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Sensory Response and Nutritional Product Evaluation in University-Based Competitive Baseball

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Abstract

Background: Dietary protein is an essential component of athletic nutrition, supporting tissue maintenance, muscular adaptation, and recovery from physical training. Although protein supplements are widely available, their acceptance may depend on sensory characteristics, convenience, and digestive comfort.

Objective: This investigation examined the sensory response, consumption preferences, and gastrointestinal experiences of collegiate baseball players following the intake of a frozen whey-based nutritional product.

Materials and Methods: A total of 46 baseball players (21 ± 2 years) enrolled at an NCAA Division II institution participated in the investigation. Following resistance-training sessions, each participant received a chocolate-flavored whey protein frozen product. Participants subsequently completed an electronic questionnaire covering demographic characteristics, product evaluation, supplementation preferences, and gastrointestinal experiences. Descriptive statistical procedures were used to summarize the collected responses.

Results: Thirty-eight participants (86.9%) expressed favorable opinions, selecting one of the three positive response categories. Most participants indicated a preference for the tested product compared with conventional protein supplementation alternatives. Five participants reported mild gastrointestinal symptoms, including two reports of bloating. No moderate or severe gastrointestinal complaints were documented.

Conclusion: The findings indicate favorable sensory acceptance of the tested frozen nutritional formulation among the participating collegiate baseball players. The limited reports of digestive discomfort provide preliminary evidence of short-term tolerability. Further investigations involving larger populations, controlled comparisons, and objective recovery measurements are required.

Keywords: Sports Nutrition; Whey Protein; Frozen Functional Food; Sensory Acceptability; Collegiate Athletes; Dietary Supplementation; Gastrointestinal Tolerability; Post-Exercise Nutrition.

INTRODUCTION

Nutrition is an important component of athletic preparation, influencing energy availability, tissue maintenance, training adaptation, and recovery. The nutritional requirements of competitive athletes are influenced by exercise intensity, training duration, body composition goals, and the distribution of macronutrients throughout the day. Appropriate dietary planning can support physiological adaptation and help athletes maintain their training capacity [1].

Protein plays a central role in maintaining skeletal muscle and supporting the repair of tissues subjected to repeated physical stress. Athletes involved in regular resistance and sports training may require greater protein

intake than individuals with sedentary lifestyles. Daily protein requirements, protein quality, and the timing of consumption are relevant factors when developing nutritional strategies for physically active populations [2].

Dietary protein contributes essential amino acids required for muscle protein synthesis and other physiological functions. The quantity and quality of protein consumed can influence the response to exercise, during periods of increased training demand. Adequate protein intake, combined with appropriate energy consumption, contributes to the maintenance and development of lean tissue [3].

The nutritional demands associated with competitive sport have encouraged the use of different protein-containing foods and supplementation products. Protein supplementation provides a convenient method of increasing dietary protein intake when ordinary meals do not adequately meet an athlete's nutritional requirements. Its usefulness depends on the individual's dietary pattern, exercise program, and nutritional objectives [4].

Resistance exercise stimulates muscle protein synthesis, and the availability of essential amino acids contributes to this process. Research involving young men has demonstrated that muscle protein synthesis responds to the quantity of ingested protein following resistance exercise. These findings support the importance of providing sufficient high-quality protein during the post-exercise period [5].

Whey protein is frequently used in sports nutrition because of its amino acid composition and relatively rapid digestion. Comparisons involving whey, casein, and soy protein have demonstrated differences in postprandial amino acid availability and muscle protein synthesis responses. These characteristics have contributed to the widespread use of whey-based formulations in athletic nutrition [6].

The distribution of protein intake across the recovery period may also influence muscular adaptation. Research has indicated that the amount and frequency of protein consumption can affect myofibrillar protein synthesis following resistance exercise. Consequently, convenient food formats that allow athletes to consume protein regularly may have practical nutritional value [7].

