Nutritional Product Development: Integration With Diet Analysis Software

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Abstract

Sports nutritional supplement sales have increased dramatically. Most are unnecessary and no substitute for a balanced diet; comparable products (e.g. sports bars and sports drinks) can be made at home. Diet analysis software use provides substantial information on nutritional products. Some programs allow recipe creation and yield food labels meeting 1994 Nutrition Education Labeling Act requirements. An exercise done in an undergraduate sports nutrition class is described in this paper. Students developed sports nutrition products similar to leading commercial brands, analyzed them, and created food labels for consumer education.

Introduction

Athletes have increased their use of nutritional ergogenic aids in the recent years largely due to the explosion in advertising. Widespread use of vitamins, minerals, protein supplements, and sports drinks has been documented (Massad, Shier, Koceja, & Ellis, 1995, Haymes, 1991).

The increased exposure to advertisements has occurred since the passage of the Dietary Supplement Health and Education Act (DSHEA) in 1994, forming a new category called "dietary supplements." Since the passage of this act, vitamins, minerals, amino acids, herbs, and other metabolites do not fall under Food and Drug Administration (FDA) approval. This has lead to a significant rise in the number of nutritional aids on the market.

Sales for sports drinks and energy bars have increased dramatically. Sports drinks are usually designed for fluid-electrolyte replenishment or carbohydrate loading. Some are also designed for protein supplementation or meal replacement. Energy bars are usually marketed as high-carbohydrate "energy boosters," or meal replacements. The appeal of energy bars is the effect they have on glycemic index, or the extent to which they raise blood sugar. Some energy bars have a lower simple sugar and higher complex carbohydrate content than typical candy bars and theoretically lead to a more moderate, sustained increase in blood sugar. This would benefit endurance athletes who need to sustain a stable blood sugar to delay hypoglycemia and fatigue.

In the United States, consumer sales of sports bars went from $360 million in 1996 to $860 million in 1999. Sales of sports drinks went from 100 million in 1996 to $120 million in 1999 (Nutrition Business Journal, San Diego, California, c 2000).

Despite the successful marketing of sports bars, few research studies have substantiated a significant role they would have in improving sports performance. Hertzler (2000) compared glycemic responses in adults after they consumed white bread, candy bars, moderate-carbohydrate energy bars, and high-carbohydrate energy bars. The blood glucose responses from the high-carbohydrate energy bar were similar to that of the candy bar. This occurred despite the fact that sugars comprised a much higher percent in the candy bars versus the high-carbohydrate energy bars. Claims of a more moderate, sustained increase in blood sugar based on a low simple to complex carbohydrate ratio are not well founded, based on this research. This raises the question of whether "energy" bars really benefit sports performance.

Sports drinks, especially fluid-electrolyte replenishment drinks, can benefit athletes because they taste good and encourage rehydration after prolonged exercise. The most important elements making a sports beverage taste good are flavor-type, flavor intensity, and sweetness (Passe, 2001). Successful marketing of sports drinks can be attributed to their good taste, convenience, and overall acceptability.

Teaching Idea

This nutrition supplement and labeling assignment was pilot tested in an undergraduate *Nutrition for Sports and Exercise* class. It could be adapted for any health, nutrition, or physical education class where nutrition and exercise are part of the curriculum. All students in the course had completed introductory nutrition, general chemistry, and anatomy and physiology courses as pre-requisites to *Nutrition for Sports and Exercise*. The exercise-related functions of

all macronutrients (protein, fat, and carbohydrate), their specific roles in metabolism, and their utilization during various types of exercise had all been studied in detail prior to this assignment. Nutritional supplements designed to enhance performance had also been studied in the weeks preceding this activity. The purpose was to design nutritional products with nutritional content, taste, and convenience similar to commercial products, at a significant savings in cost.

The activity began with a discussion of purported ergogenic benefits, cost, convenience, and overall uses of common sports nutritional products. Students identified the products they most frequently used, and the products most frequently used by their peers, and/or sports teammates. Fluid-electrolyte drinks, "energy bars," and protein drinks were the products most commonly reported. The questions and discussion are summarized in Table 1.

