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Determinants of Dietary Supplement Consumption Among International Students in the University of Debrecen: Integrating Social Media Usage and Health Consciousness into the Theory of Planned Behavior

Ghaith, Abrar University of Debrecen, e-mail: a.ghaith@outlook.com
Salem, Omar University of Debrecen

SUMMARY

Dietary supplements are popular globally and may be more susceptible due to specific challenges encountered abroad. This study looks at the factors affecting their consumption at the University of Debrecen using the Theory of Planned Behavior (TPB).

An online cross-sectional survey design measuring attitude, subjective norms, perceived behavioral control, health consciousness, social media usage, and intention to purchase dietary supplements was used. 320 international students provided data online for convenience sampling.

Due to social media use, health consciousness, and subjective norms, international students typically had positive attitudes regarding dietary supplements. A sense of behavioral control suggested self-assurance in acquiring and ingesting supplements.

The findings emphasized the significance of social media usage, attitude, subjective norms, perceived behavioral control, and health consciousness in influencing purchase intentions. The results offer guidance for creating focused interventions that support responsible and well-informed supplement use.

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1. INTRODUCTION

A dietary supplement is one that is used orally with an intention to supplement the ingredients of the diet; it may include vitamins, minerals, herbs, amino acids, and other ingredients (Temple, 2012; Mishra et al., 2020). The definition set up by the U.S. Food and Drug Administration (FDA) is a product that is orally consumed that contains "dietary ingredients," especially to supplement the diet (Mishra et al., 2020). Dietary supplements are available in different forms such as tablets, capsules, powders, and liquid, and they are not considered as food and medicine (Temple, 2012; Mishra et al., 2020; Buchman, 2002). Unlike drugs and food additives, they are exempted largely from regulation by that category in which they fall- dietary supplements (Buchman, 2002). Due to a shift in health perception and an emphasis on preventive health, the majority of people globally currently utilise dietary supplements, resulting in a market value of over $100 billion annually (Binns et al., 2018). Additionally, it was noted that most consumers were using dietary supplements more frequently in an effort to boost their immune systems and protect themselves from the COVID-19 virus (Djaoudene et al., 2023; Ghaith et al., 2023). Since the consumption of dietary supplements has gained significant popularity among

individuals seeking to enhance their health and well-being. International students, a rapidly growing population, are no exception to this trend. International students face unique challenges and stressors while studying abroad and thus may be particularly inclined to use dietary supplements (Huang et al., 2023). Understanding the determinants of dietary supplement consumption among this population is crucial for developing targeted interventions and promoting healthy behaviors. However, the specific factors influencing their dietary supplement use in a new academic environment have not been extensively explored. Using the Theory of Planned Behavior (TPB) as a theoretical framework, this study examines the factors influencing international students at The University of Debrecen-Hungary intention to purchase dietary supplements. While purchase intention is the dependent variable, the independent factors under investigation are attitude, subjective norms, perceived behavioral control, health consciousness, and social media usage. This research will contribute to a better understanding of factors influencing dietary supplement use among international students. It can inform targeted interventions to promote healthy dietary practices and responsible supplement use within this population

2. Literature Review

2.1. Dietary Supplement Popularity and International Students

Cultural dissimilarities have been reported to affect dietary supplements, such that people from different cultures tend to consume supplements either more or less than the local population, choose different types of supplements, and have different reasons for doing so (Huang et al., 2023; McArthur et al., 1990). Huang et al. (2023) showed differences in preference and frequency of supplement use between the Chinese international and Korean college students in South Korea, with cultural backgrounds influencing both consumption behavior and product choice. Such a cultural dimension to supplement acceptability has been confirmed by earlier works such as McArthur et al. (1990), where different beliefs and practices with regard to supplementation emerged amongst international and U.S. students. Other factors reviewed in the literature include age, self-reported health status, interest in health, and, in the case of international students, length of residence in the host country (Huang et al., 2023). Within this context, health motivation—meaning the internal drive of an individual to undertake health-enhancing activities—has been found to modify the relationship between social cognition (e.g., subjective norms, perceived behavioral control) and intentions to consume supplements (Noor et al., 2019).

This study focuses further on expanding the findings by investigating the application of the TPB framework to understanding the dietary consumption of international students in The University of Debrecen.

2.2. Stress and Health Concerns among International Students

International students face significant challenges when studying abroad, including academic stress, cultural adaptation, and social isolation (Wu et al., 2015; Zhai, 2002). These adjustment issues can negatively impact their physical and mental health (Sharif, 1994). Academic demands often present the greatest difficulty, with students struggling to communicate with professors and classmates (Wu et al., 2015). Cultural differences and language barriers further compound these challenges (Zhai, 2004). Temperature comfort in educational environments is a strong influencer on students' well-being and academic performance. Investigations covering a wide spectrum of climates and educational stages indicate that the factors determining students' perception of thermal comfort and their adaptability of it vary with age and exposure to climate (Torriani et al., 2023; Romero et al., 2023). International students often face much more discomfort than their local counterparts, especially in sub-cold climates (Mmereki & Akpaca, 2021). Interestingly, students generally perceive the coldest months to be the most uncomfortable, regardless of geography (Golshan et al., 2021). The adaptive approach to assessing comfort needs across age groups has been found more appropriate from a practical point of view, sometimes in combination with Fanger's method (Romero et al., 2023). The recently introduced COVID-19 requirements for ventilation affected thermal comfort within classrooms (Romero et al., 2023). Such findings require model thermal comfort guidelines for educational buildings to be stratified according to age, climate, and cultural adaptation that allow for the best learning conditions (Torriani et al., 2023; Romero et al., 2023).

The process of dietary acculturation can lead to health consequences, with many students reporting weight gain due to larger portions, unstructured mealtimes, and frequent snacking (Alakaam & Willyard, 2020). Notably, a majority of international students reported taking unprescribed dietary supplements after moving to the United States (Alakaam & Willyard, 2020). To address these issues, universities should provide academic and cultural orientation programs (Zhai, 2004) and develop policies aimed at reducing the impact of acculturation on international students' health and well-being (Alakaam & Willyard, 2020).

