

Exploratory study of dietary supplement consumption among athletes

 **Gréta Újvári.** *Doctoral School of Business and Management. University of Pannonia. Veszprém, Hungary.*
 **Zoltán Veres.** *Faculty of Economics. University of Pannonia. Veszprém, Hungary.*
 **Brigitta Zsótér**  *Faculty of Engineering. University of Szeged. Szeged, Hungary.*

ABSTRACT

The study aims to explore athletes' dietary supplement preferences: athletes of different levels and from different sports have been involved in the research, thus ensuring its complexity. In the article, a series of in-depth interviews with 30 respondents, mystery shopping, and an international literature analysis conducted using the PRISMA method are presented, which serve as a suitable basis for subsequent large-scale quantitative research. Based on the research covering 31 different sports, it can be said that the use of various dietary supplements is mainly characteristic of individual athletes and those who train partly or entirely in gyms. Hypothetically, four consumer groups could be identified based on consumer awareness and dietary supplement consumption, which are as follows: conscious athletes, rational curious consumers, influenceable changers, and trend followers. Higher-level and long-time athletes are the most conscious when choosing dietary supplements. For consumers, price, quality, and composition are the main considerations when purchasing dietary supplements.

Keywords: sport nutrition; consumer preferences; consumer decision-making; dietary supplement.

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 **Corresponding author.** *Faculty of Engineering, University of Szeged, Szeged, HU-6724 Mars tér 7, Hungary.*

E-mail: zsoterb@mk.u-szeged.hu

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INTRODUCTION

The market size of dietary supplements in Europe was estimated at USD 49.39 billion in 2025 and is expected to grow by 9% annually until 2033 (grandviewresearch.com, 2026). Dietary supplements are worth using for athletes if they are safe, legally available, and effective (Close et al. 2022, Peeling et al., 2019).

In this study, we examine the dietary supplement consumption habits and consumer preferences of athletes using bibliometric and qualitative methods. We sought to answer research questions such as what consumer needs and preferences emerge when purchasing dietary supplements, and how athletes can be categorized. Ultimately, our goal was to develop a model of consumer decision-making. Our research was preceded by bibliometric and qualitative preliminary research, and its results can be validated through further quantitative research.

The results of our research show that we hypothetically distinguished four types of consumers based on their purchasing preferences, awareness, and consumer profiles, which are as follows: 1. conscious athlete, 2. rational curious, 3. influenceable changer, and 4. trend follower. Based on the interviews, we established a micro- and macro-environmental model of consumer decision-making with the factors that may influence consumers' decisions when purchasing dietary supplements.

This study explores the mechanisms of consumer decision-making through the lens of dietary supplement purchasing, thereby reflecting consumer behaviour. As such, the findings of this study may be useful for sports scientists, healthcare professionals, researchers, healthcare marketers, consumer behaviour researchers, and those in the field of behavioural economics. In addition to highlighting the need to educate consumers so they can obtain the dietary supplements they need from safe sources and take them according to the recommended dosages, our study also points out that we do not yet consider the ecological footprint of these products when purchasing them. Just as our model illustrates the decision-making process that dietary supplement buyers go through, it is also worth emphasizing that they may obtain information from sources that are not entirely reliable.

Literature review

The study aims to explore consumer behaviour regarding dietary supplements; therefore, we first introduce the concept of dietary supplements, as defined in Directive 2002/46/EC of the European Parliament and of the Council. This states that this food category includes foods intended to supplement the diet, containing various nutrients in concentrated form or other substances with nutritional or physiological effects. This category therefore includes various vitamins, minerals, and other nutrients (eur-lex.europa.eu, 2002).

Many athletes use dietary supplements during their training or competitions. The most popular supplements include vitamins, minerals, proteins, creatine, amino acids, herbal supplements and certain ergogenic ingredients (Maughan et al., 2007; Bozo et al., 2024). Several studies demonstrate that competitive athletes are more likely to consume dietary supplements than amateur or recreational athletes (Lun et al., 2012; Erdman et al., 2006; Braun et al., 2009). Further studies also confirm that the more frequently athletes train and the older they are, the more dietary supplements they consume (Garthe and Maughan, 2018). The type of sport also plays a significant role in the consumption of supplements, as athletes in strength and endurance sports are more likely to consume dietary supplements compared to those in sports that rely on technical and tactical components (Isenmann et al., 2024). Several key factors influence the effect of dietary supplements on exercise performance and recovery. These include age, gender, fitness level, sport, skill level, ethnicity, and even the gut microbiota (Willems et al., 2025). Naturally, in addition to the benefits of exercise, we must

not overlook the additional benefits of dietary supplements. Creatine, for example, offers significant benefits for people with Alzheimer's disease, those with clinical depression, and those with brain injuries, and it also helps improve cognitive function and sleep quality (Candow et al., 2026). Athletes use creatine to enhance performance, reduce fatigue, and promote recovery, as confirmed by international literature. It is a valuable dietary supplement among athletes due to its high safety profile, affordability, and well-established ergogenic effects (Ashtary-Larky et al., 2025).

