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Unveiling the Relationships between Food Literacy, Spiritual Intelligence and Sustainable Gastronomic Behavior: Moderating Effect of Sustainable Commitment

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ABSTRACT

As people's food habit and lifestyle are emerging as significant factors in relation to a sustainable food system, this study explored the relationships between food literacy, spiritual intelligence and sustainable gastronomic behavior with verifying the moderating effect of sustainable commitment. The data analysis was conducted on public consumers in South Korea who have experience in food purchase and dining out and a total of 497 samples were selected. SPSS 24.0 and AMOS 24.0 were utilized, and the analysis of structural equation model is performed for analysis. Consequently, both relational and system food literacy competencies were confirmed to have positive effects on the sustainable gastronomic behaviors unlike with functional food literacy. Moreover, all food literacy competencies showed positive influences on spiritual intelligence, and spiritual intelligence had a great impact on sustainable gastronomic behavior in individual perspective. The moderating effect of sustainable commitment was also confirmed in this research model. According to the results, this study suggested comprehensive implications that contribute to developing public's food literacy and spiritual intelligence as well as promoting sustainable gastronomic behavior and commitment for future sustainable world.

KEYWORDS: food literacy; spiritual intelligence; sustainable gastronomic behavior; sustainable commitment

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INTRODUCTION

Although the world has developed a lot over the past few decades, it is no exaggeration to say that today's global society is in a state of serious instability due to the side effects of excessive development [1]. It cannot be denied that there have been positive changes in the lives of the public, such as the development of transportation and science and technology, and the improvement of social, economic, and cultural levels but people on Earth these days are currently facing a crisis due to countless catastrophes and calamities such as ongoing wars, climate change, and

infectious diseases [2]. Also, relentless development policies and mechanical activities have seriously damaged natural environment resources and even human life [3]. In particular, the stability of the natural ecosystem is threatened by climate change that cannot be controlled by human power, and the range of biodiversity is also being substantially reduced [4,5]. As a result, the issue that people around the world must work to protect the safety of the global food environment is emerging as a hot topic [6,7].

Recently, heavy rains, fires, and landslides caused by various external environment factors have been occurring sporadically all over the world and they have emerged as the main culprits in destroying the safety of food supply [8]. These factors are hugely destroying not only natural resources but also foundation of social systems, and they are also causing a surge in food prices which endangers the lives of ordinary people [9]. As the proportion of food expenditures among the public increases, their life becomes unstable, and the quality of the food consumed is deteriorating due to high price and difficulties of food access [10]. Therefore, the current standard and quality of the public's dietary life continues steadily worsening [11,12].

In this situation where the food environment and social stability are becoming more unstable, the improvements of individual food literacy and sustainable gastronomic behavior are emerging as ways to overcome these severe problems [5,9]. Firstly, food literacy which is defined as functional, social, and system competency related to food knowledge and dietary habits is considered as a major factor that induces public's wise food consumption behavior at various levels [13]. This food literacy is proven as the basis for both healthy dietary food choices and sustainable food consumption behavior that goes beyond the individual level [14,15]. Moreover, sustainable gastronomic behavior which encourages emphasizing the value of sustainability in an individual's life and expanding it to the context of the food system has become the most significant issue these days [16,17]. By looking at food in this comprehensive aspect, people can be involved in circular food system and cooperate with others to create sustainable food environment [18]. As importance of these sustainable concepts increases, various research studies are actively conducted across manifold academic disciplines [19].

In addition, spiritual intelligence is currently emerging as an essential competency to build and develop the sustainable society in the future world [1]. Spiritual intelligence, which is one of the three major intelligences that people have with IQ and EQ, is generally defined as 'the intelligence with which people access their own deepest meanings, values, purposes, and highest motivations' [20]. It is the crucial quality as the ultimate intelligence which allows people to comprehend and search for profound meaning beyond oneself [21]. This concept has gained importance in recent years as it is expanded to a wide spectrum and innovatively applied to diverse sustainable research studies [22]. Because

previous related studies found that people with a higher level of spiritual intelligence cherish social and environmental values and make efforts to put them into sustainable practice in daily lives, spiritual intelligence is highly anticipated to function as a potential trigger for sustainable gastronomic behavior [23].

Accordingly, based on previous studies, it was predicted that if the level of food literacy and spiritual intelligence of public citizens improves, this will be of great help in recognizing the current food environment crisis and will further have a positive impact on taking action to develop the food environment. Therefore, this research was conducted with the belief that there are close relationships between food literacy, spiritual intelligence, and sustainable gastronomic behavior in current precarious food system and derives detailed research results by classifying food literacy competency into three multi-dimensions: functional, social, and system. The dimension of sustainable gastronomic behavior was also classified into individual from a microscopic perspective and civic from a macroscopic perspective. In addition, this study explored the moderating effect of sustainable commitment for verifying group differences in gastronomic behavior depending on the level of high and low. Through these diverse perspectives, this study aims to explore the relationships between research variables in depth for deriving meaningful implications and effective ways to induce public efforts on the food environment safety. Therefore, this research was carried out under the hypothesis as follows.

(1) To analyze the impact of food literacy on both sustainable gastronomic behavior and spiritual intelligence.

(2) To analyze the influence of spiritual intelligence on sustainable gastronomic behavior.

(3) To analyze the moderating effects of sustainable commitment on the relationships among research variables.

This study is described in the following order. In section 1 (INTRODUCTION), the background and purpose of the research study are explained in detail. In section 2 (THEORETICAL BACKGROUND AND RESEARCH HYPOTHESIS) as a literature review, key concepts of research variables are introduced and the close relationships between them are examined. In section 3 (RESEARCH METHODOLOGY), research model with hypotheses and analysis methods are described in order. In section 4 (RESULTS), specific data results according to each research hypothesis are described to derive research implications. In section 5 (DISCUSSION AND IMPLICATIONS), based on the final results, important research information is discussed and meaningful implications are suggested for the future research.

