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Level of happiness and its association with food literacy among Seoul citizens: results from Seoul Food Survey 2021

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ABSTRACT

BACKGROUND/OBJECTIVES: Happiness is an important factor in life, and food literacy (FL) has been emphasized as a core concept for a happy and healthy life. This study examined the level of happiness of Seoul citizens according to their sociodemographic factors and their association with FL.
SUBJECTS/METHODS: This study used the data from the Seoul Food Survey, a cross-sectional study conducted on 4,039 Seoul citizens from September to October 2021. FL was measured using a validated questionnaire consisting of 33 items from 3 sub-domains: 14 items in the nutrition and safety domain, 8 items in the cultural and relational domain, and 11 items in the socio-ecological domain. Statistical analysis involved descriptive statistics and multivariate regression analysis.
RESULTS: Various sociodemographic factors, such as household income, subjective health status, and food insecurity, were found to be associated with the level of happiness. The level of FL was also associated with the happiness scores. After adjusting for variables associated with happiness, the participants with the highest quartile FL scores were 7.32 times more likely to respond that they were happy than those with the lowest FL score. Three FL domains and total FL showed linear increases in overall happiness after controlling for subjective health status and sociodemographic factors ($P < 0.001$).
CONCLUSIONS: After adjusting for the related covariates, higher levels of FL were associated with higher scores in happiness. Based on this study, it would be meaningful to evaluate ways to intervene in FL to improve the level of happiness among the general population.

Keywords: Food; literacy; happiness; eating behavior; diet surveys

INTRODUCTION

Positive emotions, such as happiness, are essential because they promote health, prevent disease, and significantly impact life [1,2]. Numerous factors, including age, social relationships, education, and economic status, can affect happiness [3,4]. For example, less stressed people generally had a partner or a lover, were physically active, and had a higher level of happiness [5]. On the other hand, those with lower household incomes, poor health,

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Conflict of Interest

The authors declare no potential conflicts of interests.

Author Contributions

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and food insecurity have a lower level of happiness [6,7]. Health literacy is also important for happiness. People with low health literacy had poor health and were significantly less likely to be happy than those with adequate health literacy, even after adjusting for other factors [8,9]. The Fifth National Health Plan also indicated that health literacy was important for happiness and emphasized strategies to increase health literacy to improve health and well-being [10].

Food literacy (FL), which is derived from health literacy, helps people make more appropriate food choices, which is an essential competency for sustainable eating and well-being [11,12]. Many studies reported that people with high FL scores were more likely to show good health indicators or have a healthy diet [13,14]. In contrast, those with low FL scores were more likely to experience food insecurity or a poor diet [14,15]. People who eat breakfast daily and consume fruit and vegetables frequently are likelier to feel happy [5,16]. A healthy diet is closely related to happiness and well-being [17,18]. Therefore, it is necessary to understand FL and its relationship with happiness because the factors closely associated with FL, such as health indicators, diet, and food insecurity, are important for happiness.

FL can influence an individual's sustainable well-being, health indicators, and diet [19]. Many studies have examined the effects of health indicators, food insecurity, and a healthy diet on happiness and their relationship [11,13,14]. On the other hand, no studies have evaluated the association between happiness and FL. The objectives of this study were as follows: 1) evaluate the level of happiness among Seoul citizens according to various sociodemographic and behavioral factors; and 2) assess the association between happiness and FL after adjusting for various covariates that are related to happiness based on the 2021 Seoul Food Survey.

SUBJECTS AND METHODS

Study design and data collection procedure

The Seoul Food Policy Team has conducted the Seoul Food Survey every year since 2018. This survey aimed to measure the perception and interest in food of Seoul citizens, diagnose their overall diet status, and derive a customized policy coping with their demand for food quality and interest. This study used the data from the 2021 Seoul Food Survey, a cross-sectional survey of the entire Seoul area conducted by the Seoul Metropolitan Government. This study employed a stratified cluster sampling method based on the 2020 Population Census conducted by the Korean Bureau of Statistics. This study targeted household members 18 years or older living in Seoul, and 4,039 people participated in the 2021 survey.

The survey was conducted from September 13th to October 29th, 2021, by trained data collectors of K-stat, a survey-specialized company, using a household visit interview. If there were no household members at home, the investigator left the questionnaire and asked the participant to complete it. Before collecting the questionnaire, missing information was checked more conveniently for the participants (in person or by phone). Written consent was obtained from all participants who participated in the survey, and they received a local gift certificate as a reward. The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board of Dankook University (DKU 2020-01-006).

Measures

Sociodemographic characteristics, weight status, subjective health, and food security status

This study measured gender, age, education attainment, household type, occupation, type

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of employment, monthly household income, subjective social class, food security status, and subjective health status as sociodemographic factors. Measured variables were reclassified to be appropriate for analysis. Age was divided into 6 age groups: 18–29, 30–39, 40–49, 50–59, 60–69, and 70 years and older. Education attainment was classified into 3 groups: less than high school, high school graduates, and more than college entrance. There were 4 household types: one-person households, households with couples, households with 2 generations, and others. The occupation was classified into 6 groups: professionals, service/sales, manual workers, students, homemakers, and unemployed. The employment status was divided into types: wage workers (permanent position), temporary or contract-based positions, business owners (self-employed), and others. The monthly household income was classified into 5 groups: < 2.0 million, 2.0–3.5 million, 3.5–5.0 million, 5.0–7.0 million, and ≥ 7.0 million Korean Won (KRW). There were 5 subjective social classes: lowest, lower middle, middle, upper middle, and highest.