Wardenaar et al. (2024) conducted a quantitative study among 225 high school students regarding the safety of dietary supplements. Only 24% was confident in stating that they consume products tested by a third party, meaning that the product is tested in a laboratory other than at the manufacturer. Only 46% of teens who consume dietary supplements recognized the logos of organizations that certify third-party testing. It may also be surprising that 29% of respondents began taking dietary supplements before the age of 14. They primarily began using these products to build muscle mass, enhance performance, or for weight loss or weight gain. It is also important to address the issue of product counterfeiting. This is because a lack of consumer awareness, market influence, materialism, brand perception, and previous purchasing experiences play a decisive role in the decision-making process of gullible consumers. However, improving these factors can help reduce the likelihood of consumer deception (Al Atat, 2024). The use of dietary supplements can offer significant benefits for athletes; however, their use must be supported by scientific research, which allows athletes to maximize the benefits of this product category while minimizing potential risks (Zdunek et al., 2024).

MATERIAL AND METHODS

Literature review with PRISMA methodology

In parallel with our qualitative research, we conducted a literature review following the steps of the PRISMA method (Moher et al., 2009). The goal was to review which sports had been studied so far, what research methods were used, what sample sizes were employed, and what the focus of the studies was, so that we could compare our research results and identify research gaps to guide the future direction of our study. For this, we used the Web of Science database, where we searched for articles in English. The process of applying the method is illustrated in Figure 1.

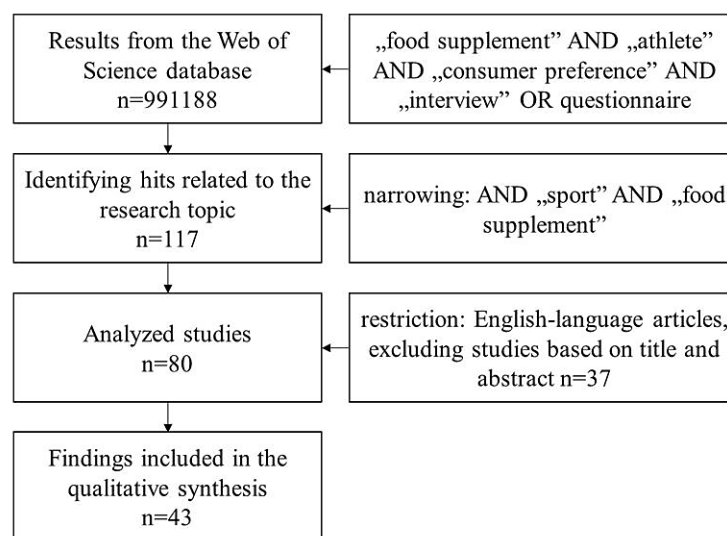


Figure 1. Methodology of international literature analysis based on the PRISMA method.

Table 1. Results of international literature analysis based on the PRISMA method.

Title	Author	Year	Journal	Sample and research methodology	Research focus
Analysis of food supplements and sports foods consumption patterns among a sample of gym-goers in Portugal	Lopes, S., Cunha, M., Costa, J. G., Ferreira-Pego, C.	2024	Journal of the International Society of Sports Nutrition	133 women and 170 men who exercise at the gym, in-depth interviews	reasons and circumstances for purchasing and consuming dietary supplements and sports foods
Prevalence of sports supplements consumption and its association with food choices among female elite football players	Molina-López, J., Pérez, A. B., Gamarra-Morales, Y., Vázquez-Lorente, H., Herrera-Quintana, L., Sánchez-Oliver, A. J., Planells, E.	2024	Nutrition	126 female soccer players, questionnaire survey	dietary supplement selection and consumption habits, and examination of their correlations
Evaluation of Dietary Intakes and Supplement Use in Paralympic Athletes	Madden, R. F., Shearer, J., Parnell, J. A.	2017	Nutrients	18 male and 22 female Paralympians from 9 paralympic sports, 3 days of food diary recording, dietary supplement questionnaire	examination and comparison of dietary supplement habits with the RDA (recommended daily allowance)
Dietary supplement use and its associated factors among gym users in Southern Brazil	Molz, P., Rossi, R., Schlickmann, D., Dos Santos, C., Franke, S.	2023	Journal of Substance Use	294 women and 248 men who exercise at the gym, online questionnaire survey	examination of correlations related to the use of dietary supplements
Supplement Use of Elite Australian Swimmers	Shaw, G., Slater, G., Burke, L. M.	2016	International Journal of Sport Nutrition and Exercise Metabolism	20 female and 19 male swimmers, online questionnaire survey	examining the influence of the Australian Institute of Sport (AIS) Dietary Supplement Program on swimmers' dietary supplement habits
Nutritional supplement-usage associated characteristics of high-performing athletes	Sousa, M., Fernandes, M. J., Soares, J., Moreira, P., Teixeira, V. H.	2016	British Food Journal	159 men, 82 women, 13 different sports requiring high performance, questionnaire survey	identification of socio-demographic, health and sports-related characteristics
Use of food supplements and determinants of usage in a sample Italian adult population	Giammarioli, S., Boniglia, C., Carratù, B., Ciarrocchi, M., Chiarotti, F., Mosca, M., Sanzini, E.	2013	Public Health Nutrition	the questionnaire was sent to 10,000 randomly selected individuals in 10 cities in Italy, and 1,723 people returned it: 771 men, 945 women, and 7 of unknown gender	characterization of the Italian population, its lifestyle and behaviour based on demographic, physical and health-related characteristics
Patterns of Nutrition and Dietary Supplements Use in Young Egyptian Athletes: A Community-Based Cross-Sectional Survey	Tawfik, S., El Koofy, N., Moawad, E. M. I.	2016	PLOS One	202 males, 156 females Adolescents aged 13-18 from Egypt, 11 different sports, questionnaire survey	designed to assess basic and sports nutrition patterns among young athletes
Nutritional supplement use among university athletes in Singapore	Tian, H. H., Ong, W. S., Tan, C. L.	2009	Singapore Medical Journal	35 male and 47 female Singaporean university students, aged 18 or older, who are members of at least one sports team, participating in 16 different sports, questionnaire survey	assessment of demographic parameters, types of dietary supplements, frequency of use, motivation, knowledge, expenditure, side effects
Sport Nutrition Knowledge, Behaviours and Beliefs of High School Soccer Players	Manore, M. M., Patton-Lopez, M. M., Meng, Y., Wong, S. S.	2017	Nutrients	survey of 294 female and 241 male adolescents aged 14–18 who play soccer in secondary school, using two questionnaires	examination of knowledge, behaviour, and beliefs related to sports nutrition among high school football players