2.3. The Theory of Planned Behavior (TPB) as a Framework

The Theory of Planned Behavior (TPB) by Ajzen (1991) offers a well-established framework to understand factors influencing health-related behaviors (Norman & Conner, 2005; Conner & Sparks, 2005), including dietary supplement consumption (Ghaith et al., 2023). The TPB posits that three key factors influence behavioral intention: attitude, subjective norms, and perceived behavioral control (Ajzen, 1991). This study validates the theory of planned behavior in understanding the factors influencing dietary supplement purchasing intentions among international students at the University of Debrecen. According to the Theory of Planned Behavior (TPB) model, studies consistently identify attitude, subjective norms, and perceived behavioral control (PBC) as significant predictors of students' intention to use supplements (Alami et al., 2019; El Khoury et al., 2021). This finding extends to young adults more broadly, with Lee et al. (2016) demonstrating that subjective norms, perceived behavioral control, and attitude significantly predict their purchase intention of dietary supplements.

Research shows that attitudes toward dietary supplements are conditioned by a number of factors. For example, Individuals with higher health consciousness tend to exhibit more positive those attitudes towards supplements: they are more likely to see their benefits, less likely to see risks (Royne et al., 2014).

Health motivation also moderates the relationship between social cognition and intention to consume supplements (Noor et al., 2019). Willis and Stafford (2016) found that health consciousness, rather than familiarity with supplement advertising, significantly affects attitudes toward different supplement types and price perceptions. Among adolescent athletes, attitudes are better predictors of intentions to use supplements than subjective norms, with athletic trainers having more influence on attitudes and intentions than parents and coaches (Dunn et al., 2001). These findings suggest that health consciousness and perceptions of improved health play a crucial role in shaping attitudes toward dietary supplements, while the influence of subjective norms and advertising familiarity may vary depending on the context and population studied.

2.3.1. Theory of Planned Behavior constructs

The Theory of Planned Behavior is built on three constructs. The first, attitude, refers to an individual's beliefs about the positive and negative consequences of a behavior (Ajzen, 1991). Attitude towards supplements consistently emerges as a significant predictor of consumption intention and behavior, most studies show that a positive attitude toward dietary supplements is associated with the intention and behavior of consuming them. This means that human beings who perceive supplements to be beneficial will tend to take them. (Jeżewska-Zychowicz & Pilska, 2006; Noor et al., 2019).

The second construct is subjective norms, which are the perceived social pressures to engage or not engage in a behavior (Ajzen, 1991). Social influences, particularly from family and friends, play a role in shaping attitudes and consumption patterns (Huang et al., 2023; Noor et al., 2019).

The third construct is perceived behavioral control. This refers to an individual's confidence in their ability to perform the behavior (Ajzen, 1991). Perceived behavioral control also impacts supplement use. Specifically; perceived behavioral control has a generally positive influence on supplement use. Those who feel confident in their ability to acquire and properly use a supplement are more likely to have an intention to use one and, in fact, actually use the supplement. (Noor et al., 2019).

2.3.2. Additional Factors Influencing Supplement Use

Beyond the core TPB constructs, other factors might influence international students' dietary supplement consumption, particularly health consciousness and social media usage. Research indicates that health consciousness is positively associated with attitudes toward dietary supplements and their perceived benefits (Royne et al., 2014; Willis and Stafford, 2016). Supplement users tend to be more health-conscious, better educated, and more likely to adopt healthier lifestyle habits compared to non-users (Dickinson & Mackay, 2014). While traditionally associated with older adults, younger populations, including university students, are increasingly using supplements (Choi, 2019). Health involvement (the level of individual importance or interest assigned to health and health-related decisions) depicts the degree of engagement of the individual in managing one's health, which may affect behaviors regarding supplement use., rather than knowledge or expectations about efficacy, appears to be a significant predictor of supplement use and future purchase intentions among young adults (Choi, 2019). However, familiarity with supplement advertising does not significantly influence attitudes or price perceptions (Willis & Stafford, 2016).

Social media plays a significant role in shaping health behaviors and disseminating health information among young adults. Studies have shown that dietary supplement use is prevalent among college students, with the internet and social media platforms serving as important sources of information (Salmean & Alhuwail, 2018). An integrated health campaign model on social media revealed that communicative behaviors, such as information acquisition and transmission, mediate the relationship between perceptions and behavioral intentions (Yoo et al., 2018). Young adults report that social media is highly persuasive in influencing dietary behaviors through social support, access to health information, and exposure to

fast-food advertisements (Friedman et al., 2022). However, exposure to health-focused content can also induce feelings of guilt, particularly among women. These findings suggest that social norms on social media platforms are crucial in shaping young adults' health behaviors, highlighting the potential for targeted interventions.

2.4. Knowledge Gap and Research Aims

The previous literature has presented several insights regarding the use of dietary supplements and the challenges international students face. The gap in understanding pertains to the specific factors impacting the consumption of dietary supplements by international students when in a new environment such as Hungary. This study will accommodate this gap by examining the factors influencing the intention to purchase dietary supplements among international students at the University of Hungary within the framework of the TPB.

2.5. The Research Model

The initial structural model includes one dependent variable (the purchasing intention of dietary supplements) and five independent variables (attitude, subjective norms, perceived behavioral control, health consciousness, and social media usage).

Attitude as an independent variable: This refers to a student's positive or negative evaluation of consuming dietary supplements.

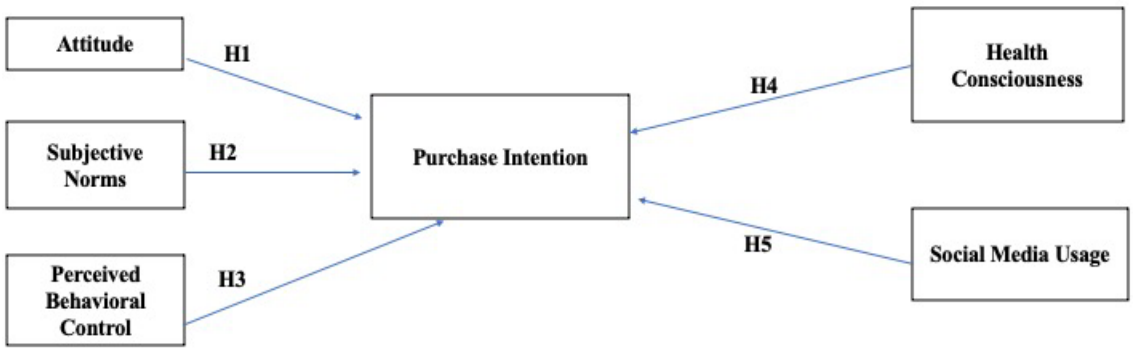
Subjective Norms as an independent variable: This reflects the perceived pressure from family, friends, and the broader community regarding supplement use.