Evidence from controlled research and meta-analyses indicates that protein supplementation can enhance adaptations to resistance exercise, including improvements in muscle mass and strength. The extent of these benefits depends on habitual dietary intake, training characteristics, and the amount of supplemental protein consumed [8].

Despite the availability of different supplementation products, athletes do not necessarily consume them consistently. Product characteristics, including taste, texture, appearance, convenience, and ease of preparation, may influence consumption decisions. Nutritional products that are difficult to consume or poorly accepted may be less suitable for routine use.

Previous research has demonstrated that protein supplementation can contribute to improvements in muscle strength and fat-free mass when combined with resistance training. However, the effectiveness of supplementation in practical settings also depends on adherence to recommended nutritional practices [9].

The distribution of protein throughout the day is another important factor in sports nutrition. Research examining protein consumption patterns has suggested that distributing adequate quantities across meals may support muscle protein synthesis more effectively than consuming most of the daily amount in a single sitting [10].

Sports nutrition recommendations also emphasize the importance of integrating protein intake with adequate energy, carbohydrate, hydration, and micronutrient consumption. Supplementation should therefore complement a balanced dietary pattern rather than replace the nutritional value of regular meals [11].

Although dietary supplements are commonly used by competitive athletes, their selection requires appropriate evaluation of product quality, nutritional composition, safety, and suitability for the intended purpose. Athletes should obtain supplementation guidance from qualified nutrition professionals and use products appropriate to their individual requirements [12].

Nutrition-related decisions among athletes are influenced by several factors beyond physiological requirements. Previous investigations have identified gaps in nutrition knowledge and differences in the availability of reliable dietary information. These factors can affect the selection and regular consumption of appropriate foods and supplements [13].

Research involving collegiate sports populations has also demonstrated that nutrition knowledge may vary among athletes and athletic support personnel. Access to qualified dietary guidance is therefore relevant when developing strategies to improve nutritional practices within university sports programs [14].

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Food selection among collegiate athletes is influenced by perceived health benefits, expected effects on performance, food availability, and recommendations from nutrition professionals. These findings indicate that athletes evaluate nutritional products according to both their perceived usefulness and practical characteristics [15].

Time limitations, financial restrictions, inadequate food availability, and insufficient nutrition knowledge have also been identified as barriers to healthy eating among collegiate athletes. These challenges highlight the need for accessible nutritional options that can be incorporated into demanding academic and training schedules [16].

Taste and product acceptability are relevant when selecting nutritional supplements intended for repeated consumption. Although protein powders and beverages are established supplementation formats, alternative food preparations may provide additional choices for athletes who prefer different sensory characteristics.

A frozen whey-based product represents an alternative approach to delivering dietary protein after exercise. Its sensory properties may influence whether athletes consider it suitable for regular consumption. However, favorable taste and appearance alone cannot establish its effectiveness in improving athletic performance or muscular recovery.

Therefore, the present investigation examined the sensory evaluation and consumption preferences of collegiate baseball players following the intake of a chocolate-flavored frozen whey protein product. A secondary objective was to document gastrointestinal experiences reported after consumption. The findings may provide preliminary information regarding the practical acceptability of alternative protein-containing food formats in collegiate athletic environments.

MATERIALS AND METHODS

Study Participants

The investigation involved 46 collegiate baseball players recruited from an NCAA Division II institution. Participants had a mean age of 21 ± 2 years. Recruitment was conducted through announcements during team meetings. Before participation, the players received information explaining the research objectives and study procedures. Informed consent was obtained in accordance with the institutional review board requirements described in the original study.

Nutritional Intervention

Following scheduled resistance-training sessions, participants received a chocolate-flavored frozen whey protein product marketed as Whey Good Protein (The Original Protein Shake on a Stick, Whey Good, West Memphis, Arkansas, USA). Each participant was instructed to consume the product immediately after completing the training session. They were also advised to maintain their usual dietary practices throughout the investigation.

The nutritional composition of the product was originally presented in Table 1. However, the actual nutrient quantities are not included in the supplied manuscript text and therefore cannot be reproduced accurately here.

