Article

What Attributes of Meat Substitutes Matter Most to Consumers? The Role of Sustainability Education and the Meat Substitutes Perceptions

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Abstract: Given the rising environmental, health, and food safety concerns, the advantages of meat substitutes are garnering increased attention. Applying the extended theory of planned behavior, this study explored what aspects of meat substitutes positively influence consumer purchase intention associated with attitude, subjective norms, and behavioral control. In addition, the level of consumers’ education in sustainability was analyzed for its potential moderating effect within the proposed model. A total of 319 responses obtained from Korean consumers were used. The analysis results revealed that the health attributes of meat substitutes improved consumer attitude, subjective norms, and behavioral control. The environmental attributes enhanced consumer attitude and behavioral control but had no significant effect on subjective norms. Further, subjective norms led to a positive attitude, and attitude and behavioral controls positively improved meat substitutes’ purchase intention. Our analysis revealed that sustainability education significantly enhanced the positive relationship between behavioral control and purchase intention. This study provides an integrative framework that allows for a systematic understanding of consumer responses regarding meat substitutes. Our model may be useful in exploring other influential attributes of meat substitutes that can lead to more positive consumer responses and ultimately enhance consumption.

Keywords: meat substitutes’ attributes; consumer attitude; subjective norms; behavioral control; purchase intention; education levels in sustainability

1. Introduction

“It tastes like meat, but is better for you” [1]. In the food service market, meat substitutes are no longer eaten only by vegetarians, but are now considered food that protects human health and the environment [2]. Meat substitutes require less agricultural resources, water, and energy than real meat, and are beneficial to health [3]. Further, the livestock industry is well known as the main source of methane gas generation [4]. According to the United Nations Food and Agriculture Organization, greenhouse gases emitted by livestock farms account for approximately 15% of total noxious emissions [5]. Environmental issues are gaining traction because climate change and associated disasters caused by greenhouse gases are emerging worldwide [4]. The resulting environmental damage from producing meat substitutes is less significant than that generated by the production of real meat [3]. In particular, meat substitutes can feed more consumers than real meat when the same amount of agricultural resources is invested [1]. Meat substitutes have flourished worldwide since the early 21st century and have become a popular food item [2]. In general, meat substitutes are similar in texture and taste to real meat, and the ingredients used are mainly gluten, and soy proteins with new ingredients added, such as soy leghemoglobin and mycoprotein [1,2]. Furthermore, the United Kingdom, France, Germany, Sweden, and the Netherlands have developed and carried out advanced research into meat substitutes, with European countries mainly dominating the global meat substitutes market [2]. The U.S. meat substitute industry grew by 27% in 2020 compared to
China, which consumes the world’s largest amount of meat and eggs, is drawing international attention for its move to include meat substitutes in its next five-year food plan [5]. By 2030, the global market for meat substitutes will grow to above 140 billion USD [6]. In Korea, the meat substitutes market is showing steady growth, and, as of 2021, approximately 20% of Koreans are flexitarians, which combines flexible and vegetarian to refer to people who usually try to eat only vegetarian meals, but sometimes eat meat [7]. A survey of Korean consumers conducted in 2021 found that 55% of consumers reported health benefits as the main motive for purchasing meat substitutes [7].

Mancini and Antonioli [8] emphasized that meat substitutes are attracting attention from three perspectives—animal well-being, minimizing environmental pollution, and food safety. Prior relevant studies have highlighted the importance of meat substitutes in terms of health and the environment [9–11]. Santo et al. [11] indicated that research on meat substitutes may reduce environmental problems, contribute to animal welfare, and improve human health. This industry seems to have endless potential for future development, but the literature is limited to investigating consumer-perceived benefits, while the important factors involving consumer purchasing processes are yet to be explored. This study is designed to address this gap.

Numerous studies have applied the theory of planned behavior (TPB) to ensure the reliability and validity of predicting consumers’ future behavior [12]. TPB contends that attitude, subjective norms, and behavioral control influence consumer behavior [13]. Further analysis of the influence of subjective norms on attitudes has enhanced the explanatory power of the theory [12,14–16]. To provide a fundamental theoretical framework for analyzing the relationship between meat substitutes’ attributes and purchase intention, the current study extends the TPB model by adding consumer education levels in sustainability as a new variable. This addition plays a critical role within the TPB model.