THEORETICAL BACKGROUND AND RESEARCH HYPOTHESIS

Food Literacy

The term ‘food literacy’, derived from the process of structuring and developing the concept of health literacy, refers to a complex concept that goes beyond simply reading, writing, and understanding food language to identifying accurate food information [24,25]. Because food not only provides essential nutrients for people, but also helps them form social relationship with others and provides cultural and cultural information, it should be highlighted from multi-layered perspectives with comprehensive mindset [9,13]. In general, food literacy is ‘a basic ability to acquire, interpret, and understand food and nutritional information’ and ‘a capability to use information to improve one’s health’ [15]. It is also described as ‘a combination of knowledge, skills and behaviors related to the planning, management, selection, preparation and consumption of food to meet food intake’ and ‘an individual’s food knowledge within a complex food system’ [15]. In addition to skills and behavior, it refers to the ability to develop a positive relationship with food and the ability to make wise food choices considering various social environmental factors in everyday life [26–28].

As it is shown that food literacy includes various themes from micro to macro aspects, the study by [13], one of the representative studies of food literacy, sheds theoretical light on it from the perspective of individual competency. Competency is a source that develops an individual ability to be effective, serves as a central source for achieving goals and achievements in life [29]. It also serves as an important foundation for personal and spiritual growth [30]. In this context, [13] defines food literacy as a specific competency that a person possesses in relation to food, which can be classified into three dimensions as functional, social, and system competencies. Firstly, functional competency refers to not only nutritional knowledge but also practical skills, such as cooking, utilizing a food budget, and seeking valuable information. Relational competency refers to whether an individual has a positive relationship with food, enjoys diverse kinds of dishes and values sharing food with others. System competency refers to whether an individual recognizes the significance of local food and environmental impacts, such as understanding the importance of food-related justice and sustainability in order to contribute a stable and healthy food system. These various aspects of food literacy are proving powerful and important in creating sustainable food environment in these times.

Spiritual Intelligence

Individual spiritual intelligence and sensitivity have become the most important issues in complex modern societies [1]. Zohar et al. [20] indicates that people have three major human intelligences that are material capital, social capital, and spiritual capital, and these function as

people's foundational capitals when making decisions and leading independent life. Generally, spiritual intelligence is defined as 'the intelligence with which people themselves access deepest meanings, values, purposes, and highest motivations', and creates the crucial capability as the ultimate intelligence which allows people to comprehend the whole entire world. Also, it is interpreted as 'soul intelligence' which makes people become sentimental and integrate many fragments of present life harmoniously [31]. Because of these multifarious aspects of spiritual intelligence, it is regarded as a transformative and innovative intelligence that allows modern people to break old paradigms and invent new meaningful life [32,33].

Even though spiritual intelligence is often considered as ecological intelligence, it includes more comprehensive scopes and details [34,35]. Not only spiritual intelligence makes people see the hidden patterns that connect human activity to the larger flow of nature, but also it makes people discover the interconnectedness between human, society, environment and planets [36]. It leads people to extend their creativity and mental freedom for holistic and transversal understanding of the whole world. Also, spiritual intelligence is known to develop the consciousness beyond their physical conditions and works as a framework for identifying and organizing capabilities so that the individual compatibility is increased by using spirituality [37]. It enriches people's lives by improving their spiritual capacity to understand the significance of care and compassion for both oneself and others [33,38]. Therefore, spiritual intelligence is greatly highlighted with the need for dignity, mastery, self-esteem and self-actualization and plays as a drive to comprehend the whole world [39]. For these reasons, many previous studies found inextricable links and crucial relationships between spiritual intelligence and sustainability [1,22]. It is obvious that these crucial concepts should be emphasized as important in the current situation where spiritual and environmental values are at stake [21].

Sustainable Gastronomic Behavior

As modern people's awareness of a sustainable society to protect the environment and local communities increases, the concept of sustainable food and gastronomic behavior is becoming important as well [16,17]. Sustainable gastronomic behavior, a concept that has evolved from the concepts of wine and eco-friendly gastronomy, is currently defined as 'food related behaviors comprised of sustainable and ecological procedures from food production to processing, consumption, and processing', and 'ethical eating lifestyle that respects the system' [4,40]. This refers to actions that are necessary for the social well-being beyond individual life, and strongly reflects the ecological importance of the macroscopic level [41]. In other words, gastronomic behavior in modern society means environmentally conscious gastronomic behavior with ethical food citizenship [18].

According to previous studies on sustainable gastronomic behaviors, they are generally classified into companies' sustainable management operations and consumers' sustainable gastronomic behaviors. Sustainable management of companies refers to ethical production and provision of service, and includes concepts such as eco-friendly management, employees' work ethics, and public health promotion [42]. On the other hand, sustainable gastronomic behavior of individual consumers can be classified into the categories at the individual level and citizen level [43]. Individual sustainable gastronomic behavior refers to consistently practicing a diet that reflects healthy and sustainable values in daily life, such as preferring fresh food, using eco-friendly packaging materials, and striving for recycling and reducing food waste. It encompasses actions that favor companies that practice sustainable management practices [44,45]. Civic sustainable gastronomic behavior requires more aggressive and robust level of actions such as proposing sustainable food policies to solve and prevent social problems that threaten the safety of current food system for future generations [4,46]. It also includes actions that participate in and support sustainable food production system and supply processes, and actively encouraging others to practice sustainable gastronomic behavior [44].

