

Segmentation of dietary supplement consumers using cluster analysis: An examination of attitudes and brand perceptions

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Abstract

The market for dietary supplements has experienced significant growth in recent years, leading to increasing competition among market participants. As consumer needs become more diverse, identifying and understanding distinct consumer segments has become increasingly important. The aim of this study is to segment dietary supplement consumers based on their purchasing preferences, brand awareness, and trust in brands. The research is based on a quantitative methodology using a questionnaire survey with a sample of 420 respondents. To determine the number of clusters, hierarchical cluster analysis was applied as a first step, followed by K-means clustering to establish the final group structure. The analysis identified three distinct consumer segments: a conscious, brand-aware and quality-oriented group; a low-involvement, passive consumer segment; and a quality-oriented group with selective brand awareness.

The results indicate that consumers differ significantly in their evaluation of product attributes, their attitudes toward brands, and the influence of influencers on their purchasing decisions. The main managerial implication of the study is that companies should adopt differentiated, segmentation-based marketing strategies that take into account the varying needs and preferences of different consumer groups.

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1 Introduction

In parallel with the rise of the health-conscious lifestyle, the dietary supplement market has shown dynamic growth in recent years, which is also evidenced by the increasing revenues of manufacturing companies. Consumers are increasingly seeking various dietary supplements for sports performance enhancement, health preservation [1], or aesthetic purposes. Simultaneously, the number of products and brands available on the market has expanded significantly, resulting in intensified competition among manufacturers and distributors. Because of the growing supply and changing consumer demands, gaining a deeper understanding of consumer preferences and decision-making mechanisms has become crucially important for companies. Purchasing decisions can be influenced by numerous factors, including product price, quality, taste, attitude towards the brand, and various communication tools, such as the role of influencers. However, consumers do not form a homogeneous group; thus, identifying different segments is essential for developing effective marketing strategies. Market segmentation allows companies to target different consumer groups more effectively and to offer products and communication solutions tailored to their specific needs.

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The purpose of the present research is to segment consumers in the dietary supplement market based on their purchasing criteria, brand awareness, and brand trust. Cluster analysis was applied during the research to uncover the distinct consumer groups and to identify their main characteristics. The results can contribute to the development of relevant, targeted marketing and product strategies for market players.

2 Literature Review

The investigation of consumer behavior is one of the central questions of marketing, particularly in a dynamically evolving market such as the dietary supplement industry [2]. Purchasing decisions are the result of a complex process in which product characteristics, attitudes towards brands, and external sources of information all play a role, with special regard to the credibility of social media and digital content creators [3].

The literature highlights that in the case of food and health-related products, quality and value play a pivotal role in consumer behavior. Quality often emerges as the most critical decision criterion, while price is interpreted not only as a cost factor but also as an indicator of quality [4] [5]. Among health-conscious consumers, there is a strong tendency to prefer products perceived to be of higher quality [6]. The role of brands is equally decisive in consumer behavior. Brand equity, brand awareness, and brand trust have a significant impact on purchasing decisions, as they reduce perceived risk and increase consumer satisfaction [7] [8]. Domestic research also confirms that trust in brands is one of the most important factors among Hungarian consumers in the food and health markets [9]. In recent years, with the rise of digital marketing, the role of influencers has become substantially appreciated. Influencers can appear to be credible sources for consumers, thereby influencing their attitudes and purchasing decisions [10] [11]. However, the effectiveness of influencer marketing heavily depends on credibility, the follower base, and the relevance of the content [12].

Market segmentation is a fundamental tool of marketing strategy, allowing companies to identify homogeneous consumer groups and develop targeted offerings for them [13] [14]. Cluster analysis is a particularly widespread method for uncovering consumer segments, as it can create well-differentiated groups based on multidimensional data. The application of this method is also widely prevalent in food and health market research [15].

The importance of consumer segmentation also appears in domestic literature, especially in the examination of health-conscious consumption and the food market. These studies point out that consumers' attitudes, lifestyles, and value systems significantly influence purchasing decisions [5] [16].