Questionnaire Administration

Following product consumption, participants completed an electronic questionnaire designed to obtain information regarding their experience with the nutritional product.

The questionnaire consisted of several sections:

- Participant demographic characteristics.
- Flavor of the product consumed.
- Previous experience with the selected flavor.
- Evaluation of product appearance, taste, smell, and texture.
- General satisfaction with the nutritional formulation.
- Preferred characteristics of the product.
- Suggested improvements.
- Preference compared with alternative protein supplementation products.
- Gastrointestinal experiences following consumption.

Sensory responses were recorded using a six-point Likert scale ranging from extreme dislike to extreme liking. Supplementation preferences were assessed using a six-point agreement scale ranging from strong disagreement to strong agreement. Gastrointestinal experiences were evaluated through seven multiple-choice questions addressing symptoms occurring after product consumption.

Data Collection and Outcome Measures

The principal outcomes were participants' sensory responses, their preferences regarding the tested nutritional formulation, and the gastrointestinal symptoms reported after consumption. The primary outcome was the proportion of participants expressing favorable opinions of the product. Secondary outcomes included preferences relative to other supplementation formats and the

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frequency of reported digestive complaints.

Statistical Analysis

Questionnaire responses were transferred into SPSS software, version 28 (IBM, Armonk, New York, USA), for descriptive analysis. Frequencies and percentages were calculated for categorical responses. Means and standard deviations were used for continuous variables where appropriate. The analysis focused on describing participant responses rather than establishing causal relationships or determining the effectiveness of the product on exercise performance (Figure 1).

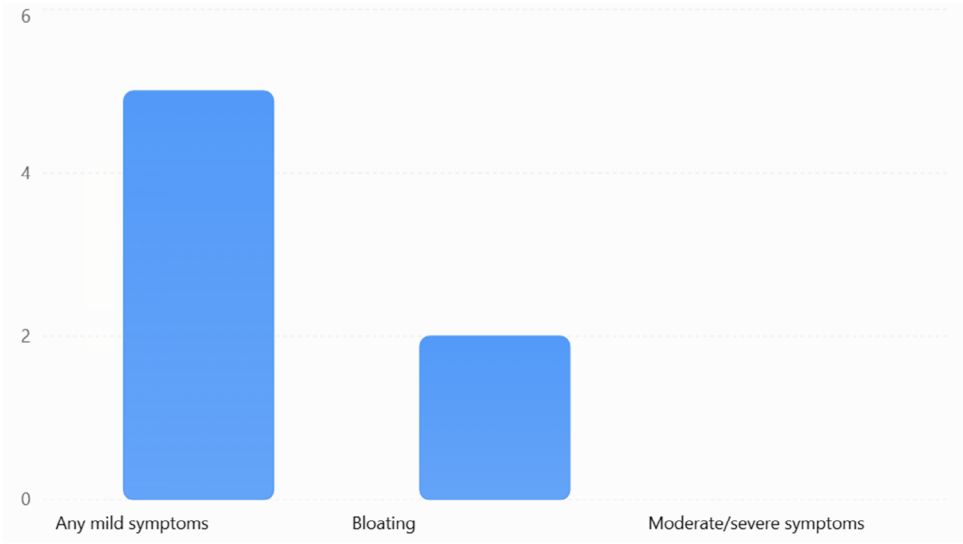


Figure 1: Gastrointestinal Experiences Following Consumption.

RESULTS

Participant Characteristics

A total of 46 collegiate baseball players completed the investigation. The participants had a mean age of 21 ± 2 years and were enrolled at an NCAA Division II institution. All participants received the chocolate-flavored frozen whey protein formulation following resistance-training sessions. Product evaluation and gastrointestinal experiences were documented through the electronic questionnaire (Table 1).

Table 1: Participant Characteristics and Description of the Nutritional Intervention.