Sustainable Commitment

Commitment is generally defined as 'being immersed deeply in something' or 'a promise to ensure that a certain belief or action continues in steady manner' [47]. From a psychological perspective, it is interpreted as an obligation or responsibility for specific actions that should be assigned [11]. When people are deeply immersed and committed in a specific subject, self-independence, internal discipline, and responsibility are simultaneously induced and these emotions become effective drivers of new behaviors [48]. In this way, commitment has been found to bring a huge impact on people's life by providing mental experiences that allow individuals to recognize their identity and values and precipitating future actions as well [49,50].

Recently, there has been a trend in various fields to apply the concept of commitment to consumer psychology and behavior fields. In general, consumer commitment is defined as 'a psychological characteristic that occurs about specific objects or brands that an individual prefers and frequently purchases' [51]. Therefore, it is often considered as 'a strong sense of trust and responsibility, and a desire to actively support' [52]. This consumer commitment has been shown to be closely related to people's environmental responsibility, ethical awareness, and sustainable practices [53]. Based on previous studies, [54] developed a tool to measure an individual's level of commitment in the natural environment and discovered that it plays a pivotal role in encouraging eco-friendly behavioral intentions. Also, the study of [11] revealed that people with a higher level of commitment had a higher level of intention

to engage in eco-friendly behavior and actively practiced eco-friendly behaviors in real life. Kerstetter et al. [55] demonstrated that people's sustainable commitment to protect the natural environment and cultural heritage is an important factor in practicing sustainably responsible behavior. In other words, one's commitment toward sustainability not only creates a sense of responsibility and obligation as a social member of the environment and local community, but also builds self-identity based on these beliefs, ultimately leading to practicing sustainable behavior even if it requires self-sacrifice or hassles [55,56].

Relationships among the Constructs

Based on a review of previous studies, the concepts of food literacy, spiritual intelligence, sustainable gastronomic behavior and commitment are positively related to each other. It indicates that if people have ideal and proper level of food literacy and spiritual intelligence, they can make better food choices and developing valuable eating habits toward sustainable gastronomy [9,19]. Furthermore, this literacy and spiritual intelligence not only induce people themselves to maintain their healthful eating lifestyle in a consistent manner, but also powerfully influence others by emphasizing the necessity of sustainable gastronomic behaviors [1]. Accordingly, food literacy and spiritual intelligence are expected to be potential sources in developing people's comprehensive understanding of importance of sustainable gastronomic behavior for better future world. Therefore, this study sought to analyze in detail the influences of people's food literacy and spiritual intelligence on their efforts in sustainable gastronomy behavior. In addition, the moderating effect of sustainable commitment in the relationship between research variables is additionally examined for acquiring detailed information.

Relationship between food literacy and sustainable gastronomic behavior

Competency, which underlies the dominant force in one's lifetime, results in a high level of decision-making capability, performance and flexibility [9]. Therefore, it is effectively utilized as a motivator in solving problems and overcoming difficulties [30]. Since competency has a great impact on an individual's thoughts and actual behaviors, it should be considered in-depth when studying eco-friendly and sustainable consumer behaviors [44,57].

Accordingly, this study examined food literacy from the perspective of competency, and related previous studies are as follows. Poelman et al. says that people with a high level of food literacy have strong self-regulation and control ability when dealing with food [5]. They do not easily fail to the temptation of unhealthy foods such as fast food or junk food and continuously consume healthy foods such as vegetables and fruits according to their planned diet and budget. Also, Perry et al. reveals that people with ideal food literacy have self-efficacy and confidence in practicing sustainable gastronomic behavior, and these are

used to build actual sustainable eating habits and lifestyles [58]. Slater et al. proves that social bonds and cultural enjoyments which are gained from sharing food together are expressed as one's social competencies [13]. These positive factors exert significant impacts in practicing sustainable eating behaviors that pursue social friendliness and eco-friendliness. Vidgen also verifies that people who recognize the value of food as a social function have a high standard of food literacy in terms of social interaction, and this has a significant impact on daily food selection and eating habits [9]. In addition, Sumner demonstrates that not only people who consider food literacy as a social competency are highly interested in various social and environmental issues, but they also actively seek solutions to problems and consciously participate in public activities to create a healthy food system [59]. A study by Cullen et al. reveals that an individual's food literacy which reflects food system values has a positive relationship with ecological gastronomic behavior [26].

Based on these existing studies, when people possess a high level of food literacy in various dimensions and utilizes it effectively, they will successfully practice sustainable gastronomic behavior in a consistent manner. This is expected to help both the individual's own development and the growth of community to which the individual belongs [60]. Accordingly, this study established the research hypothesis as follows.

Hypothesis (H1-1). Functional competency positively influences individual sustainable gastronomic behavior.

Hypothesis (H1-2). Functional competency positively influences civic sustainable gastronomic behavior.

Hypothesis (H1-3). Relational competency positively influences individual sustainable gastronomic behavior.

Hypothesis (H1-4). Relational competency positively influences civic sustainable gastronomic behavior.

Hypothesis (H1-5). System competency positively influences individual sustainable gastronomic behavior.

Hypothesis (H1-6). System competency positively influences civic sustainable gastronomic behavior.

Relationship between food literacy and spiritual intelligence

Spiritual intelligence, which promotes an understanding of impacts beyond oneself, is another significant element that people should pay attention to [61]. Because spirituality refers to a basic feeling of being connected with entire universe and a search for meaning that transcends material well-being, Zsolani says that it has a focus on deep-routed human values and relationships with a universal source [62]. Therefore, if people consider this intelligence in connection with the overall concept of food literacy, it functions as an individual's food related competency that leads people to act with wisdom and compassion [63].