The BioTechUSA Group closed 2025 with a revenue exceeding 100 billion forints, while achieving double-digit growth in a challenging market environment [17]. Despite economic difficulties, BioTechUSA maintained an unbroken growth trajectory. Surpassing the previous year's record, it produced revenue growth of nearly 15%, bringing its turnover to 236.4 million euro last year. The company invested 13 million euro into various projects. Despite the unfavorable economic environment, the company's financial stability further improved in 2023. The operating profitability indicator, EBITDA, grew by 3.5%, reaching 27.36 million euro. BioTechUSA's global market presence and operational background are outstanding: it is represented in more than 103 countries, where the network consists of 1,800 employees, 4,500 partners, as well as 49 webshops and 307 stores. Four additional brands belong to the company: Scitec Nutrition, which is specifically a brand for people dedicated to bodybuilding; Builder, a Hungarian online dietary supplement webshop operating for over 20 years; ShakerStore, a manufacturer of custom shakers; and VitaminShop, a multi-brand-oriented vitamin webshop.

The pursuit of a more conscious lifestyle may lead to the expansion of the customer base, but the increase in raw material prices has made procurement more difficult. The company achieved revenue of 236.4 million euro, representing a 15% increase, and remained profitable: EBITDA increased from 25.25 million euro to 27.36 million euro. Protein powders remain popular, and additionally, the demand for dietary supplements has grown, while an increasing number of special food products have also appeared. Due to the changing environment, consumer habits have also transformed. The group follows an omnichannel strategy, as it is actively present in both online and

offline channels, such as partner shops, stores, gyms, supermarkets, food chains, and drugstores. The company maintained its domestic market-leading role, and its market share grew in France, Germany, and Poland as well. Meanwhile, it achieved dynamic growth in Southern and Northern Europe. Outstanding growth was also shown in Iraq and Vietnam [18] [19].

The literature has supported that consumer decisions are multidimensional, and examining product characteristics, attitudes towards brands, and communication effects is essential for an effective marketing strategy. Connecting to this, the present research analyzes the segmentation of consumers in the dietary supplement market using cluster analysis.

3 Material and method

The aim of our research is to segment competitive and recreational athletes based on their purchasing behavior, brand awareness, and brand trust. The study was based on quantitative research, using an online questionnaire distributed within athletic and social media groups. Participation was voluntary and anonymous, yielding 420 evaluable responses.

Through cluster analysis, three main cluster groups were identified. Respondents rated the importance of specific product attributes, such as price, quality, taste, brand loyalty, packaging, and usefulness in their purchasing decisions on a 1 to 5 Likert scale. Additionally, the influence of influencers on purchasing decisions was measured using the same 1 to 5 scale.

Furthermore, respondents were asked to rate their awareness of various dietary supplement brands, and brand trust was organized into a separate set of questions assessing the perceived reliability of the participating brands. All variables were uniformly recorded on a 1 to 5 Likert scale.

3.1 Applied Methods

First, the number of clusters was determined using hierarchical cluster analysis with Ward's method and squared Euclidean distance. The advantage of this method is that it does not require a predefined number of clusters, and the graphical dendrogram assisted in selecting the optimal cluster count. Based on the dendrogram, the formation of three clusters proved to be justified; therefore, K-means cluster analysis was applied for the final grouping, specifying the creation of 3 cluster groups based on the preliminary investigation. The K-means clustering method was chosen because it enables efficient and stable clustering of larger sample sizes, as well as a more precise determination of the differences between clusters.

Standardization of the variables was not required, as the included variables were recorded on the same measurement scale, a 1–5 Likert scale, thereby ensuring their comparability.

During our research, the following hypotheses were formulated:

H1: Consumers can be segmented based on their attitudes toward purchasing dietary supplements.

H2: The consumer groups organized into clusters based on dietary supplement purchases significantly differ in their perception of the importance of product attributes (e.g., price, quality, flavor).