Table 1 lists the literature sources where research focus is most closely aligned with the topic we are examining. It can be observed in the studies published to date that the scope of the participants is generally limited to a specific sport, dietary supplement, age group, gender, or country. Their research topics include the analysis of food diaries, the examination of the use of a specific dietary supplement, or the analysis of dietary supplements used for athletic purposes. The studies employ either qualitative or quantitative methodologies; that is, the use of a hybrid methodology is not typical. Our study is a preference study designed to explore who and how can influence consumer decision-making, and what factors are important to consumers when purchasing and consuming dietary supplements. We were unable to find any such studies through our literature review, so the topic of our research can be considered novel. It is important to

note that the topic of sustainability has not yet been sufficiently examined in the context of dietary supplements, so this area also holds promises for new findings.

In our research, we sought answers to the following research questions:

- *What consumer needs and preferences emerge among athletes when purchasing dietary supplements?*
- *How can athletes be grouped based on their dietary supplement habits?*
- *What model represents consumer decision-making regarding the purchase of nutritional supplements?*

Qualitative research methodology

In the spring of 2026, we conducted 30 in-depth interviews with athletes, coaches, and other professionals from various sports. The study was approved by the Research Ethics Committee of the University under approval No. 19/2026, dated 23 March 2026. In order to ensure the generalizability of our findings, we established a strict set of reliability criteria prior to conducting the interviews (Table 2) (Flint et al., 2002).

Table 2. Reliability and findings of the study: Interpretative and grounded theory criteria.

Reliability criteria	Ensuring this in research
<i>Credibility</i> How representative the results of the investigation can be	- Several researchers participated in preparing the interviews and collecting data - Representatives of various sports were invited to the interviews
<i>Transferability</i> To what extent the results of the study hold true in other contexts	- The interviews were professionally conducted - We ensured complete anonymity for the participants*
<i>Independence</i> The extent to which the findings are unique to a given place and time; the extent to which the stability or consistency of the results can be explained	- The interviews were conducted by one person, so all interviews followed the same pattern and were conducted in a similar style - Representatives of different sports were invited to the interviews - None of the participants were affiliated with retail chains, manufacturers, or distributors at the time of the interviews, so they had no interest in promoting a particular brand
<i>Verifiability</i> The extent to which the results and findings are assured based on the interviewees' accounts, and the extent to which researcher bias can be ruled out	- Every conversation with each interviewee was recorded in a manuscript of at least two pages per subject - We prepared a summary of more than 60 pages, which was studied and analysed independently by our three-member research team in order to avoid researcher bias - We contributed to each other's analysis as auditors - We consulted with external experts on our interviews and their summary
<i>Integrity</i> The extent to which misinformation or evasiveness on the part of interviewees influences the results of the study	- The interviews were professional, completely anonymous, and free from threats - At the beginning of the interview, we informed the subjects that there were no wrong answers to our questions
<i>Relevance</i> The extent to which the findings are relevant to the subject of the investigation	- Each interviewee had to complete a three-page questionnaire measuring their motivation to exercise, health status, and physical activity - Based on our guidelines and interview method, we were able to draw genuine conclusions while preserving the anonymity of the subjects
<i>Comprehensibility</i> The extent to which interviewees understood the questions asked of them and the objectives of the research	- We rephrased the questions for our interviewees if they understood them differently - We let them contribute to the success of our interview with their own experiences and insights
<i>Generalizability</i> Degree of assurance that multiple perspectives have been examined	- Interviews were of sufficient length and openness to elicit many complex facets of the phenomenon and related concepts - The research captured multiple aspects of the phenomenon
<i>Controllability</i> The extent to which different manufacturers, distributors, and external factors can influence the results of the study	- Neither the interviewees nor the interviewer were influenced by any products or brands in their choices or preferences

Note. * Was justified in sensitive areas such as performance enhancement.

