowledge about general and sports nutrition (26, 32) as well as serving sizes (5, 19, 24). Recent findings have also highlighted the importance of post-exercise recovery nutrition in training and performance. This supports the idea that consuming carbohydrates, protein, and some fat within the first hour after a work-out aids in recovery by inducing the restoration of muscle glycogen, decreasing muscle damage and facilitating the synthesis of protein as muscles repair (13, 30, 33). Because milk, particularly chocolate milk, is a rich source of carbohydrate and protein that is easily obtained and inexpensive, it is often suggested as a recovery beverage (27, 35). Compared to a carbohydrate replacement drink, research with chocolate milk has shown improved performance (18, 28) and improved VO_{2max} (13) during subsequent exercise among cyclists and reduced perceived exertion and perceived exertion after resistance training (33). Following this research, recommendations suggested that chocolate milk may be used as a recovery beverage (18, 22).

Thus, the purpose of this study was to evaluate student understanding of recovery beverage serving sizes to guide the selection of topics for and development of future education programs for this population.

METHODS

Participants

Power analysis indicated that a sample size of 30 would give 80% power to detect differences between means at $p<0.05$. To assure adequate numbers of women, biology majors and non-athletes that would allow comparisons and account for possible drop-out, additional subjects were recruited. The final sample consisted of 73 participants. Students at Kean University taking upper-level biology and health science classes leading to careers in science-related allied health and helping professions, such as medicine, science education, athletic training, exercise science and physical education, were invited to participate. Each participant gave written informed consent, and the research was approved by the Institutional Review Board at Kean University.

Protocol

The survey questions and procedures were based on those used previously in similar research with college students and young adults (5, 7, 19, 24). Participants first completed a brief survey with questions regarding gender, college academic major, weight, milk consumption, recovery beverage use, daily physical activity and student athlete status. The beverage intake questions asked students to indicate how many glasses of milk they had consumed in the past three days to help them recover from exercise (response options ranged from 0 to 5 or more glasses) and how many times during the past three days they had consumed a recovery beverage other than milk (response options ranged from 0 to 5 or more times). Students were also asked to indicate how many days in the past three days they had engaged in physical activity for at least 20 minutes.

Participants then met with one of the investigators in a private area of the research laboratory and were given a 32 oz (946 ml) clear plastic container filled with powdered milk to represent protein powder and an empty 8 oz (237 ml) clear plastic container. A black, plastic 1 tablespoon (15 ml)-sized scoop without measurement markings on it was provided with the powder. Using the scoop, participants were asked to scoop into the eight ounce container the amount of protein powder they would use if they were making a beverage to recover from exercise in the first hour after exercise. Similar to previous research studying student knowledge of serving size (5, 24), the researcher did not watch the participants pour but rather turned to retrieve and prepare the next item in order to reduce possible self-consciousness of the participants. The researcher returned to collect the containers and put them to the side out of view of the participants to be weighed using a calibrated digital scale (Smart Weigh PL11B Professional Digital Scale). The researcher then brought the participant a half gallon jug of chocolate milk and a clear, plastic, 32 ounce, reusable sports bottle. The sport bottle used for this experiment is similar to the type of bottle popularly used to mix protein shakes, and was chosen because it did not have any markings indicating volume on it. The participant was instructed to pour the amount of beverage they would serve themselves during the first hour after exercising (Milk 1). Once again, the researcher did not watch participants pour. When the participant finished, the researcher collected the bottle and set it aside with the protein powder. The participants then answered a follow-up question on the survey asking how many cups out of what they just poured they would actually drink. (Response options ranged from less than ½ cup to more than 2 cups.) After this question, participants were given a new bottle and a guide for serving milk as a recovery beverage. The guide included the recommended amounts of 0.8 $g \cdot kg^{-1}$ carbohydrate and 0.4 $g \cdot kg^{-1}$ protein (about 2 cups of milk for many athletes) to consume during post-exercise recovery that have been reported in the literature (3, 16, 17, 32). Since the guide was developed for pre-professionals in health and sports science fields, the recommended amounts were reported in this format to reflect the language used in guidelines and position papers these students frequently encounter (3, 16, 17, 32). The guide also included a serving size of chocolate milk that would meet these guidelines for many of the athletes based on body weight (2 cups or 473 ml) to eliminate the need for calculations while illustrating that this amount was grounded in research. A picture of a hand making a fist was added as a visual guide to a serving size of 1 cup (Figure 1). This illustration was chosen because it is familiar and commonly used to illustrate a 1 cup serving of milk and other foods

(2, 9, 10). The guide also listed the nutrients provided by 1 cup of low fat chocolate milk (calcium, fluid, electrolytes, carbohydrates and protein) and briefly explained their importance in post-exercise recovery (i.e. hydration or muscle rebuilding). Recipes that could be made or served post-workout with low-fat chocolate milk, such as a smoothie or trail mix with nut butter, were included, along with web resources for additional nutrition information (e.g. www.choosemyplate.gov).