The concept of sustainability began to draw attention in the 1980s; the terms sustainable development and consumption are concepts that, broadly, have a very strong influence on human thinking and behavior, especially in the field of environmental education [17]. The meaning of sustainability has gradually expanded to denote a concept that helps us advance to a better future through an integrated balance in the environmental, social, and economic fields [18]. Many scholars have argued that education in sustainability is essential, and research on the infinite possibilities it presents is necessary [17–19]. The level of education of an individual directly affects their attitudes toward social phenomena and their own behavior as a consumer [20,21]. Varela-Candamio et al. [22] argued that education improves one’s thinking, problem-solving ability, and decision-making skill by directly affecting consumption attitude and behavior. Accordingly, prior studies have addressed the importance of consumer education, with an emphasis on its significant moderating role between attitude and behavior [23]. To understand how consumers’ education level in sustainability impacts their decision-making regarding the purchase of meat substitutes, this study focuses on the moderating effect of education levels in sustainability on the relationship between attitude, subjective norms, and behavioral control, and that of purchase intention. This approach—applying the extended TPB and addressing the moderating effect of education levels in sustainability—may provide valuable contributions to related research fields. The applications of these results aim to contribute to the effectiveness of marketing strategies and, in turn, to the future development of the growing meat substitutes industry. This will ultimately contribute to the food service industry, and food resources, helping solve pressing environmental issues.

Accordingly, the goals of this study are summarized as follows:

1. This study examines the relationships between meat substitutes’ health and environmental attributes and consumer attitude, subjective norms, and behavioral control;
2. Applying the extended TPB model, this study verifies the relationships between consumer attitude, subjective norms, and behavioral control and the meat substitutes’ purchase intention;
3. This study investigates the moderating effect of education levels in sustainability (high vs. low) on the relationships between consumer attitude, subjective norms, behavioral control, and the meat substitutes’ purchase intention.

2. Theoretical Framework and Research Hypotheses

2.1. Attributes of Meat Substitutes

Meat substitutes include fake meat, alternative meat, synthetic meat, meat analog, and cultured meat [1]. The market is receiving substantial attention due to its many advantages, such as health benefits, reduced environmental pollution, conservation of agricultural resources, feeding of more people, energy conservation, moral consideration for animals, and religious commitment [1].

Regnier-Davies [24] investigated the Chinese people’s perception of meat substitutes and revealed that these consumers tend to regard substitutes positively due to food safety and security concerns, namely unsafe food and high food price volatility. Hwang et al. [25] analyzed the positive and negative aspects of meat substitutes based on Korean consumers’ perceptions. They found that food curiosity was the main driver of their purchase intention, while the unnaturalness of meat substitutes and distrust in biotechnology were significant constraints in purchasing them. Mancini and Antonioli [8] investigated Italian consumers’ perceptions of meat substitutes. They analyzed differences in consumption behaviors between consumers who were not familiar with meat substitutes and those exposed to positive information on it. They found that consumer purchase intention increased significantly when they were convinced that meat substitutes could provide various environmental benefits. In particular, they constructed environmental sustainability as an external attribute of meat substitutes that would importantly contribute to preserving natural resources. These results indicate the need to identify effective ways to deliver accurate information to consumers, leading to individuals’ positive perceptions and willingness to consume meat substitutes. Therefore, following Hwang et al. [25] and Mancini and Antonioli [8], we gathered new data based on related research fields, focusing on their health and environmental attributes.

2.2. Extended Theory of Planned Behavior (ETPB)

Social psychologists mostly agree that human behavior is goal-oriented and based on a well-planned framework [12,13]. Human behavior is preplanned and executed according to the development of the plan [13,15]. Some parts of a plan may be routine and unconscious, but plans are essential for the smooth functioning of daily lives [13]. Ajzen [13] first proposed the TPB to address these arguments. Concepts such as attitudes and individual characteristics play a key role in predicting future behavior [26]. Personal attitudes, subjective norms, and behavioral control affect future human behavior in a specific situation. Thus, Ajzen [26] presented the relationships between individual attitudes and behaviors, subjective norms, and behaviors and between behavioral control and behavioral relationships as basic concepts of the TPB. Subsequent studies, such as Tarkiainen and Sundqvist [16], Kim et al. [14], Paul et al. [12], and Shin and Hancer [15], have argued that subjective norms also affect individual attitudes and therefore have proposed the ETPB. The original TPB has been used widely and extended by academics by adding other important factors that would more effectively predict future consumer behavior. Similarly, ETPB has also been widely applied to predict consumer food consumption behaviors in a variety of contexts such as halal food [27–31] and organic food [16,32–34]. A recent study by Choe et al. [35] based on ETPB investigated the fact that consumers’ willingness to use a drone food-delivery service included product innovativeness.

2.3. Meat Substitutes’ Attributes and Their Effects on Attitude, Subjective Norms, and Behavioral Control

This study posits that environmental and health benefits are significant attributes of meat substitutes. Health-related attributes have been widely addressed for their positive
effect on consumer attitudes. For example, Chen [36] demonstrated that healthy Taiwanese lifestyles positively affected the attitude toward organic food. Lee and Yun [37] showed that the health attributes (i.e., nutritional attributes) of organic food led to positive attitudes. Another study by Ishaq et al. [38] addressed the Italian people's sustainable food consumption and revealed that they intended to purchase organic food for health benefits. Based on this discussion, we expect consumers to have more positive attitudes toward meat substitutes due to their health attributes. Additionally, Ishaq et al. [38] documented that, as Italian consumers perceived the high health benefits of organic food, they reported a high level of subjective norms toward it. Another study by Khayyam et al. [39] confirmed the significant and positive effect of food health attributes on subjective norms toward certain food consumption behaviors.