According to the studies by Michopoulou and Jauniškis and Muflih

and Juliana, inseparable relationships between people's food habits and spirituality are emerging as a novel research area these days [64,65]. The appearance of the term 'mindful eating' proves this close connection between food literacy and spiritual intelligence [23]. Moreover, Syed Ismail and Karia confirms that people's food knowledge and beliefs play a crucial role in maintaining both one's physical well-being and spiritual growth [66] and Schmidt discovers that people who actively practice food waste prevention behaviors are responsible and pious about food system and in higher level of spiritual intelligence [67].

In this context, one's food related competencies are closely related to spiritual intelligence, which is a set of one's spiritual and psychological capability that helps an individual to attain self-recognition, conscience and deep thinking [20,68]. Therefore, based on previous arguments, it is expected that uncovering the relationship between food literacy and spiritual intelligence in the food environment and improving their levels together would play an important role raising the level of sustainable gastronomic behaviors among the public. Accordingly, this study proposes the following hypothesis to examine the great influence of food literacy on their spiritual intelligence.

Hypothesis (H2-1). Functional competency positively influences spiritual intelligence.

Hypothesis (H2-2). Relational competency positively influences spiritual intelligence.

Hypothesis (H2-3). System competency positively influences spiritual intelligence.

Relationship between spiritual intelligence and sustainable gastronomic behavior

Many previous studies explore the synergy between spiritual intelligence and sustainable behavior [69]. Spiritual intelligence, which forms an internalized regulative ideal and behavior based on self-transcendence and interconnectedness, is essential for sustainable development by helping people in knowing about connecting with higher self and ultimately resulting in wisdom to link with community [70]. According to the studies by Attri and Datta, because spiritual intelligence captures the significance of vital meaning of interconnectedness, it plays an important role in initiating not only ethical contemplation like social responsibility, public goal attainment and decision making but also sustainable behaviors [71,72]. Severino-González says that it leads people's commitment to integrity, righteousness and respect towards others because spirituality involves the recognition of a feeling or belief that there is something greater than oneself [61].

In addition, Alizadeh Aghdam et al. and Menon and Sadasivan reveals that people with high spiritual intelligence practice more reasonable actions and believe nature is intrinsically valuable not merely instrumentally [73,74]. Also, previous studies of Gupta et al. and Marques

et al. demonstrate that when leveraging people with high spiritual intelligence by training and educating them to cultivate genuine spiritual capital, people became more interested in various sustainability issues and engaged in sustainable activities more frequently [75,76]. Consequently, this intelligence is expected to have a crucial impact on sustainable gastronomic behavior and greatly contribute to a more sustainable society for a future world. Based on previous results, this research formulates the following hypothesis to examine the impact of spiritual intelligence on sustainable gastronomic behavior.

Hypothesis (H3-1). Spiritual intelligence positively influences individual sustainable gastronomic behavior.

Hypothesis (H3-2). Spiritual intelligence positively influences civic sustainable gastronomic behavior.

Moderating role of sustainable commitment

Individual commitment related to sustainability has been shown to have a profound relationship with sustainable gastronomic behavior. According to Katzev and Johnson, one's commitment, perceived costs, and benefits of specific actions have significant impacts on practicing eco-friendly behaviors [77]. It is also discovered that ethical consumers have a sense of responsibility and commitment toward society and this leads them establish a sustainable consumption pattern [78]. A study by Vermeir and Verbeke shows that when people feel deeply involved in sustainability, they become committed in ethical and eco-friendly foods and practice sustainable food consumption behavior [57]. In other words, when a product or service matches one's important desires, goals or values, the level of involvement and commitment felt toward the target increases and exerts a great influence on the individual's making decision process and behavior as a result [79].

According to previous studies, Kerstetter and Bricker emphasizes that the desire and commitment to protect the natural environment and cultural heritage are highly significant in carrying out sustainable behaviors [55]. Davis et al. also maintains that an individual's commitment to the environment and a sense of belonging to a natural community induce the intention to do sustainable behaviors [54]. Additionally, Davis et al. verifies that people who highly recognized the value of the natural environment had a high level of commitment to the environment, and they practice environmentally friendly behavior even if it requires some personal sacrifice [56]. Based on these multidimensional previous studies, it is expected that the higher the level of commitment in the environment and society, the more actively practicing sustainable behaviors within the context of the food system. Therefore, this study proposes that one's level of commitment would have a significant moderating effect by exerting a different influence on the practice of sustainable gastronomic behavior.

Hypothesis (H4). Sustainable commitment moderates the relationships between food literacy, spiritual intelligence and sustainable gastronomic behavior.

RESEARCH METHODOLOGY

Research Model

Based on major preceding studies and research hypotheses presented above, research model for this study is created as shown in Figure 1. The components of food literacy scales are the independent variables while spiritual intelligence works as both independent and dependent variables. Sustainable gastronomic behaviors which are separated into individual and civic perspectives functions as dependent variables in this research model. In addition, group difference which are distinguished by the level of sustainable commitment act as a moderating variable.