Table 1: Summary of Opening Questions and Discussion Points, Provided by the Students in the Pilot Test

Instructor's question:	*Instructor's question*:	*Instructor's question*:
What, if any, are the benefits of fluid-electrolyte drinks?	• What is the benefit of protein drinks and meal replacement bars or drinks?	What are some disadvantages of commercial products?
Student responses: • Fluid-electrolyte drinks are designed for re-hydration, electrolyte replenishment, and glycogen re-synthesis after a long workout. • They encourage re-hydration because they taste good. • Water provides the same re-hydration benefits, while fruit juice provides some electrolytes (potassium), and some glucose. This is much less costly.	*Student responses*: • They provide energy (Calories). • They are convenient. • They provide nutrients for those "on the run." • They taste good It is important to note however, that energy bars provide *energy as calories or fuel* for the body but do not necessarily induce vigor or power.	*Student responses*: • Expensive • Nutrients provided in most products are abundant in ordinary foods and beverages. • Some claim to have "fat-burners" (e.g. chromium picolinate & L-carnitine) with little supporting evidence. • It is unclear how effectively the body can absorb vitamins and minerals added to the products. • Calorie dense supplements (e.g. sports bars and shakes) may negate efforts to decrease fat and weight.

After the discussion, an assignment was given that included the following steps. The specific aim was to design a product similar to a commercial product, that would be nutritionally comparable, palatable, convenient, and less costly. For the sake of simplicity, the assignment was limited to the nutritional products identified as most commonly used.

The steps:

1. Find *one* of the following types of nutritional supplements:
    - A high-protein liquid formula
    - A high-carbohydrate drink made for carbohydrate loading (e.g. a glucose polymer drink, such as "Gator-load").
    - A carbohydrate-loading sports bar
    - A fluid replenishment drink (e.g. designed to replace fluid loss from sweat, such as "Gatorade")
2. Save the label. Prepare a homemade recipe that is similar to the product you bought.

    It should be:
    - Relatively easy to prepare

- The same or very close in percent calories from carbohydrate, fat, and protein, as the commercial product
- Similar in taste and texture to the commercial product
- Something that you would recommend to an athlete
- Less costly than the commercial product

3. Prepare a food label on your homemade product, using the Computrition™* Diet Analysis Software.
4. Write a brief analysis that should include:
   a. A general description of the product you *purchased*. Include:
      - What the product is recommended for (e.g. body building, carbohydrate loading, fluid replacement)
      - Serving size
      - Servings per container
      - Cost per serving
   b. A general description of the product you *prepared*. Include all of the same information listed above, but pertaining to your own product.
5. Write a commentary on how they compare in taste.
6. Also include:
   - Your commercial product label.
   - Your "computrition" food label based on your homemade product.
   - A one-page flyer that advertises your product. Be creative. Incorporate clip art and use a computer program that has templates for flyers.
7. After you have gathered all of this information, present your findings in class. Include one recipe batch of your product, to share for taste testing and evaluation. Explain the cost savings of your product over the commercial product, and how they compare in nutritional content, palatability, and ease of preparation. Display your advertisement and discuss how you would promote this product to athletes.

Samples of recipes and their respective Computrition™* labels are shown in Display 1-4. After completion of the taste-testing, computerized diet analyses, and discussion, it was the group consensus that most of these products could be prepared at home, with relatively few ingredients, and at a considerable cost savings. Comments from students included: "This made me realize that most of these products have ordinary ingredients I can get in my own kitchen." "This made me want to stop supporting big businesses and corporations that make so much money on products that I can make." "Most of the bars and drinks are a waste of money." "Let's face it though, most of us won't take the time to mix and measure, it's easier to buy the stuff they sell because it's convenient."

This pilot study demonstrated that although most of these products are not necessary and are no substitute for a balanced diet, alternative recipes for expensive nutritional products (e.g. sports bars, drinks, and protein powders) could be developed. Use of diet analysis software for recipe analysis and food label development can provide substantial information for comparison of products.