Perceived Behavioral Control as an independent variable: This captures a student's belief in their ability to overcome obstacles and successfully consume supplements.

Health Consciousness as an independent variable: The intention to purchase is significantly influenced by health consciousness, which is believed to be determined primarily by attitudes and subjective norms. As such, the TPB framework attempts to clarify how health consciousness relates to these predictors to form consumption behaviors.

Social media usage as an independent variable: This study proposes social media usage as an independent variable. Students who use social media as a source of information might be more receptive to positive attitudes towards supplements and the influence of social norms.

Purchase Intention as dependent variable: This study proposes purchase intention as dependent variable that is affected by attitudes, subjective norms, perceived behavioral control, health consciousness, and social media usage.



Source: Author's own assembling based on Ajzen (1991)

Figure 1: Proposed research model

2.6. Methodology

2.6.1. Study Design and Participants

Data were collected over a four-month period, from June 14 to October 22, 2023; this study focused on cross-sectional questionnaire design which examined factors influencing the international student's intention to purchase dietary supplements at the University of Debrecen, Hungary.

2.6.2. Sampling Strategy

A non-probabilistic method convenience sampling was used to recruit participants. Using Google Forms, online links to the survey were shared via Facebook groups, WhatsApp, Telegram, and other social media platforms that international students at The University of Debrecen frequently use. Prior to completing the anonymous online survey, each eligible participant was required to fill out an informed consent form.

2.6.3. Data Collection and Response Rate

A total of 325 participants completed the self-administered questionnaire. Following data validation, 320 questionnaires were deemed usable for further analysis.

2.6.4. Questionnaire Development

The structured questionnaire was designed after comprehensive reviewing the relevant literature. Key constructs were included from the proposed theoretical framework, including health consciousness, social media usage, attitude toward dietary supplements, and purchase intention. In accordance with Ajzen's (1991) guidelines, each construct was measured by means of multi-item scales to make them more valid and reliable. The respondents were asked to give their level of agreement with a number of statements on a five-point Likert scale. The scale ranged from 1 (strongly disagree) to 5 (strongly agree). The final instrument included items on attitude (4 items), subjective norms (4 items), perceived behavioral control (4 items), health consciousness (5 items), social media usage (6 items), and purchase intention (3 items). The questions on the independent variables can be found in Appendix 1.

2.6.4.1. Measures

- Attitude, Subjective Norms, and Perceived Behavioral Control: TPB-based scales assessed students' beliefs and perceptions regarding dietary supplements.

- Attitudes: (Ajzen, 1991; Ghaith et al., 2023; Pop et al., 2020)
- Subjective norms: (Ghaith et al., 2023)
- Perceived behavioral control: (Ghaith et al., 2023)
- Health Consciousness: A validated scale measured students' focus on maintaining good health (Ghaith et al., 2023; Gould, 1988; Michaelidou & Hassan, 2008)
- Social media usage: A validated scale measured students' social media usage and trustworthiness (Chi, 2021; Pop et al., 2020).
- Purchase Intention: A scale measured students' likelihood to purchase dietary supplements in the future (Ajzen, 1991; Ghaith et al., 2023)

3. Data Analysis

Descriptive statistics summarized participants' characteristics and supplement consumption patterns. Regression analysis examined the relationships between the independent variables (attitude, subjective norms, perceived behavioral control, social media, and health consciousness) and the dependent variable (purchase intention).

3.1. Data Quality

The number of participants in this study is 325. To ensure data quality, two techniques have been employed. First, in measuring the variance of participants' responses, five cases were found to be straight liners with zero variance. These cases have been removed, reducing the total number of participants to 320. Second, the Cronbach Alfa test was used to measure reliability. According to Hair et al. (2010), Cronbach's alpha coefficients ranging from 0.70 to 0.80 are indicative

of high reliability. Values falling between 0.60 and 0.70 suggest adequate reliability, while those below 0.60 indicate poor yet acceptable reliability. Table 1 shows the reliability values of the variables, the values ranging from 0.704 for perceived behavioral control to 0.911 for purchasing intention that means the questionnaire has high reliability.

Table 1

Reliability test results

Constructs	Cronbach Alpha
Attitudes	0.811
Subjective Norms	0.788
Perceived Behavioral Control	0.704
Health Consciousness	0.829
Social Media Usage	0.874
Purchasing Intention	0.911

Source: Author's own calculations using SPSS v.29

3.2. Demographic Data

This part describes the demographic data of the respondents, it includes gender, age, educational level, student status, study field, and self-reported level of knowledge about dietary supplements. To maintain anonymity among participants considering the relatively small and diverse nature of the international student population at the University of Debrecen, country or region of origin was not asked. This was to minimize the chances of an indirect identification in combination with any other demographic variable. Further, the study focused mainly on investigating general behavioral predictors rather than cross-cultural comparisons.

Table 2

Demographic data

Demographic profile	Frequency	Percentage%
Gender		
Male	120	37.5
Female	200	62.5
Total	320	100.0
Age		
18–22 years	69	21.6
23–27 years	87	27.2
28–32 years	84	26.3
33 years & above	80	25.0
Total	320	100.0
Educational Level		
Bachelor	121	37.8
Master	115	35.9
One-tier program	9	2.8
PhD	75	23.4
Total	320	100.0
Student Status		
Scholarship Student	196	61.3
Self-financed Student	124	38.8
Total	320	100.0
Study Field		
Medical & Health	87	27.2

Engineering, Manufacturing, & Construction	80	25.0
Science, Mathematics, & Computer	48	15.0
Humanities, Social Science, & Education	34	10.6
Economics & Business	55	17.2
Agriculture, Environment, & Veterinary	16	5.0
Total	320	100.0
Knowledge Level		
Low	53	16.6
Moderate	199	62.2
High	66	20.6
Missing	2	0.6
Total	320	100.0

Source: Author's own calculations using SPSS v29

3.3. Descriptive Statistics

Table 3 illustrates the descriptive statistics of the study variables. The first column represents the independent and dependent variable, the second column indicates the mean value, and the third column deals with the values of standard deviation, and *N* value is the number of respondents.