In terms of the relationship between health attributes and behavioral control, the development of this study’s expectation was based on Backman et al. [40], who demonstrated that American high school students and their perception of health attributes were more likely to have a high level of behavioral control. The literature confirms the significant and positive relationship between food health attributes and consumers' behavioral control [39,41]. Thus, we proposed the following hypotheses:

Hypothesis 1 (H1). Meat substitutes' health attributes positively influence consumer attitude.

Hypothesis 2 (H2). Meat substitutes' health attributes positively influence subjective norms.

Hypothesis 3 (H3). Meat substitutes' health attributes positively influence behavioral control.

Lee and Yun [37] stated that the environmental attributes of organic food had a significant and positive effect on consumer attitudes. Likewise, the significant association of consumers' environmental concerns with their positive attitudes toward green products has been widely supported by more recent studies [38]. Additionally, Paul et al. [12] revealed that Indians' concerns about the environment positively affected attitudes, subjective norms, and behavioral control regarding green products. Ishaq et al. [38] found that Italian environmental concerns significantly influenced their subjective norms about sustainable consumption behavior. Weber et al. [42] studied the eating habits of biology teachers in German schools and showed that teachers' concerns and interests in the environment significantly affected behavioral control. Thus, consumer perceptions of environmental attributes play a significant role in improving positive attitudes, subjective norms, and behavioral control in terms of meat substitute consumption. Hence, the following hypotheses were proposed:

Hypothesis 4 (H4). Meat substitutes' environmental attributes positively influence consumer attitude.

Hypothesis 5 (H5). Meat substitutes' environmental attributes positively influence subjective norms.

Hypothesis 6 (H6). Meat substitutes' environmental attributes positively influence behavioral control.

2.4. Relationship between Subjective Norms and Attitude

Tarkiainen and Sundqvist [16] examined Finnish consumers’ intention to purchase organic food and showed that consumers’ subjective norms significantly improved attitudes toward organic food. Kim et al. [14] examined how customer attitudes toward nutritional information presented on restaurant menus are formed by subjective norms. Paul et al. [12] noted that Indian consumers’ subjective norms had a positive impact on attitudes toward consumption. Shin and Hancer [15] studied U.S. consumers’ local food purchase behavior and showed that their subjective norms positively affected attitudes. Thus, we propose the following hypothesis:
Hypothesis 7 (H7). Subjective norms positively influence consumer attitude.

2.5. Attitude, Subjective Norms, and Behavioral Control and Their Effect on the Intention to Purchase Meat Substitutes

Tarkiainen and Sundqvist [16] stated that Finnish consumers’ attitudes significantly affected organic food purchase intention. Alam and Sayuti [27] studied halal food purchase behavior among Malaysian consumers and found that consumers’ attitudes increased halal food purchase behavior. Kim et al. [14] studied the presentation of nutritional information on restaurant menus, showing that customers’ attitudes positively affected behavioral intentions. Ali et al. [29] examined halal meat purchase behavior in German and Chinese consumers. The results showed that their attitudes had a significantly positive effect on halal meat purchase behavior in both groups. Troise et al. [43] studied the intention to use food-delivery apps in Italy during the COVID-19 pandemic. The results showed that consumers’ attitudes significantly affected the intention to use them. Mirkarimi et al. [44] analyzed the fast-food purchase behavior of high school students in Iran and found that their subjective norms and behavioral control increased fast-food purchase behavior. Vabø and Hansen [45] studied domestic food purchase behavior in Norway and found that subjective norms significantly affected behavior. Ali et al. [28] similarly investigated Malaysians’ halal food purchase behavior, showing that consumers’ subjective norms and perceived behavioral control positively affected halal food purchase behavior. Troise et al. [43] noted that Italian consumers’ subjective norms had a very strong positive impact on their intention to use the food-delivery applications. Alam and Sayuti [27] showed that consumers’ subjective norms and perceived behavioral control increased halal food purchase behavior. Thus, we propose the following hypotheses:

Hypothesis 8 (H8). Consumer attitude positively influences purchase intentions.

Hypothesis 9 (H9). Subjective norms positively influence purchase intentions.

Hypothesis 10 (H10). Behavioral control positively influences purchase intentions.

2.6. Moderating Roles of Education Level in Sustainability

In daily lives, the level of education plays a vital role in determining individual food choice patterns and various human behaviors, ultimately affecting all decision-making processes [46]. Sustainability refers to an attitude in which humans consciously try to follow the principles of nature [19]. Learning to understand the position of humans living in the natural world is very valuable, and learning about sustainability can be an active life process [19].