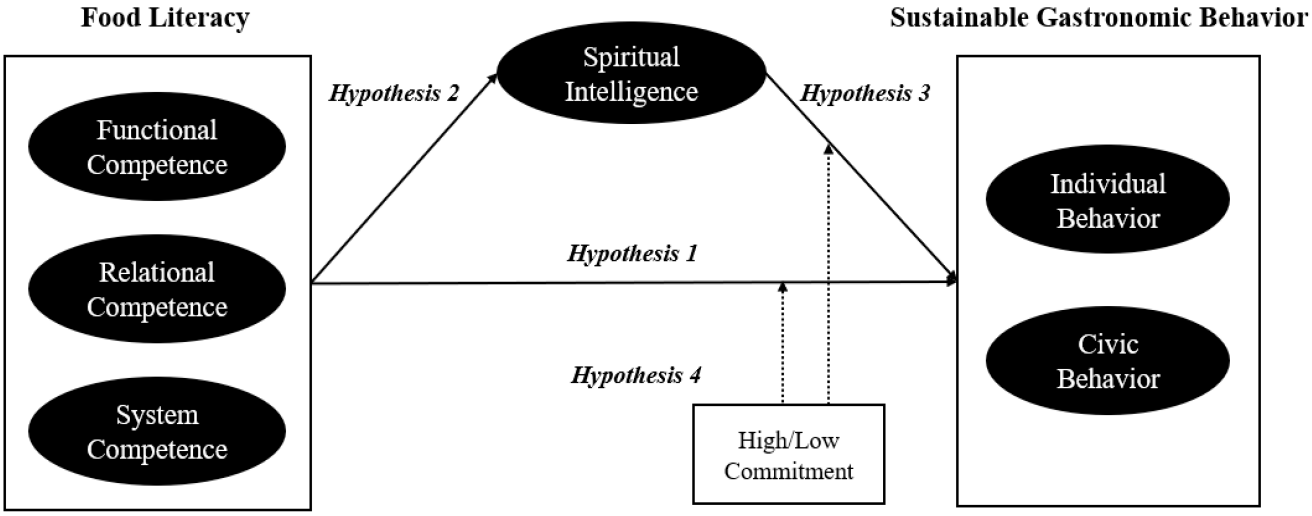

Figure 1. Research model. Note: Solid lines are main effects and dotted lines are moderating effects.

As can be seen in the research model, the hypotheses in the larger context are as follows.

Hypothesis (H1). Food literacy competencies positively influence sustainable gastronomic behaviors.

Hypothesis (H2). Food literacy competencies positively influence spiritual intelligence.

Hypothesis (H3). Spiritual intelligence positively influences sustainable gastronomic behaviors.

Hypothesis (H4). Sustainable commitment moderates the relationships between food literacy, spiritual intelligence and sustainable gastronomic behaviors.

Sample and Data Collection

The population of this research was defined as citizens in South Korea. A preliminary survey was conducted four months before the main survey to correct and complement the ambiguity of the measurement items. The main research survey was conducted in July 2022, and a total of 526 questionnaires were distributed through online survey system. The researchers explained the aim of this study to the participants and obtained consent from all the respondents. The survey was undertaken by using a self-reported method of the respondents by answering the questionnaires. Consequently, 516 questionnaires were collected, but 497 responses that fulfill reliability and validity were used for the final analysis by excluding the samples not suitable for a double analysis.

Instrument Development

A survey questionnaire in English was translated into Korean as referred to by [80]. The profile of the sample that participated in this study is shown in Table 1. The questionnaire items were rated on a 7-point Likert scale (1 = strongly disagree; 7 = strongly agree). The operational definition of each research variable is explained in the Theoretical Background section, and all the measurement items are shown on the Table 2. The questionnaire was divided into four sections. The first section measured the food literacy levels based on three-dimensional food literacy scale developed by [13]. The second section about individual and civic sustainable eating behaviors included nine items referring to the ecological food consumption scales developed by [45] and [81]. The third section measured spiritual intelligence based on the scales developed by [82] and fourth section measured sustainable commitment included six items referring to the previous studies of [43] and [80]. The last section collected demographic information of respondents such as gender, age, education level, job and primary information sources. Male and female young adults accounted for 49.5% and 50.5% respectively and response rates by generation were evenly distributed. Also, almost half of respondents (48.3%) were enrolled in 4-year universities and many people are turned out being office workers.

Data Analysis

The statistical analysis was performed using the SPSS 24.0 (IBM Corp., Armonk, NY, USA) and Amos 24.0 software (IBM Corp., Armonk, NY, USA). A frequency analysis was employed to investigate the sample's demographic characteristics, and confirmatory factor and reliability analyses were performed to assess the validity and reliability of the measurement variables. The hypotheses were tested by using a structural equation model, and the moderating effect of sustainable commitment level was tested by using a multigroup analysis.

Table 1. Profile of the sample (n = 497).

Characteristic	*N*	Percentage
Gender		
Male	246	49.5
Female	251	50.5
Age		
Under 20	70	14.1
21–30	80	16.1
31–40	84	16.9
41–50	83	16.7
51–60	88	17.7
Above 60	92	18.5
Marital Status		
Single	234	47.1
Married	256	51.5
Etc.	7	1.4
Education level		
Less high school	117	23.5
Community college degree (2 years)	85	17.1
University degree (4 years)	240	48.3
Post-graduate degree	53	10.7
Etc.	2	0.4
Job		
Student	87	17.5
Office worker	170	34.2
Self-employed	36	7.2
Professional	54	10.9
Service/Sales	36	7.2
Housewife	54	10.9
Unemployed	31	6.2
Etc.	29	5.8
Number of family members		
Live alone	66	13.3
2	106	21.3
3	124	24.9
4	169	34.0
Above 5	32	6.4

RESULTS

Measurement Model

A confirmatory factor analysis was performed to assess the validity of the collected variables before examining the developed theoretical model's causality, and Anderson and Gerbing's two-step approach was used [83]. As shown in Table 2, the standardized coefficients of all variables were at least 0.6, and composite construct reliability (0.883–0.953) and Cronbach's alpha (0.778–0.949) were at least 0.7. The chi-square value (1782.050), df (573), NFI (0.857), TLI (0.888), CFI (0.898), and RMSEA (0.065) also showed a good overall model fit [84]. The correlation analysis of the derived factors showed that both the hypotheses and the directions were consistent. The average variance extracted was 0.5 or higher, indicating discriminant validity (Table 3).

Table 2. Confirmatory factor analysis and reliability analysis.