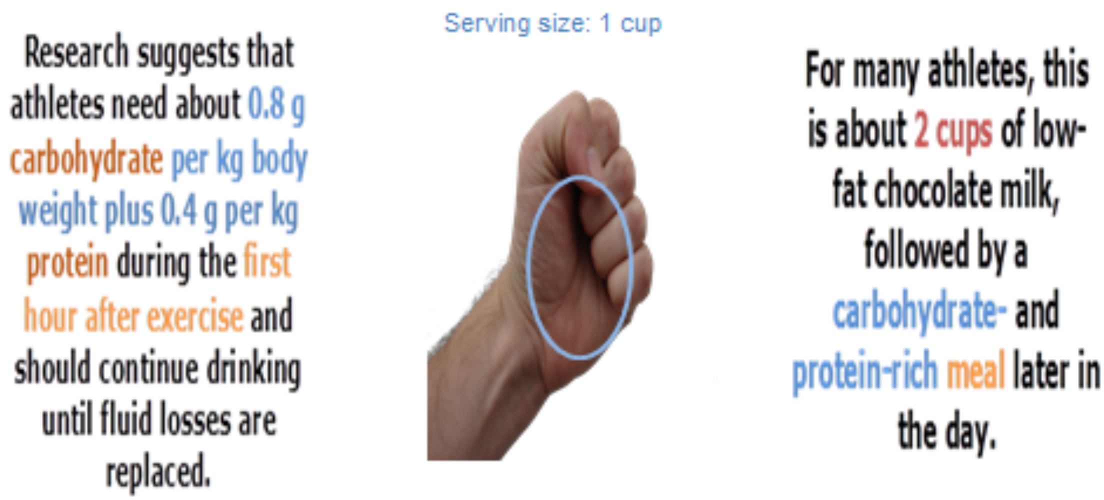

Figure 1. Recovery beverage serving size guide.

After reading the guide, participants were told to pour that amount of chocolate milk into the bottle (Milk 2). The researcher collected the second bottle and put it with the first bottle and the protein powder to measure. The participants then completed the rest of the survey, which included two questions rating how simple they felt the recovery beverage guide was to read and how likely it was to improve their measurement of recovery beverage serving size. These questions were scored using a 5-point Likert scale, with 5 being the best score. The final question asked for suggestions for improvements that would make the guide easier to read.

Statistical Analysis

Data were analyzed using SPSS, version 21. Based on the recommendation that $0.4\ g \cdot kg^{-1}$ protein should be consumed post exercise (3, 16, 17, 32), a recommended serving size of milk for each participant was calculated based on body weight. A difference score was then calculated to compare the recommended amount for that participant to the amount poured. One-way Analysis of Variance was used to examine differences in the amount of milk served with and without the guide and the amount of powder served based on student athlete status, academic major (health or biology) and gender. Values are reported as means ± standard deviations unless otherwise noted, and values were considered significant at $p<0.05$.

RESULTS

The sample consisted of 73 participants with 24 student athletes and 49 non-student athletes (Table 1). Mean body weight was 72.9±15.4 kg. Included in the sample were 34 women, 39 men, 58 health majors and 15 biology majors (Table 1). When surveyed about behaviors during the past three days, participants reported exercising more than 20 minutes at a time an average of 2.0±1.0 days, drinking 1.3±1.8 glasses of milk, and drinking a recovery beverage besides milk an average of 0.95 ±1.3 times. Forty-four students reported not drinking a recovery beverage other than milk after exercise in the past 3 days. When serving themselves, 82% of participants poured less than their individual recommended serving size of milk. On average, student athletes poured significantly closer to their individual recommendation (Milk 1) than non-athletes (436 ±128 ml versus 418 ± 127 ml, p=0.016) (Table 1). After looking at the serving size guide (Milk 2), student athletes poured significantly closer to the general post-exercise serving recommendation stated in the guide (p=0.038) (Table 1). There were no significant differences in milk poured for any of the other groups. On average, athletes served themselves significantly more protein powder than non-athletes (13.0 ± 5.6 g versus 10.3 ± 5.2, p=0.047) (Table 1). Men served themselves significantly more protein powder than women (12.5 ± 6.0 versus 9.8 ± 4.4 g, p=0.041) (Table 1). When questioned on the effectiveness of the guide, participants on average rated the guide 4.03±0.99 out of 5 on easiness to read and 3.8±1.01 on helpfulness, with scores of 5 being the easiest and most helpful. Comments regarding feedback on the guide included using more color or bold lettering, highlighting the important facts, and using bullets instead of sentences. Participants also suggested using examples in the guide that make it easier to see what a cup looks like without using measurement tools.