H3: The cluster groups show a marked difference in terms of brand awareness and brand trust.

H4: The influence of influencers varies across the different clusters regarding consumers' dietary supplement purchasing decisions.

4 Operationalizing hypotheses

For the analysis of the hypotheses formulated in our research, variables from the online survey were used, all of which were measured on a 1–5 Likert scale. On this scale, 1 indicated "not at all typical," "not at all important," or "not known," while 5 represented "completely" or "very typical/important."

Hypothesis H1 was examined through the application of cluster analysis, which allowed for the segmentation of respondents based on the included attitude and perception variables. One related set of questions investigated the factors influencing product purchase decisions (price, taste, packaging, etc.), the second focused on brand awareness, and the third evaluated brand reliability.

Thus, the operationalization of this hypothesis was based on examining the existence of distinct groups resulting from the multivariate clustering procedure.

Hypothesis H2 was verified using variables that measure the importance of product attributes, namely product price, quality, taste, brand loyalty, and the assessment of product packaging and its perceived usefulness. During operationalization, the mean values of these variables were compared across clusters, enabling the identification of differences between the groups.

Hypothesis H3 incorporated variables from the question groups that measure brand awareness and trust toward various sports supplement brands. Respondents were asked to rate the awareness and reliability of several different brands; the differences between groups were then identified based on the cluster-specific means of these ratings.

Hypothesis H4 was based on a variable measuring the impact of influencers, which examined the extent to which respondents' purchase decisions are influenced by recommendations from athletes or influencers. In the operationalization process, the mean values of this variable were analyzed by cluster.

Each hypothesis was linked to specific, measurable variables, thereby ensuring their empirical testability and the interpretability of the results.

5 Results

The average values of the responses of those belonging to the cluster groups are illustrated in the table below. The number of people belonging to each cluster group is shown in Table 3.

Table 1. Results of the cluster groups along the aspects playing a role in the product purchase decision, brand awareness and brand trust-related variables.

Clusters	1	2	3
Evaluation of aspects that play a role in your product purchase decision: Rate the following aspects from 1 to 5, how important they are to you (1=not at all, 5=very important)			
Product price	4	3	4
Product quality	5	4	5
Product taste	4	3	4
Brand loyalty	3	2	3
Product packaging	3	2	3
Product utility	5	4	5
Recommendation by an athlete or influencer	3	2	3
Brand awareness: How familiar are you with these brands? (1=not at all, 5=completely)			
BioTechUSA	5	3	4
Scitec Nutrition	4	2	2
Nutriversum	3	2	1
MyProtein	4	2	4
Brand trustworthiness rating: How trustworthy do you consider the following brands to be? (1=not trustworthy at all, 5=very trustworthy)			
BioTechUSA	4	3	4
Scitec Nutrition	4	3	2
Nutriversum	3	2	2

MyProtein	4	3	4
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Source: own data collection and editing

The iterations have not converged. The maximum absolute coordinate change of any center point is 0.060. The current iteration is 10. The minimum distance between the initial centers is 11.747.

Table 2. Iteration history

Change in cluster centers			
Iteration	1	2	3
1	4,489	5,677	5,752
2	,434	,491	,476
3	,229	,381	,244
4	,126	,199	,381
5	,087	,292	,366
6	,106	,191	,369
7	,088	,170	,328
8	,067	,218	,377
9	,066	,146	,268
10	,048	,089	,128

Source: own data collection and editing

5.1 Cluster 1: Conscious, brand-aware consumers

As shown in Table 3., the first cluster constitutes the largest part of the sample (n=193).