To enhance generalizability within a grounded theory framework, we worked with a relatively large sample size, reinforcing the heterogeneity of the research. In order to characterize the profile of athletes who consume dietary supplements, our interviewees first completed a questionnaire assessing their demographics, health, and physical fitness. During our 30 interviews, we listened to representatives of 31

different sports. This included 25 consumer interviews, in which we examined the training and dietary supplement habits of athletes, as well as 4 interviews with coaches and 1 interview with pharmacy sales staff in order to gain a deeper understanding of consumer preferences and behaviour. We developed the interview guide for the in-depth interview series based on the traditional sources summarized in the previous chapter, which we tested through two focus group interviews and two in-depth interviews. The interviews were conducted using the guide that had been pre-tested in this manner. We recorded every interview and supplemented the recordings with on-site notes, which allowed us to review them as needed. For each participant, we prepared a structured summary of at least two pages, which included the most important quotes, key findings, and relevant behavioural characteristics. These summaries served as the primary units of analysis. Based on these structured summaries, we systematically identified the most important characteristics related to decision-making, preferences, and purchasing behaviour, and then organized them into a comparative table. This allowed us to identify recurring patterns among the participants and facilitated the inductive development of consumer profiles. The resulting typology was thus based on recurring characteristics, which are presented in a structured format in Figure 3 in the Results section.

Table 3. Profiles of study interviewees.

Alias	Participant details
Alice	Pharmacy sales assistant, domestic pharmacy chain, pharmacy assistant, female, 53 years old
Amanda	PhD student (economics) and sole trader, economics university, accounting business, economist, female, 43, home exercise, health maintenance
Benjamin	Automation engineer, meat industry, mechatronics engineer, male, 24 years old, performs various forms of exercise for development: swimming, running, gym training
Brian	Senior measurement technician, electrical energy service industry, mechatronics engineer, male, 22, weightlifting, strength training, previously due to weight loss
Charles	Personal trainer, gym in the capital city, personal trainer, male, 33 years old, trains for performances, pankration, gym training
David	Soccer coach, NBI-II team, male, 33 years old, coaching soccer teams since 2015
Dylan	ERP consultant and table tennis coach, service industry, business IT specialist, male, 33 years old, competitive spirit, coach since 2019
Edward	Student (engineer), high school graduate, male, 23, previously practiced judo, currently works out at the gym, for development and strength training
Emma	Office administrator, construction company, logistics and shipping clerk, female, 30, functional training, fitness level, muscle mass increase, toning are her goals
Fiona	Nomination coordinator, food engineer, instant food manufacturing industry, female, 28, running, swimming, body shaping, endurance training, mental stability improvement are her goals
Frederick	Student (engineer), high school graduate, male, 20, discus thrower, shot putter, trains to build discipline and achieve his goals
George	Family farm, food engineer, male, 34 years old, trains with the aim of improving his movement and increasing his endurance
Grace	Student (communication and media studies), high school graduate, female, 22, horse riding, collecting foreign and domestic trophies, coaching career and development
Hannah	Quality auditor, meat industry, food safety and quality engineer, female, 24, yoga, fitness, aiming to achieve better mental and spiritual well-being
Henry	Student (computer scientist), high school graduate, male, 22, TRX and strength training, weight loss, muscle building, goal is to build a movement system
Isaac	Student (computer scientist), high school graduate, male, 23, strength training, weight loss, trains for fitness, goal is further weight loss
Ivan	Assistant professor, agricultural university, food engineer, male, 28, martial arts, gym training, relaxation, recreation, health maintenance
Jennifer	Supply accounting analyst, oil and gas industry, economist, female, 28 years old, does Zumba, drumstick fitness, stretching, spinal exercises, health maintenance, fitness, and spiritual rejuvenation for the sake of community experience
Julia	Mother, nutritionist, food engineer, female, 30, running, improving endurance, improving health
Kevin	Process engineer, automotive industry, mechatronics engineer, male, 25, bodyweight training, health maintenance, goal is to stay in shape
Lucy	Student (medical), high school graduate, female, 23, boxing, trains for mental and physical fitness
Matthew	Computer engineer, service industry, computer engineer, male, 41, running supplemented with gym workouts, goal is to maintain health and increase muscle mass
Nathan	Skilled worker, meat industry, high school graduate, male, 45, has been working out at the gym for 10 years, loves to exercise, finds it calming
Olivia	Researcher, economics university, economist PhD, female, 33, hiking, stress relief, relaxation, trains with the aim of clearing her mind
Patrick	Design engineer, -, mechanical engineer, male, 25, bodybuilding, healthy lifestyle, weight loss, strength training
Robert	Energy forecasting specialist, food engineer, electricity supply industry, male, 31, functional training, aiming to achieve a stronger physique
Samuel	Prison guard, high school graduation, male, 24, MMA, wrestling, getting the most out of himself, his goal is to become a professional athlete
Thomas	Project engineer, oil industry, oil and gas engineer, male, 36, gym training, weight gain and achieving 15% body fat% are his goals
Victoria	Personal trainer, gym in the capital city, personal trainer, female, 33 years old, has been training since 2016, currently works with female clients
Zachary	Engineering teacher, technical university, certified mechanical engineer, male, 49, cycling, aiming to break records