Table 1. Milk and protein powder poured.

	Mean±SD		
	Milk 1 (ml)	Milk 2 (ml)	Powder (g)
Student athletes (n=24)	436±128	446±132	13.0±5.6**
Non-student athletes (n=49*)	418 ±127	418±121	10.3±5.2
Women (n=34)	448±142	445±136	9.8±4.4
Men (n=39*)	402±109	428±122	12.5±6.0**
Health majors (n=58)	430±130	438±124	11.0±5.3
Biology majors (n=15*)	395±110	430±150	12.2±6.1

*n=47 non-student athletes, 37 men and 13 biology majors for Milk 2; ** p<0.05

DISCUSSION

In general, participants did not accurately pour the recommended serving size for post-exercise recovery based on their body weight, but poured significantly closer to the recommended amount when using a serving size guide. These findings are consistent with research demonstrating that students have difficulty estimating portion size (5, 24). Previous research has suggested that college students may experience a variety of barriers to milk consumption. These include moving away from home, limited selection of dairy products on campus, concerns about weight gain and lack of knowledge about the benefits of dairy products as a source of calcium and what constitutes a serving size (19). These may have also caused participants in the current study to serve less than the recommended serving size of milk. Education on the potential role of dairy products in post-exercise recovery and the use of measuring tools and other aids may help students improve serving size estimation accuracy (6).

In the current study, the protein powder scoop held 4 grams of protein powder. Looking at various popular protein powders on the market (defined as best-sellers on Amazon.com), it is evident that different protein powders contain scoops of varying size and define a serving of powder differently, likely due to the differing amounts of fillers and added ingredients that can make up protein powder. For example, for EAS whey protein powder (Abbott Nutrition), one scoop contains 19.5 g of powder, and according to the product's label a serving size is 39 g, or 2 scoops, which contains 26 g of protein (eas.com). For Now Sports' whey protein powder, one scoop contains 43 g of powder and a serving size is considered 1 scoop, providing 24 g of protein (nowfoods.com). Bio-engineered Supplements and Nutrition's (BSN) Synth-6 protein powder comes with a scoop that holds 47.2 g of powder, and has a serving size of 1 scoop, which contains 22 g of protein (gobsn.com). The Isoblend protein powder from Elite Labs USA contains a scoop that holds 28 g of protein powder, and one serving is one scoop, which provides 25 g of protein (elitelabsusa.com). Thus, a "typical" single serving of these products is about 39 g of powder (about 25 g protein) and 1.4 scoops. In the present study, participants served themselves an average of 2 scoops, suggesting that they may have determined serving size by number of scoops (perhaps the number they typically consumed) rather than visual estimation of the amount of powder. This is consistent with previous research showing that consumers have difficulty accurately estimating portion size of foods that mound or assume the shape of their container (8). Given the variation between brands of protein powder and the difficulty in estimating portion size, nutrition education for this population should include a reminder to use the Nutrition Facts panel and measure carefully to ensure a true serving (about 25 g) of protein powder is scooped. Education for future professionals in health and sports science fields should also emphasize accurately interpreting recommendations for recovery beverages and providing simple visuals (e.g. picture of a fist) to ensure correct measurement of serving sizes.

This study also makes evident the need for more education on what individuals should consume to fuel post-exercise recovery. Various studies have shown that consumption of foods or beverages providing carbohydrates, protein and fluid, including milk, promotes post-exercise recovery (25, 30, 33). However in the current study, students reported minimal consumption of milk following physical activity or at other times. Previous research with college soccer players reported that athletes typically consumed about 1.1±0.9 servings per day of foods from the meat and beans group, 4.6±3.5 servings per day from the grains group, 1.1±1.2 servings per day of vegetables, 0.9±1.2 servings per day of fruit and 2.0±1.5 servings per day of dairy products (29). Thus, though dairy products may have been consumed at other times during the day, intakes of many food groups, including potential non-dairy sources of calcium and protein, were well below recommendations (11). These findings suggest areas of focus for nutrition education interventions with this population to ensure adequate nutrient intake.

Overall, college students preparing for careers in the health and sports science professions showed limited ability to correctly interpret recovery beverage serving size recommendations. The current study supports the existing body of research on the general absence of serving size knowledge and the inability to correctly gauge portion size among college students and those in health professions (5, 24, 31). These skills are particularly important for student athletes and individuals entering sports science and health-related fields. Accurate measurement of serving sizes can affect post-exercise recovery and overall health, and students in these fields may be called upon by patients and clients to answer questions about nutrition (11, 12). Further research is needed to understand the variety of foods consumed after exercise and develop education programs that help future health and sports science professionals accurately interpret recovery beverage serving size recommendations.

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