Table 3. Evolution of the number of respondents belonging to the three cluster groups

Number of cases in each cluster		
Clusters	1	193
	2	132
	3	95
Valid		420
Missing		0

Source: own data collection and editing

The results in Table 1. clearly illustrate that for the members of this group, product quality and usefulness are the most important factors, though product price and taste also play a prominent role in their purchase decision-making. A further characteristic of these respondents is their high level of brand awareness, especially regarding the leading supplement brands (BioTechUSA, Scitec Nutrition, and MyProtein), and they generally consider these supplement manufacturing companies to be reliable. The impact of influencers is moderate, which suggests that while they are open to recommendations, they make their decisions based on their own experiences and product attributes. Recommended Strategy

For these consumers, it is best to build on communication quality and expert credibility, as quality is the most decisive factor for them. From a marketing communication perspective, involving professional content, coaches, or dietitians, and emphasizing the scientific or functional benefits of the products can be highly effective. In terms of product development, high-quality, functional products developed for specific purposes (e.g., recovery, muscle building) are likely to appeal to them.

5.2 Cluster 2: Less involved, passive consumers

In the case of the second cluster (n=132), a lower level of involvement can be observed (Tables 1. and 3.). The investigated attributes such as price, quality, taste, or brand loyalty are less important to them, and influencer recommendations do not have a major impact on them either. Members of this group possess lower brand awareness and a more moderate level of trust, which indicates a lower level of informedness and reflects a more limited interest in dietary supplement products and their market.

Recommended Strategy:

In this segment, primary focus must be placed on education and awareness-raising, and these goals should be integrated into marketing communication. During communication, product benefits and usage opportunities should be presented using simple, easy-to-understand messages. The use of discounts, coupons, or entry-level product bundles can serve as incentives for trying and purchasing the products. These marketing tools can help activate this consumer group. From a product development perspective, simple, basic-function, and affordably priced products are recommended.

5.3 Cluster 3: Quality-oriented but selective consumers

For consumers in the third cluster (n=95), quality and product usefulness remain important factors, while product price and taste are also decisive. However, their awareness of different brands shows a more differentiated picture: there are certain brands they know well and consider reliable, whereas they are less familiar with other brands and exhibit lower levels of trust toward them. The impact of influencers can be described as moderate, which may indicate that they are only partially open to external recommendations.

Recommended Strategy:

In this segment, it is worthwhile to focus on brand building and increasing brand awareness. From a marketing communication perspective, involving influencers and athletes, as well as increasing brand visibility online and on social media, can prove effective. Regarding product development, the creation of high-quality, innovative, or uniquely flavored products is recommended. These unique products can also assist brands in differentiating themselves from one another.

5.4 Summary of the clusters

The cluster analysis identified three distinct consumer segments: a conscious, brand-aware, and quality-oriented group; a low-involvement, passive consumer group; and a quality-oriented group with selective brand awareness. The results demonstrate that differences among consumers primarily manifest in their assessment of product attribute importance and their attitudes toward brands. Hypothesis H1, which stated that consumers can be segmented based on their attitudes toward purchasing dietary supplements, was supported, as our cluster analysis and its results (Tables 1. and 3.) successfully identified three well-distinguished consumer groups. Hypothesis H2, which posited that clusters significantly differ in their assessment of product attribute importance (such as price, quality, and taste), is also acceptable, given that clear differences can be observed in the preferences of each segment based on the cluster centroids. Hypothesis H3, if brand awareness and trust toward brands differ across clusters, gained confirmation, as the brand awareness and brand trust of the individual clusters yielded varying results. Hypothesis H4, which suggested that the impact of influencers varies across different clusters, is likewise acceptable, since

differences were observed among the clusters regarding the perceived legal power and influence of influencers. In conclusion, all hypotheses were supported, indicating that well-differentiated consumer segments can be identified along the investigated variables (Table 4.), and these segments possess distinct attitudes, brand perceptions, and decision-making mechanisms.