Lee and Hallak [47] added education levels as a moderating variable, analyzing the relationship between self-efficacy, innovation, and restaurant performance for restaurant owners in Australia. As a result, the education level of owners for the three paths did not show a significant moderating effect, and the need for follow-up studies was emphasized. This study is the first in the hospitality industry related to restaurants to analyze the education level as a moderating variable. In the context of sustainability practices, Singh et al. [46] analyzed the relationship between self-efficacy and workplace well-being for Indian executives engaged in the manufacturing industry; sustainability practice was added as the moderating variable. They found that sustainability practice positively and strongly moderates the relationship between self-efficacy and workplace well-being. In particular, the moderating role of education level has been analyzed in entrepreneurship research by focusing on various national firms [48–50]. Few studies have been conducted to analyze education level in sustainability as a moderating variable. Scholars argue that sustainability education plays a very fundamental role in understanding environmental issues and in planning a constructive future [17,19].

Therefore, we add consumers’ education level in sustainability as a moderating variable to expand the related theory, and propose the following hypotheses (see Figure 1):

Hypothesis 8 (H8). Consumer attitude positively influences purchase intentions.

Hypothesis 9 (H9). Subjective norms positively influence purchase intentions.

Hypothesis 10 (H10). Behavioral control positively influences purchase intentions.
Hypothesis 11 (H11a). Education level in sustainability plays a moderating role in the relationship between attitude and purchase intentions.

Hypothesis 11 (H11b). Education level in sustainability plays a moderating role in the relationship between subjective norms and purchase intentions.

Hypothesis 11 (H11c). Education level in sustainability plays a moderating role in the relationship between behavioral control and purchase intentions.

Figure 1. Research model.

3. Material and Methods

3.1. Data Collection and Study Participants

Data were collected for one week in January 2022 using an online survey company that has numerous business panels. Consumers aged 18 years or older were requested to participate in the survey. Survey companies conducted a survey after sending links to respondents’ panels suitable for this study through e-mail. All respondents received explanations regarding the purpose of this study and the assurance that their responses would be anonymous. Respondents voluntarily responded to the survey through an online survey company. Additionally, data cleaning was performed by removing outliers who checked 1 point for almost all questions. Thereby, of a total of 325 copies, 319 valid responses were used for the analysis.

3.2. Survey Instrument and Measures

To verify the hypothesized relationships, this study’s survey instrument was developed by adapting relevant studies. First, to measure the two dimensions of meat substitutes’ attributes, a total of 8 items (4 items per each construct) were adapted from Al-Swidi et al. [32]. The TPB variables, including attitude (4 items), subjective norms (4 items), behavioral control (3 items), and purchase intentions (4 items), were measured by adapting the scale measures from Hu et al. [51] and Al-Swidi et al. [32]. Finally, consumer education level in sustainability was measured using one item adapted from Erten [52]. For example, one read “I estimate my usual education level in sustainability as high”.
Single-item questions are sometimes more effective to reduce measurement materials and improve respondents’ convenience and response rates, depending on the situation and context of the study [53,54]. All the survey items were rated using a five-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = normal, 4 = agree, 5 = strongly agree). In addition, the respondents were asked to provide their sociodemographic characteristics. The initial version of the survey questionnaire was developed in English and then translated into Korean. Based on the results of the pretest conducted together with two tourism and hospitality academics, several minor changes in question wording were made to the final Korean version of the survey questionnaire. Its adherence to the original English version of the survey items was verified by two bilingual faculty members in tourism and hospitality programs. For result analysis, descriptive analysis, frequency analysis, and reliability analysis were performed using SPSS version 22. Additionally, confirmatory factor analysis, structural equation modeling analysis, and multigroup analysis were conducted using AMOS version 22.

4. Results

4.1. Sample Characteristics

Table 1 presents the sociodemographic characteristics of the respondents, which includes those in their 30s (31.3%), 40s (29.5%), 20s (25.7%), 50s (10.3%), and 60s or older (3.1%). The proportions of men (49.2%) and women (50.8%) are similar. Marital status distribution is as follows: unmarried (51.7%), married (47%), and other (1.3%). Their overall education level is high, with four-year university degree (58.6%), two-year college (16.6%), high school (12.9%), and graduate school (11.9%). Participants’ monthly income is also high, categorized into 2000 USD (32.6%), 3000 USD (16.6%), more than 5000 USD (15.7%), 4000 USD (13.8%), 1000 USD range (11.9%), and less than 1000 USD (9.4%). Finally, participants’ occupations included: office jobs (45.5%), professional jobs (19.1%), students (11.3%), homemakers (9.7%), others (7.8%), and self-employed (6.6%). In addition, we performed additional analysis to confirm the variations on consumers’ purchase intentions by meat substitutes’ attributes (health and environmental). To examine this, multiple regression analysis was conducted, and the results showed that both health and environmental attributes positively affected the purchase intentions for meat substitutes. More specifically, health attributes more strongly influenced consumers’ purchase intentions ($\beta = 0.429$, $t = 7.252$, $p < 0.000$) compared to environmental attributes ($\beta = 0.314$, $t = 5.300$, $p < 0.000$). It can be interpreted that consumers perceive health attributes more importantly than the environmental attributes of meat substitutes in the selection process.