Construct	Standardized estimate	*t*-value	CCR	Cronbach's alpha
Functional Competency			0.894	0.845
FL_1: Being able to select healthy foods within a budget	0.659	fixed		
FL_2: Being able to prepare meals with fresh foods	0.724	13.640***		
FL_3: Being able to handle food in hygiene way	0.735	13.814***		
FL_4: Being able to find credible food and eating information	0.752	14.055***		
FL_5: Being able to find credible food and eating information	0.743	13.931***		
Relational Competency			0.953	0.814
FL_6: Valuing sharing food with others	0.795	fixed		
FL_7: Valuing having meals with others	0.779	17.213***		
FL_8: Having a great interest in local food menus	0.671	14.693***		
FL_9: Understanding the role of local foods for community well-being	0.631	13.740***		
FL_{10}: Enjoying having meals in good atmospheres	0.557	11.998***		
System Competency			0.892	0.871
FL_{11}: Understanding the impact of food production process into environment	0.780	fixed		
FL_{12}: Understanding sustainability issues of food system	0.816	19.048***		
FL_{13}: Being able to think critically about unethical management practices of food companies	0.654	14.740***		
FL_{14}: Understanding social justice implications of food choices	0.795	18.475***		
FL_{15}: Understanding ethical issues in food production	0.749	17.240***		

Table 2. *Cont.*

Construct	Standardized estimate	*t*-value	CCR	Cronbach's alpha
Individual Sustainable Gastronomic Behavior (IGB)			0.928	0.778
IGB_1: Ordering the right amount of food to prevent food waste	0.584	fixed		
IGB_2: Minimizing the use of disposable products when purchasing and packaging food	0.705	11.603***		
IGB_3: Practicing recycling when disposing of food related waste	0.675	11.295***		
IGB_4: Using food companies and restaurants that practice sustainable operating policies	0.746	12.001***		
Civic Sustainable Gastronomic Behavior (CGB)			0.887	0.949
CGB_1: Participating environmental conservation activities of government or private organizations to create a sustainable gastronomic environment	0.841	fixed		
CGB_2: Promoting environmental protection activities with people with the same beliefs to build a sustainable gastronomic environment	0.906	27.047***		
CGB_3: Reporting problems that threaten a sustainable gastronomic environment to the authorities	0.895	26.474***		
CGB_4: Seeking and proposing good ideas for sustainable management of food and restaurant companies	0.917	27.665***		
CGB_5: Persuading and encouraging others to practice sustainable gastronomic behaviors	0.884	25.906***		
Spiritual Intelligence (SI)			0.908	0.898
SI_1: Striving to live a life that contributes to society	0.684	fixed		
SI_2: Living and acting responsibly	0.758	15.334***		
SI_3: Taking time to look back and reflect on my life	0.711	14.487***		
SI_4: Responding rationally even in crisis situations	0.746	15.116***		
SI_5: Striving to achieve self-actualization	0.840	16.788***		
SI_6: Trying to live with positive thinking and attitude	0.809	16.255***		
SI_7: Knowing the meaning and purpose of my life	0.692	14.128***		
Sustainable Commitment (SC)			0.883	0.913
SC_1: Believing that me and sustainable gastronomy are interdependent	0.740	fixed		
SC_2: Having an affinity for sustainable gastronomy	0.834	19.020***		
SC_3: Feeling responsible for sustainable gastronomy	0.890	20.425***		
SC_4: Feeling a sense of obligation to sustainable gastronomy	0.905	20.775***		
SC_5: Thinking sustainable gastronomy has an impact on my well-being	0.739	16.632***		

Note: FL = food literacy; CCR = composite construct reliability; Standardized estimate = β-value; χ^2 = 1782.050 (df = 573); p < .001; χ^2/df = 3.110; Normed Fit Index (NFI) = 0.857; Tucker Lewis Index (TLI) = 0.888; Comparative Fit Index (CFI) = 0.898; Root Square Error of Approximation (RMSEA) = 0.065; ***p < 0.001.

Research Hypothesis

Table 4 shows the research results of the structural equation model analysis for testing this study's hypotheses. Given that chi-square is sensitive to the sample size, other fitness indices were considered and found to be relatively reliable (chi-square = 1416.798, df = 420, TLI = 0.884, IFI = 0.895, CFI = 0.895, RMSEA = 0.069) [84]. Among the sub-factors of food literacy, functional competency had no statistically significant positive impacts on individual sustainable gastronomic behaviors (beta = 0.123, t-value = 1.784, $p > 0.05$) and civic sustainable gastronomic behaviors (beta = −0.082, t-value = −1.083, $p > 0.05$). Therefore, Hypotheses 1-1 and 1-2 were rejected. Conversely, relational and system competencies had positive effects on both individual and civic sustainable gastronomic behaviors. Therefore, Hypotheses 1-3, 1-4, 1-5 and 1-6 were accepted. This suggests that even though functional competency did not show any significant influence, relational and system competencies exert a great influence on sustainable behaviors. Moreover, because all subscales of food literacy had significant positive effects on spiritual intelligence, hypotheses 2 was clearly accepted. This result proves that the concepts of food literacy and spiritual intelligence are consistent, and the development of food literacy competencies in a multidimensional manner will be effective on the improvement of holistic spiritual intelligence. In addition, spiritual intelligence (beta = 0.261, t-value = 4.781, $p < 0.001$) also positively influenced individual sustainable gastronomic behavior. However, it (beta = −0.006, t-value = -0.102^{ns}, $p > 0.05$) did not give any positive impact on civic sustainable gastronomic behavior. Thus, Hypothesis 3-1 was accepted while 3-2 was rejected. This finding shows that a higher level of spiritual intelligence can function as a potential factor driving sustainable gastronomic behavior in individual aspect. To test Hypothesis 4, according to which the positive effect of food literacy and spiritual intelligence on sustainable gastronomic behavior is moderated by the level of sustainable commitment, a comparative analysis of unconstrained and constrained models was performed (Table 5) by dividing the respondents into two groups based on the level of commitment (High/Low). The results showed significant commitment level differences in the effects of relational and system competencies on sustainable behavior. Especially, the difference between high and low commitment groups was clearly demonstrated in the path of system competency and individual eating behavior. According to these research results, Hypothesis 4 was partly accepted, and verified that improving the level of commitment to sustainable values would be effective in promoting the practice of sustainable gastronomic behavior.