Table 4. Summary of cluster groups

Summary of casters and strategic suggestions			
Cluster's names	Main characteristics of cluster groups	Development suggestions	Literature
Brand-aware consumers	They are characterized by high quality products and importance of product utility, favorable price and taste, high brand awareness and high level of trust, medium influencer effect	Development of premium quality, functional products, innovation (special formulas), expert communication, authentic brand building	[7] [8] [5] [20]
Passive, low-involvement consumers	Product features are less important, low brand loyalty and awareness, minimal influencer effect	Simple, basic products, reasonable prices, promotions, educational campaigns, easy-to-understand communication	[21] [22] [16] [21]
Quality-oriented, selective consumers	High quality and product utility, price and taste are important, medium brand awareness, openness to influencers	Innovative products, new flavors, mid-range prices, increasing brand awareness, influencer marketing, digital campaigns	[10] [11] [5] [22]

Source: own data collection and editing

6 Discussion

The results of the cluster analysis are consistent with findings in international and domestic literature, which state that consumers form a heterogeneous group and their purchase decisions are determined by multidimensional factors [23] [24]. The three identified clusters clearly reflect the diverse consumer attitudes and preferences along which the market can be segmented.

The findings confirm that quality and product usefulness play an important role in consumer decisions, aligning with Zeithaml's [4] observations as well as domestic research, which indicates that health-conscious consumers are particularly sensitive to the quality attributes of products [5]. High values are observed along with these factors across all three clusters, suggesting that these variables function as baseline expectations in the market.

Differences between the clusters manifest primarily in brand awareness and trust toward brands. The high brand awareness and trust levels of the first cluster support the findings of Aaker [7] and Keller [8], according to which brand equity significantly contributes to consumer decisions

and reduces perceived risk. Conversely, the lower brand awareness and trust levels of the second cluster indicate that consumers in this segment are less committed, which may be associated with their lower level of involvement.

The examination of the impact of influencers yielded relevant insights. The variances among the clusters confirm that influencer marketing is not equally effective across all consumer groups. This is in line with research by De Veirman [10] and Lou and Yuan [11], which suggests that the impact of influencers largely depends on consumer attitudes and source credibility. The results of the present study show that while a moderate level of influence is typical, certain segments are more receptive to this type of communication.

The application of cluster analysis proved to be an appropriate methodological choice, as it enabled consumer segmentation based on multivariate data an approach widely applied and accepted in the literature [13] [15]. The identified clusters are highly interpretable and practically relevant, which supports the applicability of the method in analyzing the dietary supplement market.

Overall, it can be concluded that the research findings confirm the trends described in the literature, while simultaneously contributing to a deeper understanding of dietary supplement consumers. The revealed clusters highlight that differences among consumers primarily emerge in their relationship with the brand and the weighting of decision factors, thereby justifying the application of a segmentation-based marketing approach.

Interpretation of Results and Management Implications

The insights from our cluster analysis highlight that consumers in the dietary supplement market do not form a homogeneous group but differ across well-distinguished segments [25]. Our three identified clusters possess distinct preferences, levels of brand awareness, and decision-making mechanisms, which validates the necessity of a differentiated marketing strategy.

The results confirm that product quality and usefulness are important factors for all clusters; however, brand awareness and trust toward brands differed significantly between the groups [26]. This outcome proves that focusing solely on product development is insufficient; intense attention must also be dedicated to brand building and strengthening consumer trust [27]. The impact of influencers proved to be moderate, but their role varied by cluster, demonstrating that the application of such marketing tools can be successful when targeted in a segment-specific manner.

From a managerial perspective, the most critical implication of the results is that companies operating in the dietary supplement market must implement a multidimensional, segmentation-based strategy. For conscious, brand-aware consumers, a competitive advantage can be secured through high quality, credible professional communication, and innovative product development.

Consumers belonging to the less involved consumer group can be targeted and incentivized toward consumption using lower-priced, entry-level products and clear, easily understandable messages. Meanwhile, in the case of the quality-oriented but selective brand awareness segment, increasing brand awareness and strengthening emotional attachment become paramount.

The findings also point out that instead of uniform marketing communication, the application of an integrated, target-group-specific approach is advisable [28]. The role of digital channels, especially social media and influencer marketing, can be prominent; however, their effectiveness largely depends on how well they align with the attitudes and information-seeking habits of the given target group [29].

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