| Characteristics         | n (%) | Characteristics         | n (%) |
|-------------------------|-------|-------------------------|-------|
| Age (years)             |       | Monthly income          |       |
| 18–19                   | 0 (0%) | ≤ USD 1000              | 30 (9.4%) |
| 20–29                   | 82 (25.7%) | USD 1001–2000         | 38 (11.9%) |
| 30–39                   | 100 (31.3%) | USD 2001–3000       | 104 (32.6%) |
| 40–49                   | 94 (29.5%) | USD 3001–4000         | 53 (16.6%) |
| 50–59                   | 33 (10.3%) | USD 4001–5000         | 44 (13.8%) |
| 60 or older             | 10 (3.1%) | USD 5001               | 50 (15.7%) |
| Gender                  |       | Occupation              |       |
| Men                     | 157 (49.2%) | Student                | 36 (11.3%) |
| Women                   | 162 (50.8%) | Office job             | 145 (45.5%) |
| Marital status          |       | Self-employed           |       |
| Unmarried               | 165 (51.7%) | Professional job      | 61 (19.1%) |
| Married                 | 150 (47%) | Homemaker              | 31 (9.7%) |
| Other                   | 4 (1.3%) | Other                   | 25 (7.8%) |
| Educational level       |       | High school             | 41 (12.9%) |
Table 1. Cont.

| Characteristics               | Characteristics | n (%)     |
|-------------------------------|-----------------|-----------|
| Two-year college              |                 | 53 (16.6%)|
| University                    |                 | 187 (58.6%)|
| Graduate school               |                 | 38 (11.9%)|

Notes: We calculated monthly income as KRW 1192 per 1 USD by applying the standard exchange rate for January 2022.

4.2. Validity and Reliability of Measurements

As presented in Table 2, confirmatory factor analysis was conducted to verify all the constructs’ validity and reliability. The average variance extracted (AVE) values of all constructs are greater than 0.5, and all-composite construct reliability values are higher than 0.7. Cronbach’s alpha values range from 0.791 to 0.913. These results support the convergent validity and reliability of the scale measures [55].

Table 2. Confirmatory factor analysis results.

| Construct                              | Standardized Loadings | t-Value | AVEa | CCRb | Cronbach's Alpha |
|----------------------------------------|-----------------------|---------|------|------|------------------|
| Health Attributes                      |                       |         |      |      |                  |
| Meat substitutes are beneficial to health | 0.808                 | Fixed   | 0.695| 0.901| 0.901            |
| Meat substitutes consist of nutrients that are beneficial to health | 0.795                 | 15.969  | 0.901|      |                  |
| Meat substitutes help our health in many ways | 0.864                 | 17.925  | 0.901|      |                  |
| Meat substitutes have various benefits for health | 0.866                 | 17.999  | 0.901|      |                  |
| Environmental Attributes               |                       |         |      |      |                  |
| Meat substitutes are environmentally friendly ingredients | 0.784                 | Fixed   | 0.675| 0.892| 0.893            |
| Meat substitutes are an environmentally friendly food | 0.845                 | 16.427  | 0.892|      |                  |
| Meat substitutes have many benefits for the environment | 0.828                 | 16.030  | 0.892|      |                  |
| Meat substitute consumption is a solution to protect our environment | 0.828                 | 16.017  | 0.892|      |                  |
| Attitudes                              |                       |         |      |      |                  |
| I prefer meat substitutes because they are more nutritious than real meat | 0.782                 | Fixed   | 0.625| 0.869| 0.879            |
| I prefer meat substitutes as they cause fewer diseases than real meat | 0.803                 | 20.848  |      |      |                  |
| I prefer meat substitutes because they are environment-friendly food | 0.739                 | 13.937  |      |      |                  |
| It is exciting for me to eat meat substitutes | 0.834                 | 16.170  |      |      |                  |
| Subjective Norms                      |                       |         |      |      |                  |
| The trend of buying meat substitutes among people around me is increasing | 0.812                 | Fixed   | 0.677| 0.893| 0.894            |
| People around me generally believe that it is better for health to use meat substitutes | 0.814                 | 16.578  |      |      |                  |
| My close friends and family members would appreciate it if I bought meat substitutes | 0.813                 | 16.553  |      |      |                  |
| My close friends and family members would appreciate it if I chose meat substitutes | 0.851                 | 17.641  |      |      |                  |
| Behavioral Control                    |                       |         |      |      |                  |
| I can take the decision to buy meat substitutes independently | 0.754                 | Fixed   | 0.565| 0.795| 0.791            |
| I have the time to buy meat substitutes | 0.72                  | 12.349  |      |      |                  |
| I can handle any (money, time, information-related) difficulties associated with my buying decision | 0.779                 | 13.369  |      |      |                  |
Table 2. Cont.