Table 3

Mean, standard deviation, and variance of the variables

Variable	Mean	Std. Deviation	Variance	N
Attitude	3.5711	.70588	.498	320
Subjective Norms	3.2898	.80784	.653	320
Perceived Behavioral Control	3.7510	.80370	.646	320
Health Consciousness	3.9806	.67522	.456	320
Social Media Usage	2.9656	.89244	.796	320
Purchasing Intention	3.5417	.89951	.809	320

Source: Author's own calculations using SPSS v29

The results provide a comprehensive overview of the central tendencies and variability of the variables in the study. The mean scores suggest the average levels of each construct, while the standard deviations and variances provide insights into the dispersion of scores around the means.

Based on the results, the Pearson's correlation of the variables is positive, all *p* values are below 0.05. The correlation coefficient between purchase intention, health consciousness, and social media usage is positive but relatively modest, indicating that these variables have a less prominent but still significant impact on purchasing decisions. Table 4 gives more insights about the correlation coefficient values.

Table 4

Correlation Coefficient Matrix

Variables		Purchasing Intention	Attitude	Subjective Norms	Perceived Behavioral Control	Health Consciousness	Social Media Usage
Attitude	Pearson Correlation	.608	1.000	.421	.460	.230	.155
	Sig. (2-tailed)	.000		.000	.000	.003	.000
	N	320	320	320	320	320	320
Subjective Norms	Pearson Correlation	.429	.421	1.000	.210	-.009	.260
	Sig. (2-tailed)	.000	.000		.000	.435	
	N	320	320	320	320	320	320
Perceived Behavioral Control	Pearson Correlation	.462	.460	.210	1.000	.413	.034
	Sig. (2-tailed)	.000	.000	.000		.000	.274
	N	320	320	320	320	320	320
Health Consciousness	Pearson Correlation	.251	.230	-.009	.413	1.000	.099
	Sig. (2-tailed)	.000	.000	.435	.000		.038
	N	320	320	320	320	320	320
Social Media Usage	Pearson Correlation	.269	.155	.260	.034	.099	1.000
	Sig. (2-tailed)	.000	.003	.000	.274	.038	
	N	320	320	320	320	320	320
Purchasing Intention	Pearson Correlation	1.000	.608	.429	.462	.251	.269
	Sig. (2-tailed)		<.001	<.001	<.001	<.001	<.001
	N	320	320	320	320	320	320

Source: Author's own calculations using SPSS v29

To analyze the study's hypotheses, the researchers used IBM SPSS version 29 to conduct multiple linear regression in order to measure the influence of the independent variables on the dependent variable.

Table 5

Results of multiple linear regression

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	-.367	.243		-1.511	.132		
Attitude	.515	.064	.404	8.091	<.001	.675	1.481
Perceived Behavioral Control	.263	.052	.235	5.077	<.001	.787	1.271
Subjective Norms	.188	.052	.169	3.641	<.001	.783	1.277
Social Media Usage	.155	.043	.154	3.617	<.001	.928	1.078

a. Dependent Variable: Purchasing Intention

Source: Author's own calculations using SPSS v.29

Using the stepwise method for multiple linear regression, it was found that attitude, perceived behavioral control, subjective norms, and social media usage all have a significant impact on purchasing intention, with *p* values below 0.05 (Sig. <.001). Also, the variance inflation factor VIF values do not exceed 1.481, which is below the threshold of 3, indicating that there is no issue with multicollinearity, ensuring the reliability of the results. On the other hand, the results revealed that the health consciousness of students has no significant influence on their intention to buy over-the-counter dietary supplements.

3.4. Differences in Demographic Variables

Gender, age, education level, student status, study field, and knowledge level are demographic variables that have been employed in the study to explore differences among groups. Some of them have just two groups (gender and student status) and other variables have more than two groups, therefore, independent sample t-test, one-way ANOVA, and post-hoc test were employed to analyze the data.

In terms of **gender**, the results indicated a significant difference between male and female students regarding their intention to purchase dietary supplements in winter in the city of Debrecen as a response to the shortage of the vitamins that people suffer in that period. Female students are more likely to intend to buy dietary supplements than male students. Regarding **age**, the findings indicate that the age group ranging from 23 to 27 years exhibits a noticeable contrast in their preference to purchase supplements in comparison to the younger demographic of 18 to 22 years. With regards to the **knowledge level** of dietary supplements, the analysis reveals significant disparities in attitudes, perceived behavioral control, health consciousness, and purchasing intentions among participants with varying self-rated knowledge about dietary supplements. Specifically, individuals with higher self-assessed knowledge display more positive attitudes towards dietary supplements, a greater sense of control in their dietary choices, and heightened health awareness, which also translates to a stronger intention to purchase dietary supplements. These findings suggest that educational interventions could potentially enhance the uptake of dietary supplements by boosting knowledge and thereby altering attitudes and perceived behavioral control, particularly among those with an initially lower self-evaluation of their dietary supplement knowledge.

4. DISCUSSION

This study validates the theory of planned behavior in understanding the factors influencing dietary supplement purchasing intentions among international students at the University of Debrecen. According to the Theory of Planned Behavior (TPB) model, studies consistently identify attitude, subjective norms, and perceived behavioral control (PBC) as significant predictors of students' intention to use supplements (Alami et al., 2019; El Khoury et al., 2021). This finding extends to young adults more broadly, with Lee et al. (2016) demonstrating that subjective norms, perceived behavioral control, and attitude significantly predict their purchase intention of dietary supplements.