Table 3. Means, standard deviations, and correlation analyses.

Construct	1	2	3	4	5	6	7	AVE	Mean ± SD[a]
1. Functional Competency	1	-	-	-	-	-	-	0.692	4.75 ± 0.95
2. Relational Competency	0.522**	1	-	-	-	-	-	0.884	4.84 ± 0.99
3. System Competency	0.585**	0.498**	1	-	-	-	-	0.651	4.60 ± 1.00
4. Individual Gastronomic Behavior	0.518**	0.549**	0.533**	1	-	-	-	0.857	4.94 ± 0.98
5. Civic Gastronomic Behavior	0.292**	0.364**	0.411**	0.406**	1	-	-	0.499	3.43 ± 1.40
6. Spiritual Intelligence	0.465**	0.487**	0.439**	0.540**	0.269**	1	-	0.604	5.09 ± 0.93
7. Commitment	0.432**	0.439**	0.585**	0.516**	0.683**	0.377**	1	0.554	4.22 ± 1.15

Note: [a]SD = Standard Deviation; AVE = average variance extracted; All variables were measured on a 7-point Likert scale from 1 (strongly disagree) to 7 (strongly agree), **$p < 0.01$.

Table 4. Structural parameter estimates.

Hypothesized path (stated as alternative hypothesis)	Standardized path coefficients	*t*-Value	Results
H1-1: Functional Competency → Individual Gastronomic Behavior	0.123	1.784^{ns}	Not Supported
H1-2: Functional Competency → Civic Gastronomic Behavior	−0.082	-1.083^{ns}	Not Supported
H1-3: Relational Competency → Individual Gastronomic Behavior	0.309	4.981***	Supported
H1-4: Relational Competency → Civic Gastronomic Behavior	0.233	3.594***	Supported
H1-5: System Competency → Individual Gastronomic Behavior	0.282	4.226***	Supported
H1-6: System Competency → Civic Gastronomic Behavior	0.403	5.530***	Supported
H2-1: Functional Competency → Spiritual Intelligence	0.242	3.302***	Supported
H2-2: Relational Competency → Spiritual Intelligence	0.300	4.854***	Supported
H2-3: System Competency → Spiritual Intelligence	0.150	2.192*	Supported
H3-1: Spiritual Intelligence → Individual Gastronomic Behavior	0.261	4.781***	Supported
H3-2: Spiritual Intelligence → Civic Gastronomic Behavior	−0.006	-0.102^{ns}	Not Supported
Goodness-of-fit statistics	$\chi^2_{(420)} = 1416.798$ ($p < 0.001$)		
	TLI = 0.884		
	IFI = 0.895		
	CFI = 0.895		
	RMSEA = 0.069		

Note: *$p < 0.05$, ***$p < 0.001$, [ns]Not Significant; TLI = Tucker-Lewis Index; IFI = Incremental Fit Index; CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation.

Table 5. Moderating effects on groups differentiated by commitment levels.

Hypothesized path (stated as alternative hypothesis)	High (N = 245)		Low (N = 252)		Unconstrained model chi-square (df = 840)	Constrained model chi-square (df = 841)	$\Delta\chi^2$ (df = 1)
	Standardized Coefficients	t-value	Standardized Coefficients	t-value			
H4-1 Functional Competency → Individual Gastronomic Behavior	0.129	1.215^{ns}	0.092	1.442^{ns}	1925.940	1925.962	0.023
H4-2: Functional Competency → Civic Gastronomic Behavior	0.257	−1.759^{ns}	0.132	−0.829^{ns}	1925.940	1927.349	1.410
H4-3: Relational Competency → Individual Gastronomic Behavior	0.060	4.075***	0.052	3.071**	1925.940	1927.072	1.133
H4-4: Relational Competency → Civic Gastronomic Behavior	0.110	2.431*	0.071	1.701^{ns}	1925.940	1927.152	1.212
H4-5: System Competency → Individual Gastronomic Behavior	0.102	3.059***	0.070	1.796^{ns}	1925.940	1928.277	2.337
H4-6: System Competency → Civic Gastronomic Behavior	0.199	3.274**	0.101	2.246*	1925.940	1929.649	3.709
H4-7: Spiritual Intelligence → Individual Gastronomic Behavior	0.084	3.591***	0.079	3.231**	1925.940	1926.090	0.150
H4-8: Spiritual Intelligence → Civic Gastronomic Behavior	0.151	−0.063^{ns}	0.106	−1.420^{ns}	1925.940	1926.521	0.573

Note: CFI = 0.861; IFI = 0.862; *p < 0.05, **p < 0.01, ***p < 0.001, ^{ns}Not significant.