| Construct                                             | Standardized Loadings | t-Value | AVEa | CCRb | Cronbach’s Alpha |
|-------------------------------------------------------|-----------------------|---------|------|------|-----------------|
| Purchase Intentions                                    |                       |         |      |      |                 |
| I would look for specialty shops to buy meat substitutes| 0.882                 | Fixed   | 0.731| 0.916| 0.913           |
| I am willing to buy meat substitutes in future         | 0.867                 | 21.327  | 0.867| 21.327|                 |
| I am willing to buy meat substitutes regularly         | 0.85                  | 20.513  | 0.743| 20.513|                 |
| I would also recommend to others to buy meat substitutes| 0.819                 | 19.157  | 0.743| 19.157|                 |

Notes: $\chi^2/df = 2.625, p < 0.001$; root mean square residual (RMR) = 0.042; goodness of fit index (GFI) = 0.856; Tucker–Lewis index (TLI) = 0.930; comparative fit index (CFI) = 0.942; incremental fit index (IFI) = 0.942; root mean square error of approximation (RMSEA) = 0.071; an AVE = average variance extracted; b CCR = composite construct reliability.

To verify the discriminant validity for each construct, correlation coefficient values were compared with the square root value of AVEs. The correlation coefficients between all variables are smaller than the square root values of AVE except for the relationship between consumer attitude and subjective norm. On this path, we performed secondary analysis (correlation coefficients $\pm 2 \times$ standard error); distribution of the confidence interval ranged from 0.677 to 0.937 [55]. Finally, we confirmed that one was not included in the confidence interval. Therefore, discriminant validity was supported [55,56] (see Table 3).

Table 3. Discriminant validity and correlations.

| Construct               | 1   | 2   | 3   | 4   | 5   | 6   | Mean | SDb |
|-------------------------|-----|-----|-----|-----|-----|-----|------|-----|
| 1. Health Attributes    | 0.833a|     |     |     |     |     | 3.518| 0.743|
| 2. Environmental Attributes | 0.727| 0.821a|     |     |     |     | 3.717| 0.719|
| 3. Attitude             | 0.702| 0.632| 0.79a|     |     |     | 3.159| 0.837|
| 4. Subjective Norms     | 0.620| 0.531| 0.807| 0.822a|     |     | 2.991| 0.88 |
| 5. Behavioral Control   | 0.618| 0.617| 0.667| 0.667| 0.751a|     | 3.373| 0.797|
| 6. Purchase Intentions  | 0.657| 0.626| 0.746| 0.642| 0.678| 0.854a| 3.431| 0.876|

Notes: Correlation coefficients are shown below the diagonal line; AVEa is the average variance extracted, shown on the diagonal line; SDb is the standard deviation.

4.3. Results of Testing Hypotheses 1 through 10

Structural equation modeling (SEM) was employed to verify the hypothesized relationships. In general, SEM is performed after verifying the validity and reliability of a research model through CFA [56]. Since convergent validity, discriminant validity, and reliability were satisfied in the previous CFA, we confirmed the causal relationship between variables through SEM [56]. In this step, the relationships between the variables’ influence levels and directions were examined based on statistical significance levels, standardized coefficients, t-value, and model fit, etc., using SPSS and AMOS version 22 [56]. In terms of the SEM model fit, $\chi^2/df = 2.620, p < 0.001$, the root mean square residual (RMR) = 0.043, the goodness of fit index (GFI) = 0.858, the incremental fit index (IFI) = 0.941, the Tucker–Lewis index (TLI) = 0.931, the comparative fit index (CFI) = 0.941, and the root mean square error of approximation (RMSEA) = 0.071; therefore, the model fit was adequate [56]. As presented in Figure 2, the health attributes of meat substitutes positively influenced attitude ($\beta = 0.21, \ p < 0.004$), subjective norm ($\beta = 0.616, \ p < 0.001$), and behavioral control ($\beta = 0.381, \ p < 0.001$); therefore, Hypotheses 1, 2, and 3 were supported. Furthermore, the environmental attributes of meat substitutes positively influence attitude ($\beta = 0.178, \ p < 0.005$) and behavioral control ($\beta = 0.381, \ p < 0.001$); hence, Hypotheses 4 and 6 were supported. However, the environmental attributes of meat substitutes do not significantly influence subjective norms ($\beta = 0.083, \ p > 0.402$); therefore, Hypothesis 5 was not supported.
In addition, subjective norms positively influence attitude (β = 0.668, p < 0.001) and attitude (β = 0.855, p < 0.001), and behavioral control (β = 0.371, p < 0.001) positively influences meat substitutes' purchase intentions; however, subjective norms (β = -0.38, p < 0.004) negatively influence purchase intentions; therefore, Hypotheses 7, 8, and 10 were supported, but Hypothesis 9 was not supported.