The outcomes demonstrate the significant impacts of attitudes, perceived behavioral control, subjective norms, and social media usage on these intentions. Particularly, attitude stands out as a strong predictor, suggesting that positive perceptions towards dietary supplements are closely tied to higher purchasing intentions. This aligns with Ajzen's (1991) theory, which posits that a favorable attitude towards a behavior enhances the likelihood of its execution. Perceived behavioral control also significantly influenced purchasing intentions, indicating that students who feel more capable of managing their dietary choices are more inclined to buy supplements. This could be leveraged in interventions aiming to boost consumer confidence and perceived ease of supplement procurement. Subjective norms had a notable but lesser impact, reflecting the role of social influence and external expectations in shaping consumer behavior.

4.1. Attitudes Towards Dietary Supplements

The study results reveal that the participants generally held positive attitude towards dietary supplements. This aligns with previous research suggesting a favorable perception of potential health benefits associated with supplement consumption (Royne et al., 2014; Willis & Stafford, 2016). The high mean score for health consciousness in this study further emphasizes the prioritization of well-being among these students. This focus on health likely contributes to positive attitudes towards supplements as a potential means of enhancing health.

4.2. Subjective Norms and Perceived Behavioral Control

Though not as much as attitude, subjective norms and perceived behavioral control also had significant impacts on students' intentions to purchase dietary supplements. Research on young adults and student populations highlights the significant role of subjective norms, reflecting perceived social pressure, in dietary supplement purchase intentions (Lee et al., 2016). While some studies found subjective norms to be the strongest predictor of purchase intention (Lee et al.,2016), others reported a weaker influence (Jeżewska-Zychowicz & Pilska, 2006). Attitudes consistently emerge as a key factor influencing purchase intention (Lee et al., 2016; Jeżewska-Zychowicz & Pilska, 2006; Azila Mohd Noor et al., 2014). Interestingly, adolescent athletes demonstrated stronger prediction of intentions through attitudes compared to subjective norms (Dunn et al., 2001). The influence of significant others such as athletic trainers was noted to impact attitudes, subjective norms, and intentions regarding supplement use among adolescents (Dunn et al., 2001). These findings highlight the interplay of social and personal factors in dietary supplement consumption decisions.

PBC and knowledge were earlier found to be particularly associated with intentions to take nutritional supplements among adolescent girls (Alami et al., 2019). Similarly, self-efficacy, closely related to PBC, predicts health-promoting behaviors across diverse countries (Luszczynska et al., 2004). These findings suggest that students' perceived control over obtaining and using supplements – potentially influenced by accessibility, affordability, and personal knowledge – is an important factor in their consumption. The TPB model demonstrates utility in explaining supplement use behavior among students in various contexts.

4.3. Health Consciousness and Dietary Supplement Use among International Students

The descriptive data indicated that participants' overall levels of health consciousness were high, despite the fact that our study showed that health consciousness was not a significant predictor of purchase intention. Research on university students reveals a strong link between health consciousness and dietary supplement consumption (Royne et al., 2014; Willis & Stafford, 2016). Health-conscious individuals tend to have positive attitudes towards supplements, perceiving them as beneficial and reducing perceived risks (Royne et al., 2014). However, familiarity with direct-to-consumer advertising can moderate this relationship, potentially inflating perceived benefits (Royne et al., 2014). The Theory of Planned Behavior (TPB) further supports this link, suggesting that health consciousness shapes attitudes, subjective norms, and perceived behavioral control regarding supplement use, with health motivation further influencing these relationships (Noor et al., 2019). While health consciousness is important, navigating accurate nutrition information online can be challenging for students (Szűcs et al., 2015).

Research identifies three distinct consumer groups: "ambitious", "health conscious", and "indifferent" (Szűcs et al., 2015). Given the unique challenges they face, international students can be seen as a vulnerable group in terms of dietary supplement utilization. Factors such as limited access to culturally competent health care, language barriers, different levels of health literacy, and lack of knowledge about local regulations may somehow determine their ability to weigh the merits and demerits of consuming supplements. These scenarios render them even more susceptible to misinformation or product misuse when functioning mainly through social media or so-called informal peer networks. Hence, reaching this group with reliable evidence-based messages becomes so imperative, as emphasized by Szűcs and his colleagues (2015) underlining the need for a tailored communication strategy for various consumer segments. Research on international student health paints a complex picture. While some studies report increased risks of negative health outcomes and lower help-seeking behavior for mental health compared to domestic students (Skromanis et al., 2018), others suggest international students may have better overall wellness profiles (McDaniel et al., 2021).

Additionally, studies in Turkey (Citak Tunc et al., 2021) and Australia (Harris et al., 2020) highlight the potential influence of cultural background on health perceptions and behaviors. These contrasting findings emphasize the need for targeted and culturally-sensitive health promotion programs for international students.

4.4. Social Media Usage and Dietary Supplement Use among International Students

Additionally, the data show a moderate but statistically significant positive correlation between social media usage and the desire to purchase dietary supplements. Social media usage influences consumer purchasing intentions in social commerce, with cultural intelligence mediating the effect (Hu & Zhu, 2022). However, social media was found to be a less influential factor in dietary supplement purchases among female military cadets (Jaffe et al., 2021). Nonetheless, social media platforms serve as a significant source of information about dietary supplements for college students (Salmean & Alhuwail, 2018). The impact of social media on supplement knowledge and purchasing behavior may vary across demographics. While product quality, absence of banned substances, and ingredients were the top factors influencing purchases among female cadets (Jaffe et al., 2021), college students in general showed high supplement use and relied on various information sources, including the internet and social media.

5. Conclusions

This study explored the applicability of the Theory of Planned Behavior in the context of dietary supplementation among international students of the University of Debrecen in Hungary. The findings reveal that attitudes, subjective norms, perceived behavioral control, health consciousness, and social media usage are all important determinants of students' intentions to purchase these dietary supplements, with attitude and perceived behavioral control being two of the principal predictors.

With the empirical evidence for supplement consumption on the backdrop of international student life, this study successfully adds to the body of knowledge regarding health behavior trends among internationally mobile student populations. The implications from the results would provide some substantial input for national health policymakers, university administrators, and health and wellness service providers in their endeavors to promote student welfare. In particular, there is room to develop culturally sensitive health promotion interventions, like nutrition education programs and wellness workshops that can effectively be employed to prevent extreme reliance on dietary supplements.