We recruited the subjects using quota sampling and the snowball method, based on their athletic level and the sports they practiced. We ensured the heterogeneity of the profiles, avoiding the under- or over-

representation of any particular type. Table 3, which summarizes the respondent profiles, demonstrates the heterogeneity of our research (see, for example, the research concept published by Flint et al. in 2002). During the quota sampling process, we ensured that the participation of women and men was nearly equal. We also made sure that both those engaged in intellectual and physical work, as well as those participating in individual and team sports, were represented in the study.

During the qualitative phase, we identified the frequency of information using a saturation analysis. We analysed the interviews sequentially, one after another. We assessed content saturation during the sequential analyses. We considered saturation to have been reached when approximately 90% of the newly analysed interviews did not yield any substantially new findings and the existing consumer groups were consistently confirmed.

To gain a deeper understanding of consumer preferences and to refine the results of our in-depth interview series, we also employed the mystery shopping method in our research. Based on a pre-prepared set of guidelines, we conducted mystery shopping visits in the spring of 2026 to investigate consumer preferences and the personalization of sales recommendations. We focused our research on various types of stores, such as drugstores, pharmacies, and specialty dietary supplement stores. At the end of the mystery shopping visit, we informed the salespersons about the research, and then, with their consent, we recorded their experiences of the purchase afterward.

The mystery shopping visits were conducted according to a pre-established set of guidelines. The goal was to examine consumer behaviour and preferences, as well as to determine what information salespeople at different types of stores can provide to adult athletes and to what extent they are able to offer personalized recommendations. The mystery shopping process was as follows:

- Arrival at the store,
- Browsing, expressing interest, asking questions,
- Disclosing that the visit was part of a research study and requesting consent to participate,
- Departure,
- Summary of results, shopping experience, recording of experiences.

The target audience profile was as follows: a woman in her late 20s who, in addition to her office job, tries to take care of her health and exercises regularly. In addition to a healthy, varied diet, she takes vitamins and minerals when necessary. She browses and researches dietary supplements both online and offline. She is looking for a dietary supplement to support her 3–4 strength-training sessions per week. Her current goal is to lose 6–8 kg.

We included 4 different dietary supplement stores, 3 different drugstores, and 2 different pharmacies in the mystery shopping study. The goal was to compare where and how personalized recommendations regarding the use of dietary supplements are provided, and to identify, through conversations, the customer preferences and customer groups that emerge in each type of store. The different types of businesses and product profiles provided us with a basis for comparison regarding their various similarities and differences.

When selecting the stores, it was important to us that they be well-run, established businesses in high-traffic areas so that we could gather as much information as possible during the study. We visited stores in both the capital and rural areas to ensure a more accurate overall picture. We preselected the types of stores based on their popularity and the type of store. After the purchase, to preserve anonymity, the results were

recorded only on paper, using a pre-prepared evaluation form. This form includes the date of the visit, the type of the store, and the name of the town.

RESULTS AND DISCUSSION

Dietary supplement consumption patterns among athletes

Various vitamins and minerals also belong to the group of dietary supplements, which not all of our interviewees were aware of. Almost one in three respondents said they liked to take vitamins C and D, or even multivitamins, to protect their immune system against possible illnesses or to recover from illnesses.

"I definitely consider vitamins to be beneficial, and I take them myself, but I don't know much about other types of dietary supplements. I definitely feel the beneficial effects of calcium and magnesium. I used to have muscle cramps more often than I do now since I started taking them." (Jennifer, 28)

Approximately one-tenth of respondents mentioned that they consume vitamins and minerals because they believe that the nutritional content of vegetables and fruits has decreased.

"Even if you eat a lot of vegetables and fruits every day, they don't contain as many minerals and vitamins as they used to." (Charles, 33)

The most common group of dietary supplements are protein powders, which are popular among hobbyists, recreational athletes, and competitive athletes. This is followed by creatine, which is used by athletes who feel their performance has plateaued. Typically, it is the group of gym-goers who are most likely to use dietary supplements.

Our 33-year-old female personal trainer interviewee reported on the placebo effect during the interviews and said that the use of various supplements reassures those who exercise for hobby and recreational purposes.

"Sometimes dietary supplements have a full placebo effect. Some people felt lighter after just two days of using the product, even though it was probably just calorie deficit. Dietary supplements also give clients a sense of reassurance that I've done my part." (Victoria, 33)

Dietary supplement purchasing preferences among athletes

After examining dietary supplement habits and experiences, we turned our attention to consumer decision-making and behaviour. In terms of where they shop, nearly half of respondents prefer to shop online.

"It's much easier, they deliver to your door." (Grace, 22)

However, speciality dietary supplement stores are also very popular.