DISCUSSION AND IMPLICATIONS

Conclusion and Discussion

In contrast to economic and cultural developments, the safety of society and the food environment is becoming threatened these days, and the importance of publics' sustainable gastronomic behavior among is increasing. In this context, this study aims to explore the relationships between food literacy, spiritual intelligence and sustainable gastronomic behaviors in depth and to examine the moderating effects of the level of sustainable commitment for deriving meaningful implications. The results show that both food literacy competencies especially relational and system dimensions were closely associated with sustainable gastronomic behaviors. Spiritual intelligence also has a great positive impact on those behaviors. These results are consistent with recent previous studies and indicate that public should be encouraged to develop their food literacy and spiritual intelligence for practicing multifarious gastronomic behaviors so that their competencies can function as potential nourishments for supporting sustainable societies and better world [85,86]. Moreover, all three dimensions of food literacy had a huge impact on spiritual intelligence as predicted. This confirms that a holistic view of food literacy sits alongside the extensive notion of spiritual intelligence and all these research variables should be considered carefully in conjunction with another [34,87]. Furthermore, the level of sustainable commitment played a significant moderating role in this research, and in particular, there is a big difference in groups on path between system competency and individual sustainable gastronomic behavior. It suggests that sustainable gastronomic behavior, even at an individual level, can be implemented successfully when supported by specific food literacy competency that considers the food system from a macro perspective [88,89]. Consequently, all these research results proved that not only food literacy, but also spiritual intelligence and sustainable commitment can be powerful driving forces to promote sustainable gastronomic behaviors in the future.

Theoretical Implications and Practical Implications

Based on the results, this study contributes to suggest the following academic, policy, and practical implications. First, from an academic perspective, this study illuminates the concept of food literacy from expanded and macroscopic perspectives by including general functional competency as well as relational and system competencies. This is believed to have played a significant role in informing the public that the concepts of food literacy in the expanded dimension are actually important and should be further emphasized at a time when food literacy research is being conducted focusing only on the functional dimension [2,14,19]. Also, this study focused on actual consumers' sustainable gastronomic behaviors, not just behavioral intentions, and

classified them in detail at the micro level from a personal perspective and the macro level from a food citizenship perspective. This is judged to be differentiated from existing studies limited to just behavioral intentions, and it provides rich and valuable interpretations to researchers in related fields in terms of exploring behavioral practices. Moreover, based on the logic that cognitive and internal capabilities such as spiritual intelligence and sustainable commitment are closely related to modern people's interest and behavior toward sustainability, this study combined these novel concepts to expand the scope of previous studies and verified potential relationships between research study variables [56,69]. Therefore, it is believed to be a new and innovative academic study related to consumer psychology and behavior in existing food and restaurant industry research fields.

Furthermore, from a policy perspective, it is urgently needed to introduce educational programs related to food literacy and spiritual intelligence for encouraging public's sustainable gastronomic behavior. Accordingly, the government, food-related departments, and educational institutions should show deeper interests in developing food literacy and spiritual capabilities from an integrated perspective and actively promote education programs and political supports at the national level [24]. In other words, as various stakeholders are involved in the present food system environment, experts working in the fields of food, society, environment, policy, and education should come together to communicate and collaborate to develop effective policies for stable food system toward sustainability. In particular, since overall thinking about food and sustainable diet behaviors are formed during childhood, it is most important to provide systematic educational opportunities about food-related competencies and sustainability to young people [85]. Also, various educational curriculums and facilities should be provided for public to improve the food literacy and spiritual intelligence such as intervention programs at the level of compulsory school education and civic education. Free online courses and urban farming experiences that are easily accessible to the public are believed to be effective in emphasizing interest in and importance of these research notions.

In addition, this study has significant practical implications as follows. If parents in the home environment actively provide proper education to develop food literacy and spiritual intelligence during their children's growth and demonstrate exemplary sustainable citizenship behaviors, their children will learn sustainable ethics and food consumption behaviors voluntarily by watching their parents' conscious practices [90]. It is expected that they will make autonomous efforts to practice sustainable gastronomic behaviors even after childhood and effectively recognize the development of a sustainable society. Furthermore, if food companies show ethical management strategies that reflect the values of a sustainable food system and importance of gastronomic behaviors in their advertising and promotion, it will be powerful in creating a positive

reputation and being remembered by consumers as a company with sincerity and high sense of responsibility. These operating strategies are expected to play a key role in improving the company's brand value and intangible capital. Therefore, this study is expected to be effectively utilized to inform the potential influence of food literacy and spiritual intelligence on sustainable gastronomic behavior for sustainable future.

Limitations and Future Research

There are few limitations to this study. Firstly, although this study was conducted using a sample of all age groups, food literacy competency is contextual depending on the individual's home environment and social situational factors. Therefore, if follow-up studies by classifying samples in detail according to gender, generation, or economic income level are conducted, specialized and meaningful research results can be obtained from various perspectives. Secondly, since food literacy competency research is currently being actively conducted in Western countries, this study was also conducted based on representative previous studies in Western countries. However, an individual's food literacy competency is formed based on society and culture that reflect national characteristics and is greatly influenced by various external factors. Therefore, in future research, there is a need to continuously revise and supplement the concept and scale of food literacy competency to suit the ethnic sentiments, society, and food environment factors of Asian countries or South Korea. In addition, this study only focused on the moderating effects of sustainable commitment level. It is necessary to verify the moderating effects of other influential factors such as gender, generation, education level, and economic income. Therefore, if future studies extend the scope of this study with more various research variables, they will provide meaningful information to researchers for encouraging public's competencies and sustainable gastronomic behaviors.

DATA AVAILABILITY

The dataset of the study is available from the authors upon reasonable request.

AUTHOR CONTRIBUTIONS

Conceptualization, YL; Methodology, YL; Software, YL; Validation, YL; Formal Analysis, YL; Investigation, YL; Resources, YL and TK; Data Curation, YL; Writing—Original Draft Preparation, YL; Writing—Review & Editing, YL and TK; Visualization, YL; Supervision, YL and TK.

CONFLICTS OF INTEREST

The author declares that there is no conflict of interest.

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