In addition, the apparent impact of social media on health-related choices points to an immediate need for the establishment of regulations to ensure the authenticity of evidence-based information to students. This would aid any future intervention in strategically using digital platforms to ensure dissemination of trustworthy content, deterring misinformation, and promoting informed dietary behavior among international students.

6. Limitations

It would be suggested that though this study gives much insight into some of the aspects affecting dietary-supplement consumption among international students at The University of Debrecen in Hungary, it is being drained by some limitations. First, the research investigates the consumption pattern only within the international student population in a Hungarian university, thus restricting the extension of its findings to any other student populations. Hence, a more heterogeneous sampling of dietary-supplement consumption patterns would broaden the insight from around the world and other educational institutions.

In addition, the cross-sectional design applied in this study assessed students' attitudes and behaviors at a single point in time and therefore failed to capture changes in consumption patterns across time spans. A longitudinal study would be insightful in monitoring the impacts of acculturation, academic stress, and changing health awareness on dietary supplement use by international students.

Another limitation was self-reports, which could be readily influenced by socially desirability bias. For example, participants might tend to over-report their healthy behaviors or intention to buy. Future studies could include an objective measure, such as buying records or even some bio-assessment on health to authenticate these findings.

Lastly, this study covered the major psychological and social factors affecting dietary supplement consumption, but it did not cover such factors as government regulations or healthcare policies, or the impact of university health services, which are crucial to the developmental phase of the students' perception and behavior regarding dietary supplements.

7. Future Research

Current findings of this study should be broadened with more diversity, for instance by including international students from different academic institutions and cultural backgrounds. The significance of results would be increased, and a much more comprehensive picture of student supplement use trends globally would emerge.

Also, longitudinal studies would be useful to assess how students' purchasing behaviors and perceptions of health change over time. The research could incorporate the long-term influence of acculturation, diet, and academic pressure on the use of supplements.

And in-depth interviews or a focus group may also reveal insights into the driving factors, beliefs, and challenges that affect the decision-making process of international students with regard to dietary supplements. This would complement the quantitative findings with depth and nuance regarding the psychological and cultural driving forces.

Future research could also investigate how various digital platforms influence supplement purchasing decisions through online health information, digital marketing, and mobile health applications; insight into this would help to create more appropriately targeted interventions for informed decision-making and to shield against misinformation.

Finally, Policy measures such as nutrition education programs within universities or stricter controls on dietary supplements advertising may ultimately be pursued to potentially enhance students' health and well-being. Future work may provide a basis for assessing such interventions in relation to their informing of health promotion strategies.

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Author's contribution

Abrar Ghaith: Created ideas and hypotheses for study 50%, conceived and designed the study 50%, collected the data 60%, performed the analysis 70%, wrote the paper 50%, logical explanation and presentation of findings 50%, overall: 55 %.

Omar Salem: Created ideas and hypotheses for study 50%, conceived and designed the study 50%, collected the data 40%, performed the analysis 30%, wrote the paper 50%, logical explanation and presentation of findings 50%, overall: 45 %.

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Data availability statement

Data available on request due to privacy, from the corresponding author: Abrar Ghaith, a.ghaith@outlook.com

REFERENCES

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179-211. https://doi.org/10.1016/0749-5978(91)90020-T

Alakaam, A., & Willyard, A. (2020). Eating habits and dietary acculturation effects among international college students in the United States. *AIMS Public Health, 7*(2), 228. https://doi.org/10.3934/publichealth.2020020

Alami, A., Tavakoly Sany, S. B., Lael-Monfared, E., Ferns, G. A., Tatari, M., Hosseini, Z., & Jafari, A. (2019). Factors that influence dietary behavior toward iron and vitamin D consumption based on the theory of planned behavior in Iranian adolescent girls. *Nutrition Journal, 18*, 1-9. https://doi.org/10.1186/s12937-019-0433-7

Azila Mohd Noor, N., Yap, S. F., Liew, K. H., & Rajah, E. (2014). Consumer attitudes toward dietary supplements consumption: Implications for pharmaceutical marketing. International *Journal of Pharmaceutical and Healthcare Marketing, 8*(1), 6-26. https://doi.org/10.1108/IJPHM-04-2013-0019

Barnes, K., Ball, L., Desbrow, B., Alsharairi, N., & Ahmed, F. (2016). Consumption and reasons for use of dietary supplements in an Australian university population. *Nutrition, 32*(5), 524-530. https://doi.org/10.1016/j.nut.2015.10.022

Binns, C. W., Lee, M. K., & Lee, A. H. (2018). Problems and prospects: public health regulation of dietary supplements. *Annual Review of Public Health, 39*(1), 403-420. https://doi.org/10.1146/annurev-publhealth-040617-013638

Buchman, A. L. (2002). Personal and government regulation of nutritional supplements: what we want and what we should expect. *Journal of Laboratory and Clinical Medicine, 139*(6), 339-342. https://doi.org/10.1067/mlc.2002.124200

Chi, N. T. K. (2021). Understanding the effects of eco-label, eco-brand, and social media on green consumption intention in ecotourism destinations. *Journal of Cleaner Production, 321*, 128995. https://doi.org/10.1016/j.jclepro.2021.128995

Choi, J. (2019). The association between health conditions, consciousness, involvement, and knowledge and dietary supplement intake among university students in South Korea. *International Journal of Environmental Research and Public Health, 16*(20), 4028. https://doi.org/10.3390/ijerph16204028

Citak Tunc, G., Citak Bilgin, N., & Cerit, B. (2021). The relationship between international students' health perceptions and their healthy lifestyle behaviors. *Journal of Religion and Health, 60*(6), 4331-4344. https://doi.org/10.1007/s10943-021-01336-0

Conner, M., & Sparks, P. (2005). Theory of planned behaviour and health behaviour. *Predicting Health Behaviour, 2*(1), 121-162. https://doi.org/10.4236/jcc.2015.310003

Dickinson, A., & MacKay, D. (2014). Health habits and other characteristics of dietary supplement users: a review. *Nutrition Journal, 13*(1), 14. https://doi.org/10.1186/1475-2891-13-14

Djaoudene, O., Romano, A., Bradai, Y. D., Zebiri, F., Ouchene, A., Yousfi, Y., Amrane-Abider, M. Sahraoui-Remini, Y., & Madani, K. (2023). A global overview of dietary supplements: regulation, market trends, usage during the COVID-19 pandemic, and health effects. *Nutrients, 15*(15), 3320. https://doi.org/10.3390/nu15153320