References

Computrition, Inc. P.O. Box 4689, Chatsworth, CA 91313. For more information on Computrition™ go to: http://www.computrition.com/

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Display 1. A High Protein Drink

16 ounces skim milk
4 tbsp non-fat dry milk powder
2 tbsp cocoa powder
2 tbsp peanut butter
2 tsp sugar

Blend all ingredients in a blender. Served chilled. Makes 2 servings.

Nutrition facts:

Serving size:	8 ounces	
Calories:	230	
Calories from fat:	85	
		% Daily Value
Total fat:	9 g	15%
Saturated fat:	2 g	11%
Polyunsaturated fat:	3 g	
Monounsaturated fat:	4 g	
Cholesterol:	6 mg	2%
Sodium:	162 mg	7%
Potassium:	704 mg	20%
Total carbohydrate:	25 g	8%
Dietary fiber:	3 g	11%
Sugars:	19 g	
Protein:	16 g	
Vitamin A		9%
Vitamin C		5%
Calcium		39%
Iron		6%

Display 2. A High-Carbohydrate Drink (designed for carbohydrate loading)

8 ounces apple juice
8 ounces soymilk
1 banana, peeled and diced
½ cup frozen, sweetened strawberries

Nutrition facts:

Serving size:	8 ounces	
Calories:	195	
Calories from fat:	24	
		% Daily Value
Total fat:	3 g	4%
Saturated fat:	0 g	
Polyunsaturated fat:	1 g	
Monounsaturated fat:	0 g	
Cholesterol:	0 mg	
Sodium:	18 mg	1%
Potassium:	591 mg	17%
Total carbohydrate:	43 g	14%
Dietary fiber:	4 g	16%
Sugars:	21 g	
Protein:	4 g	
Vitamin A		2%
Vitamin C		52%
Calcium		2%
Iron		9%

Display 3. A Sports Bar Designed for Carbohydrate Loading

40 large marshmallows (one 10 ounce bag)
2 tbsp non-hydrogenated margarine
6 cups crispy brown rice cereal
¾ cup sunflower seeds
1 cup raisins
½ cup semi-sweet chocolate bits

Melt margarine and marshmallows in a large, microwave-safe mixing bowl in microwave for two minutes. Mix in cereal, sunflower seeds, raisins, and chocolate bits. Spread into a 13 by 9 inch greased baking pan. With a wooden spoon, press flat so that mixture fills entire pan and surface is flat. Allow to cool. Cut into 18 squares.

Nutrition facts:

Serving size:	1 bar
Calories:	176
Calories from fat:	52

		% Daily Value
Total fat:	6 g	9%
Saturated fat:	1 g	7%
Polyunsaturated fat:	2 g	
Monounsaturated fat:	2 g	
Cholesterol:	0 mg	
Sodium:	118 mg	5%
Potassium:	132 mg	4%
Total carbohydrate:	31 g	10%
Dietary fiber:	1 g	4%
Sugars:	18 g	
Protein:	3 g	
Vitamin A		6%
Vitamin C		8%
Calcium		1%
Iron		7%

Display 4. A fluid replenishment drink (designed for fluid-electrolyte replenishment and glycogen re-synthesis)

12 ounces low-calorie cranberry juice
2 ounces fruit punch
2 ounces water
1/8 teaspoon salt

Blend all ingredients in a blender or shake well in a quart-size bottle. Serve chilled. Makes 2 servings.

Nutrition facts:

Serving size:	8 ounces
Calories:	47
Calories from fat:	0

		% Daily Value
Total fat:	0 g	0%
Saturated fat:	0 g	0%
Polyunsaturated fat:	0 g	
Monounsaturated fat:	0 g	
Cholesterol:	0 mg	
Sodium:	104 mg	4%
Potassium:	46 mg	1%
Total carbohydrate:	12 g	4%
Dietary fiber:	0 g	0%
Sugars:	18 g	
Protein:	3 g	
Vitamin A		0%
Vitamin C		121%
Calcium		2%
Iron		1%