Variable	Recorded information
Total participants	46
Mean age	21 ± 2 years
Athletic population	Collegiate baseball players
Competition level	NCAA Division II
Nutritional formulation	Frozen whey protein product
Flavor administered	Chocolate
Administration period	Immediately after resistance training
Assessment method	Electronic questionnaire

Sensory Evaluation of the Nutritional Product

Participant responses indicated favorable acceptance of the tested nutritional formulation. Thirty-eight individuals, representing 86.9% of the study population, selected one of the three positive response categories: Like Extremely, Like, or Like Somewhat. The remaining eight participants (13.1%) did not select one of these three favorable categories. Their individual response categories were not available in the supplied results. Participants evaluated the product according to their impressions of its sensory characteristics, including taste, smell, appearance, and texture (Table 2).

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Table 2: Distribution of Participants According to Their General Product Evaluation.

Response category	Participants	Percentage
Favorable responses (three positive categories combined)	38	86.9%
Other response categories combined	8	13.1%
Total	46	100%

Preferences Compared With Other Protein Supplementation Formats

The majority of participants indicated that they preferred the tested frozen nutritional formulation compared with other protein supplementation alternatives. Responses were collected using a six-point agreement scale. Participants were asked to indicate their preference for the product relative to other available protein supplementation options. The findings suggest that the frozen format was acceptable to many members of the participating team. However, the precise distribution of agreement and disagreement responses was not included in the supplied numerical results (Table 3).

Table 3: Participant Preferences Regarding the Tested Frozen Nutritional Formulation.

Assessment parameter	Reported finding
Preference compared with other supplementation options	Majority expressed preference
Evaluation method	Six-point agreement scale
Comparison group	Other protein supplementation formats
Exact response frequencies	Not available in supplied text

Gastrointestinal Responses

Gastrointestinal experiences were assessed following consumption of the frozen whey protein product. The detailed results identified five participants who experienced mild gastrointestinal symptoms. Two participants specifically reported mild bloating following consumption. No moderate or severe gastrointestinal complaints were reported. The original manuscript also described a 4.0% rate of mild gastrointestinal symptoms. This figure is inconsistent with the reported total of five participants because five out of 46 represents 10.9%. The two reports of bloating represent approximately 4.3% of the study population (Table 4).

Table 4. Gastrointestinal Experiences Following Product Consumption.

Gastrointestinal outcome	Participants	Percentage
Any reported mild gastrointestinal symptom	5	10.9%
Mild bloating	2	4.3%
Moderate or severe symptoms	0	0%
Total participants	46	100%

DISCUSSION

The present investigation examined the sensory response and gastrointestinal experiences of collegiate baseball players after consuming a frozen whey protein nutritional product. The findings indicated that the tested formulation received favorable responses from most participants. Thirty-eight of the 46 players (86.9%) expressed positive opinions, suggesting that the product was acceptable to a substantial proportion of the participating population.

The acceptability of a nutritional supplement is relevant because athletes may encounter difficulties maintaining appropriate dietary practices when their training schedules, academic commitments, and food preferences compete for limited time. An alternative food format that is convenient and appealing may provide an additional method of incorporating protein into the daily diet. The sensory characteristics of nutritional products can influence consumption behavior. Taste, smell, texture, and visual presentation contribute to an individual's experience with food. Products that meet consumer expectations may be more likely to be incorporated into regular dietary routines. However, the favorable responses recorded in this investigation should be interpreted as evidence of

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immediate product acceptance rather than proof of long-term consumption or improved nutritional status.

The use of whey protein as a post-exercise nutritional ingredient is supported by previous investigations examining protein digestion, amino acid availability, and muscle protein synthesis. Different dietary protein sources produce varying patterns of amino acid appearance following consumption, which may influence their physiological responses during recovery [17].

Previous research comparing dairy protein sources has also demonstrated differences in their digestion and absorption characteristics. These findings provide a scientific basis for the widespread use of milk-derived proteins in sports nutrition formulations [18]. Nevertheless, the present investigation did not measure blood amino acid concentrations, muscle protein synthesis, or other physiological markers. Therefore, the favorable sensory responses cannot establish an anabolic or performance-enhancing effect. Gastrointestinal comfort represents another practical factor when selecting nutritional supplements. The present findings indicated that five participants experienced mild gastrointestinal complaints, while two specifically reported bloating. No moderate or severe symptoms were recorded. These observations suggest that substantial digestive discomfort was not commonly reported within this sample following a single consumption occasion.