Dunn, M. S., Eddy, J. M., Wang, M. Q., Nagy, S., Perko, M. A., & Bartee, R. T. (2001). The influence of significant others on attitudes, subjective norms and intentions regarding dietary supplement use among adolescent athletes. A*dolescence, 36*(143), 583-591. https://pubmed.ncbi.nlm.nih.gov/11817638

El Khoury, D., Tabakos, M., Dwyer, J. J., & Mountjoy, M. (2023). Determinants of supplementation among Canadian university students: a theory of planned behavior perspective. *Journal of American College Health, 71*(6), 1957-1965. https://doi.org/10.1080/07448481.2021.1951276

Friedman, V. J., Wright, C. J., Molenaar, A., McCaffrey, T., Brennan, L., & Lim, M. S. (2022). The use of social media as a persuasive platform to facilitate nutrition and health behavior change in young adults: web-based conversation study. *Journal of Medical Internet Research, 24*(5), e28063. https://doi.org/10.2196/28063

Ghaith, A., Echchad, M., AlHaman, F., & Al-Shalby, R. (2023). Assessing the Influence of the COVID-19 Pandemic on the Purchasing Intention of Vitamins in Kuwait using the Theory of Planned Behavior. *Jordan Journal of Pharmaceutical Sciences, 16*(3), 565-577. https://doi.org/10.35516/jjps.v16i3.1611

Golshan, T., Lande, S., Nickfardjam, K., Cohensedgh, S., Roitblat, Y., Nehuliaieva, L., Khabie, D. Stillman, R, Volynsky-Lauson, A. Mametov, K., & Shterenshis, M. (2021). Thermal comfort in school classes in the era of global warming: a prospective multicenter study. *Journal of School Health, 91*(2), 146-154. https://doi.org/10.1111/josh.12986

Gould, S. J. (1988). Consumer attitudes toward health and health care: A differential perspective. *Journal of Consumer Affairs, 22*(1), 96-118. https://doi.org/10.1111/j.1745-6606.1988.tb00215.x

Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., & Thiele, K. O. (2017). Mirror, mirror on the wall: a comparative evaluation of composite-based structural equation modeling methods. *Journal of the Academy of Marketing Science, 45*, 616-632. https://doi.org/10.1007/s11747-017-0517-x

Harris, P., Salehi, A., Kendall, E., Whitty, J., Wilson, A., & Scuffham, P. (2020). She'll be right, mate!": Do Australians take their health for granted? *Journal of Primary Health Care, 12*(3), 277-288. https://doi.org/10.1071/HC20025

Hu, S., & Zhu, Z. (2022). Effects of social media usage on consumers' purchase intention in social commerce: a cross-cultural empirical analysis. F*rontiers in Psychology, 13*, 837752. https://doi.org/10.3389/fpsyg.2022.837752

Huang, L., Yoo, H. J., Abe, S., & Yoon, J. (2023). Dietary supplement use and its related factors among Chinese international and Korean college students in South Korea. *Nutrition Research and Practice, 17*(2), 341-355. https://doi.org/10.4162/nrp.2023.17.2.341

Jaffe, D., Hewit, J., Zang, K., & Crowder, T. (2021). Key Factors Influencing Purchasing of Dietary Supplements Among Female Service Academy Cadets: 860. *Medicine & Science in Sports & Exercise, 53*(8S), 286. https://doi.org/10.1249/01.mss.0000762432.03267.1b https://abrv.in/fYk7

Jezewska-Zychowicz, M., & Pilska, M. (2006). Psychosocial determinants of using vitamin and mineral supplements among students. *Polish Journal of Food and Nutrition Sciences, 15*(2), 167-170. https://abrv.in/b6n5

Lee, J. H., Lim, K. F., & Yong, K. Y. (2016). *Factors influencing purchase intention towards dietary supplement products among young adults*. Doctoral dissertation. Universiti Tunku Abdul Rahman (UTAR), Kampar, Perak, Malaysia. https://abrv.in/fWld

Luszczynska, A., Gibbons, F. X., Piko, B. F., & Tekozel, M. (2004). Self-regulatory cognitions, social comparison, and perceived peers' behaviors as predictors of nutrition and physical activity: A comparison among adolescents in Hungary, Poland, Turkey, and USA. *Psychology & Health, 19*(5), 577-593. https://doi.org/10.1080/0887044042000205844

McArthur, L. H., Grivetti, L. E., & Schutz, H. G. (1990). Practices, beliefs and knowledge of international and US students regarding food supplements and health foods. *Ecology of Food And Nutrition, 24*(4), 233-249. https://doi.org/10.1080/03670244.1989.9991103

McDaniel, A., Dionne, J., & Regan, E. P. (2021). Examining international students' holistic wellness. Journal of Student Affairs Research and Practice, 58(2), 227-240. https://doi.org/10.1080/19496591.2020.1853553

Michaelidou, N., & Hassan, L. M. (2010). Modeling the factors affecting rural consumers' purchase of organic and free-range produce: A case study of consumers' from the Island of Arran in Scotland, UK. *Food Policy, 35*(2), 130-139. https://doi.org/10.1016/j.foodpol.2009.10.001

Mishra, A., Chandel, A. K., Bhalani, D. V., & Shrivastava, R. (2021). Importance of dietary supplements to the health. *Current Nutrition & Food Science, 17*(6), 583-600. https://doi.org/10.2174/1573401316999200901111519

Mmereki, D., & Akpaca, W. D. (2021). Investigation of students' comfort and adaptation in university dormitories in humid subtropical climatic area in winter in Chongqing, China. *Cogent Engineering, 8*(1), 1968740. https://doi.org/10.1080/23311916.2021.1968740

Noor, N. A. M., Muhammad, A., & Isa, F. M. (2019). Consumption of Dietary Supplement Products Among Malaysian Consumers: The Roles of Attitude, Social Influence and Perceived Behavioural Control. *The Journal of Social Sciences Research, 5*(12), 1768-1776. https://doi.org/10.32861/jssr.512.1768.1776