4.4. Results of Testing Hypothesis 11

To verify the moderating effect of education levels in sustainability in the relationship between attitude, subjective norm, behavioral control, and purchase intentions, a multi-group analysis (MGA) was employed (see Table 4). As the degree of freedom changes by one, the path in which the difference in the chi-square value was found to be higher than 3.84 [56]. The moderating effect was demonstrated in the path of each attitude, subjective norm, and behavioral control, and purchase intentions. To derive more precise results based on the median value equal to three, the respondents were classified into two (high and low) education level groups. Individuals who rated four or higher points in terms of their education level in sustainability were included in the high education level segment, while people who rated two or lower points were classified into the low education level segment. After excluding respondents indicating the median value regarding their education level in sustainability, 210 responses were used to test the moderating effect.

Table 4. Hypothesis 11 results.

| Structural Relationship | High (n = 131) | Low (n = 79) | Free | Constrained | Δχ² | Results |
|------------------------|---------------|-------------|------|-------------|-----|---------|
| β                      | t-Value       | β           | t-Value | χ² (df = 116) | χ² (df = 115) |       |         |
| H11a A→PI              | 0.386         | 1.492       | 0.336 | 1.402       | 919.657 | 919.783 | 0.126 | Not Supported |
| H11b SN→PI             | 0.166         | -0.778      | 0.286 | 1.218       | 919.657 | 921.489 | 1.832 | Not Supported |
| H11c BC→PI             | 0.585         | 4.312 ***   | 0.088 | 0.864       | 919.657 | 923.600 | 3.943 | Supported |

Notes: A: Attitude; SN: Subjective norms; BC: Behavioral control; PI: Purchase intentions; *** p < 0.001.

Results found that education level in sustainability significantly moderated the relationship between behavioral control and meat substitutes' purchase intentions. More
specifically, in the high-education-level group, behavioral control positively influences purchase intention ($\beta = 0.585$, $p < 0.001$), while, in the low-education-level group, behavioral control does not significantly affect purchase intention; however, behavioral control has a positive influence ($\beta = 0.088$, $p > 0.388$). Therefore, Hypothesis 11c is supported.

5. Discussion and Conclusions

Health attributes were confirmed to positively affect consumer attitude, subjective norms, and behavioral control. In contrast, environmental attributes only positively affected consumer attitudes and behavioral control. In addition, subjective norms positively affected consumer attitudes, and consumer attitude and behavioral control positively affected purchase intentions. However, subjective norms were found to harm purchase intention and positively affect purchase intention through attitude. The moderating effect of education levels in sustainability was confirmed in the relationship between behavioral control and purchase intention. People with a high level of education in sustainability increased purchase intention through behavioral control. When the education level was low, no significant influence was confirmed in the relationship between the two variables.

Meat substitutes have a redeeming impact on animal welfare, environmental issues, and food safety, but methods to promote them could be improved. In particular, consumer awareness should be increased by enhancing the taste quality. Livestock farmers confronting meat substitutes argue that they are not necessarily healthy because many food additives are included in the production process. Further analysis and discussions are needed to address these aspects. Meat substitutes should be produced based on healthier ingredients. In addition, meat substitutes lack accurate terminology. The meat substitutes sector is attracting global attention, potentially helping to develop the foodservice industry and global food resources and reducing environmental pollution. Hence, different approaches are needed in academia and related industries, as further analysis and research may shape more effective marketing strategies.

5.1. Theoretical Implications

Today, consumers are more interested in health and environmental issues than they were in the past, and their knowledge and awareness on various social issues has improved. Meat substitutes are drawing attention in various fields for their potential to reduce environmental problems and improve consumers’ health. Understanding that one’s health and the earth’s environmental issues are directly connected to one’s future is crucial. Reflecting on this trend, this study analyzed how consumers’ purchase behavior of meat substitutes, in association with its attributes, would be determined. Based on the study’s findings, several theoretical implications are proposed as follows:

This study extends the limited quantitative research on meat substitutes and consumption behavior by focusing on two critical attributes. Our findings support our rationale for selecting meat substitutes’ health and environmental attributes through their significant roles in improving positive attitude, subjective norms, and behavioral control. Our contribution to the literature may serve as a basis for conducting future studies.

Second, this study used extended TPB, and nearly all paths attempting to be analyzed were found to be significant within the ETPB. Subjective norms were found to have lower purchase intentions. Therefore, this path was not supported. This result is in line with Paul et al. [12]. Subjective norms did not directly affect purchase intentions but influenced them through attitude. Regarding this result, Paul et al. [12] explained that the influence of different variables within the TPB model depended on various study contexts. They asserted that subjective norms might be a less important predictor of consumer behavior than the other variables of TPB. Similarly, Shin and Hancer [15] found that consumers’ subjective norms did not directly affect local food purchase intentions but had an indirect effect through consumer attitude. The same authors documented that, although the positive relationship between subjective norms and purchase intention had not been proven, subjective norms are crucial to engaging individuals in developing social relationships.
In addition, consumer attitude had the greatest influence on purchase intention among the variables of the TPB model. These results differed depending on the research topics, resulting in variations in the direction of the estimated effects. This study was the first to apply ETPB to conduct research on meat substitutes.