The gastrointestinal findings should nevertheless be interpreted cautiously. The investigation relied on participant-reported symptoms rather than clinical gastrointestinal assessments. Furthermore, the observation period and symptom severity were not described in sufficient detail to establish the duration or clinical significance of individual complaints. Differences in digestive responses may be influenced by individual tolerance, the amount of protein consumed, accompanying ingredients, and existing dietary habits. Research examining milk protein digestion has demonstrated that protein characteristics and food composition can influence gastrointestinal processing [19].

The practical use of protein-containing products also depends on their contribution to the athlete's complete nutritional program. A product may offer an appealing consumption format, but its nutritional value must be assessed according to protein quantity, energy content, additional ingredients, and the individual's dietary requirements. The present findings provide preliminary information about an alternative delivery format for whey protein. They do not establish that the frozen formulation is nutritionally superior to conventional protein drinks, powders, or whole-food sources. Nutritional recommendations should remain based on established dietary requirements and the athlete's individual training objectives.

Research concerning exercise-induced muscle adaptation emphasizes the interaction between resistance training, protein availability, and the physiological processes involved in muscular development [20]. Future studies could therefore investigate whether this type of frozen nutritional product produces comparable recovery responses to conventional whey protein preparations.

Practical Implications

The findings may be useful for sports dietitians, athletic trainers, and nutrition professionals working with university-level athletes. An alternative protein-containing food format may provide another option for individuals who prefer frozen foods to conventional supplementation beverages. Product selection should consider nutritional composition, sensory quality, affordability, storage requirements, and individual digestive tolerance.

Nutritional professionals should also evaluate whether a particular product contributes meaningfully to an athlete's total daily protein intake. The use of an appealing supplementation format should complement an appropriately planned diet rather than replace balanced meals.

Study Limitations

Several limitations should be considered when interpreting these findings.

First, the investigation included only 46 baseball players recruited from a single NCAA Division II institution. The findings may not represent athletes from other sports, competitive levels, or geographical settings.

Second, the assessment was based on a single chocolate-flavored formulation. Responses may differ when other flavors, ingredients, or product compositions are evaluated.

Third, the investigation relied on self-reported questionnaire responses. Individual preferences and gastrointestinal experiences may have been influenced by subjective interpretation.

Fourth, no comparison group receiving conventional whey protein supplementation was included in the supplied study description. Consequently, the relative acceptability

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of the frozen product cannot be established through direct comparative testing.

Finally, the investigation did not measure muscle strength, exercise performance, muscle protein synthesis, or recovery outcomes. The findings are therefore limited to product acceptance and reported digestive experiences.

Future investigations should recruit participants from multiple institutions, evaluate different flavors, include comparison products, and incorporate objective physiological measurements. Longer observation periods would also help establish whether favorable initial responses translate into regular consumption.

CONCLUSION

The investigation identified favorable responses toward a frozen whey-based nutritional formulation among collegiate baseball players. Most participants expressed positive opinions of the product, indicating that its sensory characteristics were acceptable within the evaluated athletic population. Preference responses also suggested that the frozen preparation could serve as an alternative to conventional protein supplementation formats. Gastrointestinal complaints were limited to mild symptoms, with bloating reported by two participants and no moderate or severe reactions documented. These findings provide preliminary information about the practical acceptability of an alternative protein-containing food format following resistance training. However, the small sample, single-institution recruitment, and reliance on self-reported responses restrict the generalizability of the observations. The investigation did not establish improvements in muscle development, exercise capacity, or recovery. Future research should incorporate larger and more diverse athletic populations, controlled product comparisons, nutritional composition analysis, and objective physiological assessments. Sports nutrition professionals may consider sensory preferences when recommending suitable protein sources as part of an individualized dietary program.

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