Norman, P., & Conner, M. (2005). The theory of planned behavior and exercise: Evidence for the mediating and moderating roles of planning on intention-behavior relationships. *Journal of Sport and Exercise Psychology, 27*(4), 488-504. https://doi.org/10.1123/jsep.27.4.488

Pop, R. A., Săplăcan, Z., & Alt, M. A. (2020). Social media goes green—The impact of social media on green cosmetics purchase motivation and intention. *Information, 11*(9), 447. https://doi.org/10.3390/info11090447

Romero, P., Miranda, M. T., Montero, I., Sepúlveda, F. J., & Valero-Amaro, V. (2023). Critical Review of the Literature on Thermal Comfort in Educational Buildings: Study of the Influence of the COVID-19 Pandemic. *Indoor Air, 2023*(1), 8347598. https://doi.org/10.1155/2023/8347598

Royne, M. B., Fox, A. K., Deitz, G. D., & Gibson, T. (2014). The effects of health consciousness and familiarity with DTCA on perceptions of dietary supplements. *Journal of Consumer Affairs, 48*(3), 515-534. https://doi.org/10.1111/joca.12051

Salmean, Y., & Alhuwail, D. (2018). Consumption patterns of dietary supplements and information seeking behaviors in the youth an exploratory study. *Journal of Food and Nutrition Research, 6*(11), 694-698. https://doi.org/10.12691/jfnr-6-11-3

Sharif, B. A. (1994). Discussing the needs of a neglected population: Adjustment problems and health issues of international students. *Journal of Health Education, 25*(5), 260-265. https://doi.org/10.1080/10556699.1994.10603043

Skromanis, S., Cooling, N., Rodgers, B., Purton, T., Fan, F., Bridgman, H., Harris, K., Presser, J. & Mond, J. (2018). Health and well-being of international university students, and comparison with domestic students, in Tasmania, Australia. *International journal of environmental research and public health, 15*(6), 1147. https://doi.org/10.3390/ijerph15061147

Szűcs, V., Szabó, E., & Bánáti, D. (2015). Exploration of attitudes about healthy nutrition based on a questionnaire survey. *Orvosi Hetilap, 156*(16), 636-643. https://doi.org/10.1556/OH.2015.30129

Temple, N. J. (2012). The marketing of dietary supplements: profit before health. In N. J. Temple, T. Wilson, & D. R. Jacobs, JR. (Eds.), *Nutritional health: Strategies for disease prevention* (pp. 435-449). Towata, NJ: Humana Pr. https://doi.org/10.1007/978-1-61779-894-8_20

Torriani, G., Lamberti, G., Salvadori, G., Fantozzi, F., & Babich, F. (2023). Thermal comfort and adaptive capacities: Differences among students at various school stages. *Building and Environment, 237*, 110340. https://doi.org/10.1016/j.buildenv.2023.110340

Willis, E., & Stafford, M. R. (2016). Health consciousness or familiarity with supplement advertising: what drives attitudes toward dietary supplements? *International Journal of Pharmaceutical and Healthcare Marketing, 10*(2), 130-147. https://doi.org/10.1108/IJPHM-06-2015-0026

Wu, H. P., Garza, E., & Guzman, N. (2015). International student's challenge and adjustment to college. *Education Research International, 2015*(1), 202753. https://doi.org/10.1155/2015/202753

Yoo, S. W., Kim, J., & Lee, Y. (2018). The effect of health beliefs, media perceptions, and communicative behaviors on health behavioral intention: An integrated health campaign model on social media. *Health Communication, 33*(1), 32-40. https://doi.org/10.1080/10410236.2016.1242033

Zhai, L. (2004). Studying international students: adjustment issues and social support. *Journal of International Agricultural and Extension Education, 11*(1). https://doi.org/10.5191/jiaee.2004.11111

APPENDIX

Appendix 1: The study questions

Dear Student, we are a research team, Omar Salem and Abrar Ghaith, PhD students in the field of Business and Management at the University of Debrecen. Currently, we are conducting a study related to identifying factors that can increase the purchase intention of dietary supplements. Note: Dietary supplements include vitamins such as vitamin C, D and B12; minerals like calcium and iron; herbs such as cinnamon and garlic; and products like probiotics and fish oils. Please help our research work by filling out the following questionnaire. Thank you in advance for your participation.

Measurement	Statement	Source
Attitude toward dietary supplements		(Ajzen, 1991; Ghaith et al., 2023; Pop et al., 2020)
	I think consuming dietary supplements is healthy	
	I think consuming dietary supplements is beneficial	
	I believe that consuming dietary supplements improves my physical appearance	
	I believe that dietary supplements are safe	
Subjective norms		(Ghaith et al., 2023)
	People who are important to me would think I should consume dietary supplements periodically	
	My family thinks I should consume dietary supplements to improve my performance, physical appearance, or general health	
	My peers/friends think I should consume dietary supplements to improve my performance, physical appearance, or general health	
	My health care professional (e.g. physician or dietitian) think I should consume dietary supplements to improve my performance, physical appearance or general health	
Perceived Behavioral Control		(Ghaith et al., 2023)
	Whether I consume or do not consume dietary supplements from now on is entirely up to me	
	It is easy for me to consume dietary supplements from now on	
	I have complete control over whether to consume or not to consume dietary supplements from now on	
Health consciousness		(Ghaith et al., 2023; Gould, 1988; Michaelidou & Hassan, 2008)
	I think about my health a lot	
	I am very self-conscious about my health	
	I am alerted to changes in my health	

	I take responsibility for the state of my health	
	I am aware of the state of my health as I go through the day	
Social Media Usage		(Chi, 2021; Pop et al., 2020).
	I use social media to find and spread information	
	I seek information from other consumers online	
	My engagement in social media influences my dietary supplements purchase	
	I use social media to search for information about dietary supplements	
	Contents about dietary supplements on social media are trustworthy	
	Contents about dietary supplements on social media are believable	
Purchase Intention		(Ajzen, 1991; Ghaith et al., 2023)
	I intend to take or keep taking dietary supplements to improve my performance and/or general health	
	I plan to take or keep taking dietary supplements to improve my performance and/or general health	
	It is very likely that I will take or keep taking dietary supplements to improve my performance and/or general health	