Brand loyalty was true for about half of the interviewees, as there are those who are not brand loyal at all, but consider the composition and active ingredients of the product and, depending on that, the price to be the main driving force behind their choice, while others specifically like to switch and change products between different brands (so-called multi-brand loyalty).

In Figure 2, we modelled consumer decision-making based on a content analysis of in-depth interviews with athletes who consume dietary supplements. First, we depicted the micro- and macro-environments in which

athletes are exposed to impulses, stimuli, and influences regarding why consuming various dietary supplements might be beneficial for them. We incorporated online and offline platforms and advertisements into the model, which provide information to decision-makers and the circle of people influencing them. We then identified the key factors that influence which dietary supplements athletes purchase. Once the purchasing decision is made and the purchase is completed, the consumer can decide, based on their own experience while using the product, whether to repurchase it or try a different dietary supplement. Of course, as a consumer, they can now share their experiences with other athletes regarding the use of that particular product after using it.

In summary, Figure 2, building on established consumer decision-making models and the results of our own qualitative research, illustrates the process that extends from encountering stimuli through the purchase to post-purchase evaluation. Although the general structure is consistent with traditional, stage-based frameworks, the model expands upon them by explicitly incorporating the micro- and macro-level environments in which athletes operate. More specifically, the model places greater emphasis on the multifaceted factors that influence athletes' decisions, including social influences, expert opinions, and online and offline information sources. Unlike general consumer models—which primarily describe the sequential stages of decision-making—our approach highlights how these external and interpersonal influences dynamically interact throughout the process.

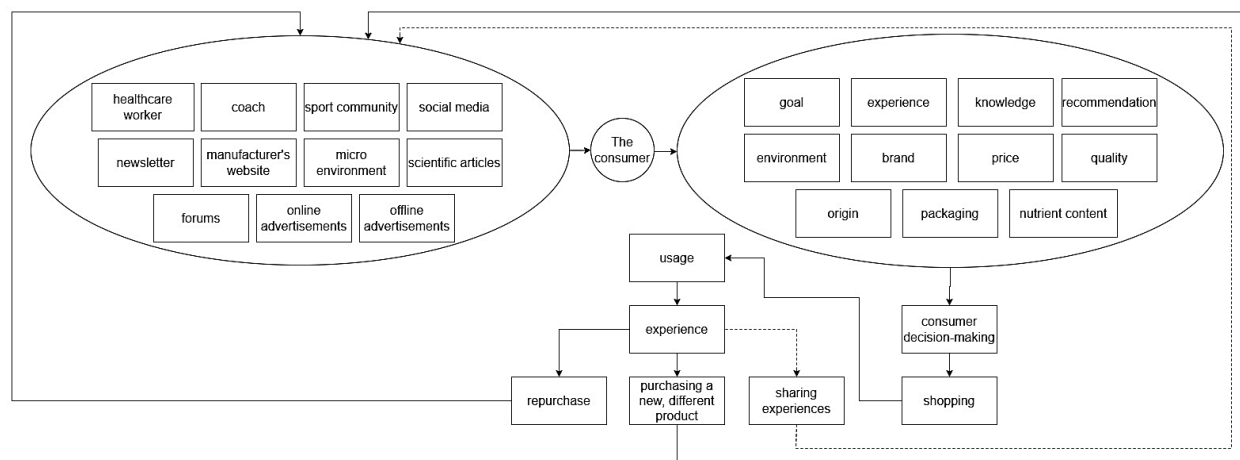


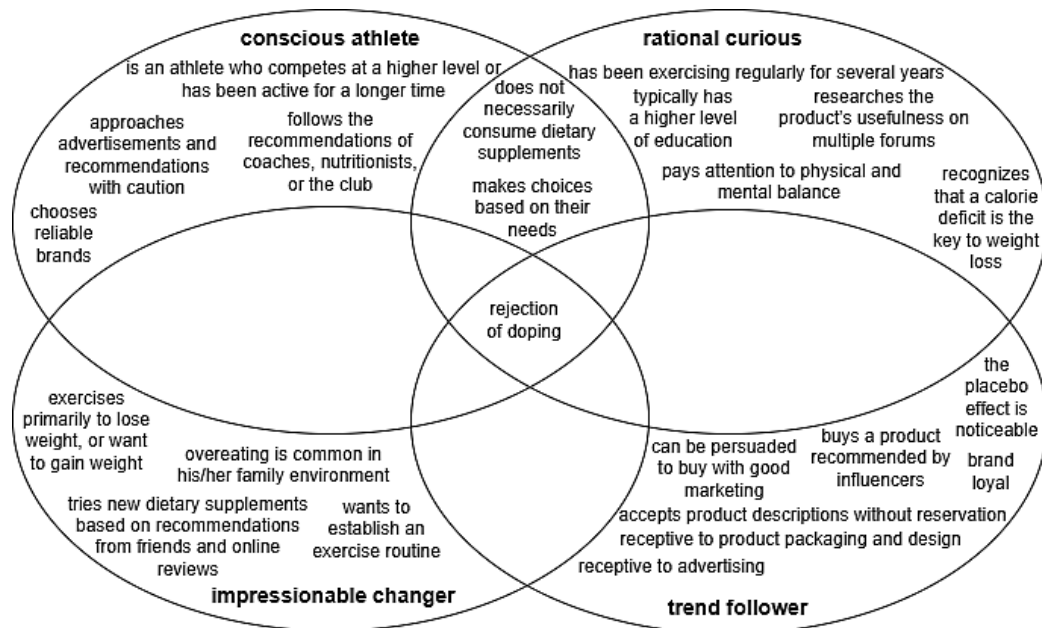
Figure 2. Model of consumer decision-making among athletes who consume dietary supplements.