Third, this study extended the TPB by adding a new variable, consumer education level in sustainability, to analyze its effect on the TPB variables. While the TPB has been actively applied to various research fields to predict consumer behavior, it has also been extended to encompass various aspects that can be significant drivers of consumer behaviors. Thus, this study included education levels in sustainability within the TPB model to better understand how to encourage consumers to purchase meat substitutes.

Finally, this study posited that an individual’s education level involves individual purchase decisions and a consumption process [22]. Thus, the education level in sustainability was tested for its potential moderating effect within the TPB model. Our finding indicated that, when consumers have a high level of education in sustainability, their behavioral control was more likely to lead to more positive intentions to purchase meat substitutes. This finding provides new data on the important role of individuals’ cognitive knowledge and their confidence in controlling and behaving in the context of meat substitute purchases.

5.2. Managerial Implications

First, this study shows that the health attributes of meat substitutes have a positive effect on consumer attitude, subjective norms, and behavioral control. In particular, health attributes strongly influence subjective norms. As the meat substitutes market grows, its consumption is considered to be a new trend. This trend exerts the most significant influence on subjective norms. Controlling one’s behavior for eating healthy food is becoming a common phenomenon. However, a significant constraint to increasing meat substitutes’ consumption has always been reported. For instance, Mancini and Antonioli [8] pointed out that, although meat substitutes have several advantages in terms of health, it has not yet captivated Italian meat consumers due to unsatisfied taste quality. A similar phenomenon has been reported by research on the Korean meat market [57]. Although the health properties of meat substitutes are already highly valued, research and development to improve its taste are necessary to address the criticism of insufficient taste quality.

Second, the environmental attributes of meat substitutes positively affect consumer attitude and behavioral control and do not significantly affect subjective norms. In particular, environmental attributes have a stronger influence on behavioral control than consumer attitudes. According to Mayhall [4], the livestock industry directly affects global warming by increasing greenhouse gas emissions such as methane, pollutes water quality, and emits vast amounts of waste in animal breeding environments. Considering these severe consequences, discouraging its growth and increasing the consumption of meat substitutes are urgently needed for preserving the environment. In other words, this study reveals that the environmental attributes of meat substitutes have the greatest influence on individual behavioral control. Modern consumers, considered as having high food-related knowledge and interest, can easily access various information online, which allows them to be widely aware of the health and environmental issues directly related to their well-being and future. Thus, their behavioral control and its effect on intent to purchase meat substitutes can be enhanced by their perceived values.

Third, this study demonstrated the significant relationship between subjective norms and attitude. More specifically, subjective norms have a positive effect on consumer attitude, and consumer attitude and behavioral control have a positive impact on purchase intentions. In contrast, although this study revealed that individual subjective norms had a statistically significant impact on purchase intention, its effects were negative. The impact of subjective norms representing social pressure on eco-environmental food consumption directly decreased meat substitutes’ purchase intentions. In addition, attitude and behavioral control are more influential predictors of consumers’ intention to purchase meat substitutes than subjective norms. According to Mancini and Antonioli [8], when consumers are
informed about the environmental benefits and positive information of meat substitutes’ consumption, their mindset or purchase intention for products is enhanced. Therefore, continuing to provide consumers with information on the various advantages and benefits of meat substitutes will be a way to increase their consumption in Korean markets.

Fourth, this study tested the moderating effect of education level in sustainability in the relationship between meat substitutes’ purchase intention and its three predictors (attitude, subjective norms, and behavior control). The moderating effect is found in only one link between behavioral control and purchase intention. When consumers have high education levels in sustainability, their behavioral control has a significant positive effect on purchase intention. In contrast, behavioral control does not significantly affect purchase intentions for the low-education-level consumer segment. In other words, consumers with high levels of education are confident in controlling their behavior and are more likely to purchase meat substitutes. Individual education levels regarding various contexts have been accessed to investigate their roles in determining consumer purchase behaviors. Kwol et al. [21] explained that one’s personal knowledge of food represents the degree of food understanding, which can be employed to improve individual healthy eating patterns. People may minimize their intake of harmful food using behavioral control, together with high education, to select healthier food products, such as meat substitutes. Additionally, Kwol et al. [21] emphasized that, at the national level, government policy needs to focus on developing educational programs for sustainable food consumption.

5.3. Limitations and Recommendations for Future Studies

Overall, this study’s results may inform future research on a broad range of topics. However, this study has some limitations. First, it only targeted Korean consumers, limiting generalization possibilities. In future research, more varied consumer segments should be examined by considering various cultural differences. Second, the attributes of meat substitutes were identified based on the literature. However, more important aspects might exist. Thus, it is recommended that future research explores other attributes. This study applied the ETPB in predicting consumer intentions to purchase meat substitutes. Future research can apply other theoretical frameworks to expand the relevant research stream.

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