Relationship between athlete profiles and dietary supplement consumption patterns

Based on the sufficiently large and heterogeneous sample and grounded theory, we classified athletes who consume dietary supplements into the following four hypothetical categories, as shown in Figure 3.

In the group of conscious athletes, sport has played an important role for at least 3-5 years. They exhibit conscious behaviour in relation to dietary supplementation and treat various information and advertisements with caution. They only consume the dietary supplements that are necessary and useful for improving their performance. Rational-curious individuals like to experiment and are willing to try new products. Individuals who have been exercising regularly for at least 1-3 years belong to this group and typically have a higher level of education. Their motivation also includes mental and spiritual fitness. The influenceable changers have been exercising regularly for less than a year. They want to lose weight or build muscle. They choose dietary supplements mainly based on the experiences of acquaintances and online reviews. They are keen

to try new types of products and brands. Trend followers feel that they are clearly doing something for their health if they use dietary supplements in addition to exercising. They do not question the effects and promises indicated on the packaging, labels, product descriptions, and advertisements of various products. They are brand loyal and are the ones most influenced by influencer marketing.



conscious athlete	rational curious	impressionable changer	trend follower
- conscious - approaches advertisements and recommendations with caution - is an athlete who competes at a higher level or has been active for a longer time - chooses reliable brands - follows the recommendations of coaches, nutritionists, or the club - makes choices based on their body's needs - does not necessarily consume dietary supplements - consumes primarily protein powder and creatine	- shops according to their needs - takes advantage of sales when they need the product - researches the product's usefulness on multiple forums - has been exercising regularly for several years - typically has a higher level of education - does not necessarily insist on taking dietary supplements - pays attention to physical and mental balance; mental well-being is also important - recognizes that a calorie deficit is the key to weight loss	- exercises primarily to lose weight, or want to gain weight - overeating is common in his/her family environment - tries new dietary supplements based on recommendations from friends and online reviews - wants to make changes in life in terms of health and exercise - typically begins their lifestyle change in January - changes lifestyle due to external influences or personal considerations - wants to establish an exercise routine	- can be persuaded to buy with good marketing - is receptive to advertising - brand loyal - accepts product descriptions without reservation - typically gets information from only one source, usually the manufacturer's or distributor's website - typically follows one or two influencers and buys the products they recommend - the placebo effect is noticeable when consuming dietary supplements - receptive to product packaging and design

Figure 3. Characteristics of the 4 customer groups.

The results of mystery shopping research

The aim of our mystery shopping research was to indirectly validate the results of our qualitative research. In terms of personalized recommendations, salespeople at specialty supplement stores performed exceptionally well, as they are able to recommend a wide range of products to athletes based on their training goals. Pharmacy staff are also able to recommend vitamin complexes tailored to specific goals and activities, but they have a limited range of dietary supplements for training. Customers visit the latter on the

recommendation of a naturopath or a doctor, or with a specific product in mind. In pharmacies, customers typically inquire about products in person and then order them online afterwards because of the more favourable prices. The advertising effect mentioned in the interviews was also evident, i.e., customers inquire about a product because of its advertising. In addition, our hypothetically constructed consumer group was also validated, where people who are at the beginning of a lifestyle change are willing to buy dietary supplements to help them achieve their training goals, whom we call influenceable changers. Based on sales staff feedback, the preferences identified in the in-depth interviews—such as good value for money, active ingredient content, brand, and flavour—have been confirmed. As we determined based on the in-depth interviews, both online and offline shopping are popular for these product categories. The results of both the in-depth interviews and the mystery shopping study confirm that the primary place where consumers purchase dietary supplements is at specialty stores—either their physical locations or their online shops.

CONCLUSIONS AND LIMITATIONS

The strengths of our study include the innovative integration of sports nutrition and consumer behaviour, an exploratory research design employing multiple methods, and a wide range of sports (31 sports). Based on a study surveying 31 different sports, the use of various dietary supplements is most common among individual athletes and those who train partly or entirely at a gym. Following a content analysis of the in-depth qualitative research, it became possible to develop a comprehensive research model. The model (Figure 2) first identifies the micro- and macro-environments where individuals are exposed to various online and offline stimuli. The most important factors influencing the target group are nutritional content, quality, and price, which can be identified as primary preferences. Based on their own experiences while using the product, athletes decide whether to repurchase it or recommend it to other athletes. The model we have developed not only describes the decision-making process but also situates existing theoretical frameworks within a sport-specific context, thereby contributing to research on consumer behaviour. While traditional consumer decision-making models outline the successive stages of a purchase, our findings highlight the central role of social influence, experiential feedback, and context-specific factors in shaping athletes' decisions. In particular, the model aligns with the Theory of Planned Behaviour, as attitudes, social norms, and perceived control are reflected in athletes' evaluation of dietary supplements. At the same time, it expands on these frameworks by demonstrating how networks of teammates, expert influence, and performance-related motivations dynamically interact during the decision-making process. By highlighting these mechanisms, the model provides a more nuanced picture of athletes' purchasing behaviour and portrays the decision-making process as iterative, embedded in a social context, and highly context-dependent.

Although previous literature suggests that professional athletes and individuals who have been training for a long time are more likely to consume dietary supplements, our research found that they are the more informed group and strive to be as careful as possible when choosing dietary supplements. Avoiding doping violations is important to them, and they prefer to obtain the nutrients they need through food. We can confirm the findings of domestic research—which indicate that women are more likely to use dietary supplements—as the interviews revealed that they are more receptive to using these products. Brand loyalty and the sense of belonging to a community were more important to them than to men, and they also feel that using dietary supplements is more effective for achieving their fitness goals. In light of the results, it can be said that our experiences may contribute to the exploration of more selective and critical consumer behaviour. The members of the four groups categorized using qualitative methods can even be interpreted as part of a developmental process, since those who have been participating in sports for a longer time are more critical and conscious when it comes to consumer decision-making.

In line with our research objective, we hypothetically identified four consumer groups based on consumer awareness and dietary supplement consumption: the conscious athlete, the rational curious, the influenceable changer, and the trend-follower. Based on grounded theory, the qualitative research methods employed provide a suitable foundation for a subsequent large-scale quantitative study, through which the significant differences and size of the specified groups can be further examined. Based on the in-depth interviews, consumer groups were identified in relation to consumer awareness, awareness of the risks associated with dietary supplements, and susceptibility to influence through social media and other channels; these are examined in more detail in Figure 3.

Athletes primarily purchase the dietary supplements they need at specialty supplement stores, where they can receive personalized recommendations similar to those in pharmacies. They mostly base their purchasing decisions on price and quality, which are primarily influenced by the experiences of acquaintances, as well as the opinions of coaches and renowned athletes. Sustainability-related preferences, such as place of origin, packaging, and whether ingredients are plant- or animal-based, are not important to athletes when selecting dietary supplements.

The findings of our study can also assist manufacturers and distributors in developing direct marketing strategies. Our results highlight which consumer groups are most influenced by various marketing tools. The group of team athletes may represent a market niche for distributors, and innovative new products could also pique the interest of several consumer groups we identified. In addition to highlighting the need to educate consumers so they can obtain the dietary supplements they need from safe sources and take them according to the recommended dosages, our study also points out that we do not yet consider the ecological footprint of these products when purchasing them. Just as our model illustrates the decision-making process that dietary supplement buyers go through, it is also worth emphasizing that they may obtain information from sources that are not entirely reliable. Nowadays, the influence of social media is undeniable, and this is also true when it comes to the consumption of dietary supplements. This influences 2 out of the 4 consumer groups. Of course, when it comes to consumer awareness, we must also emphasize that athletes should purchase dietary supplements from truly reliable sources to ensure their health and avoid doping violations. Therefore, it is definitely worth purchasing products that have also been tested by a third party. It is also noteworthy that sustainability is not a key consideration for athletes when purchasing dietary supplements. Raising awareness of this issue and producing products with a smaller ecological footprint could be groundbreaking in this industry.

Demographically, the research focused primarily on young people and young adults. It may be worthwhile to conduct a broader study, perhaps narrowing the scope to specific age groups or sports, and conducting it with a larger sample size. It is definitely worth testing the results of qualitative research using quantitative methods as well.

AUTHOR CONTRIBUTIONS

All authors meet the criteria for authorship in accordance with established ethical guidelines. Contributions are specified according to the CRediT (Contributor Roles Taxonomy) as follows: Conceptualisation: Zoltán Veres, Brigitta Zsótér. Methodology: Gréta Újvári, Zoltán Veres. Formal analysis: Brigitta Zsótér. Investigation: Gréta Újvári. Data curation: Gréta Újvári. Writing – original draft: Gréta Újvári, Zoltán Veres, Brigitta Zsótér. Writing – review & editing: Gréta Újvári, Zoltán Veres, Brigitta Zsótér. Supervision: Gréta Újvári.

All authors have critically reviewed and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

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CONFLICT OF INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this manuscript.

AI USE DISCLOSURE

In accordance with current publishing ethics and transparency recommendations, artificial intelligence (AI) tools were used solely to assist with translation and language editing, with the aim of improving clarity and readability. No AI tools were used in the generation of scientific content, including the study design, data collection, analysis, interpretation of results, or the formulation of conclusions. The authors retain full responsibility for the content of the manuscript and confirm its originality, integrity, and accuracy.

DATA AVAILABILITY

The data used in the analysis are presented in the study as Table(s) and Figure(s). Any other data requirement should be directed to the corresponding author and will be provided upon reasonable request.

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