The choices of the food security status for the past year were as follows: "1) I was able to consume a sufficient quantity of and variety of food; 2) I was able to consume a sufficient quality of food, but I could not always eat a variety of food; 3) I was unable to consume a sufficient quantity of food from time to time; 4) I was unable to consume a sufficient quantity of food frequently." Response 1 was classified as "quantity and quality sufficient," and response 2 was classified as "quantity sufficient but not quality." Responses 3 and 4 were classified as "quantity and quality insufficient." The subjective health status items asked what the respondent thought about their overall health status. The items were evaluated on an 11-point scale from 0 (very bad) to 10 (very good), and it was classified into 3 groups: not good, moderate, and good. Obesity was determined based on the height and weight provided by the respondent in the self-report method. The body mass index (BMI, kg/m^2) was calculated using these values, and classified into 4 classes according to the criteria presented by the World Health Organization for Asians: underweight (< 18.5 kg/m^2), normal (18.5–22.9 kg/m^2), overweight (23–24.9 kg/m^2), and obese (25 kg/m^2) [20].

Overall happiness in life and FL

The overall happiness in life was measured using a single item (do you feel happy in general?) answered on an 11-point scale (0 being the most unhappy state and 10 being the happiest state). This single-item measure was reported to be valid and stable for community surveys [21]. FL was measured using a validated questionnaire consisting of thirty-three items from 3 sub-domains: 14 items in the nutrition and safety domain, 8 items in the cultural and relational domain, and 11 items in the socio-ecological domain [22]. The development of these items involved a comprehensive approach that included literature reviews, a Delphi survey, test-retest surveys, and one-on-one interviews. The FL questionnaire items were measured on a 5-point Likert scale, ranging from "strongly disagree" to "strongly agree." Detailed information on the FL questionnaire items and their classification can be found elsewhere [22].

Simplified food frequency questionnaire (FFQ)

The simplified FFQ was conducted using items about how much each food was consumed on average in the past year based on their eating habits. The investigated food groups were whole grain, raw vegetables, vegetable side dishes, kimchi and pickles, meat (roast, deep fry, stew, and soup), processed meat, fish, eggs, beans and soybean products, fresh fruits, and milk and dairy products. Nine choices were given, ranging from "less than once a month" to "more than 3 times a day." This study also investigated sugar-sweetened beverages, instant noodles, fast food, and alcoholic beverages, and each item had 5 choices from "I rarely eat" to

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"I eat at least once a day." These variables were reclassified into whole grains, protein foods group, total vegetables, vegetables excluding kimchi and pickles, fruits, sugar-sweetened beverages, instant noodles, and fast food.

For analysis, the intake frequency for each food group was categorized into adequate or non-adequate consumption based on the recommended intake standard for each food group of the Dietary Reference Intakes for Koreans, depending on their gender and age, and the Korea Healthy Eating Index. For example, the criteria for adults are as follows: whole grains ≥ 1 serving/day, protein foods ≥ 5 servings/day for men and proteins ≥ 4 servings/day for women, total vegetables ≥ 7 servings/day, vegetables excluding kimchi and pickles ≥ 4 servings/day, and fruit ≥ 3 servings/day for men and fruit ≥ 2 servings/day for women [23,24]. Less than 3 times a week was set as the criterion after identifying the response distribution of the subjects because there were no recommended intake standards for sugar-sweetened beverages, instant noodles, and fast food.

Statistical analysis

This study calculated the representative values of current Seoul citizens by applying individual sampling weights to all analyses. The happiness of the subjects was scored by conducting descriptive statistics and regression analysis based on the overall happiness. This study also analyzed their overall happiness according to their sociodemographic factors and FL. The subjects' happiness was presented as the arithmetic means and standard deviations. This study analyzed the correlation between the happiness in life and FL after controlling for various sociodemographic factors and applied multivariate regression analysis.

The odds ratio was analyzed by reclassifying whole grains, protein foods group, total vegetables, vegetables, excluding kimchi and pickles, and fruit into 1 (when the intake was equal to or more than the recommended intake criterion) and 0 (when the intake was less than the recommended intake criterion). Moreover, for the analysis, sugar-sweetened beverage, instant noodles, and fast food were reclassified into 1 (less than 3 times a week) and 0 (3 or more times a week). This study identified the distribution of the subjects' happiness scores. The mean happiness score was 6.8, and most responses were concentrated between 7 and 8 points on the 10-point scale. Therefore, 8 points were used as the threshold, and 0–7 and 8–10 were classified as unhappy (n = 2,685, 66.5%, recoded as 0) and happy (n = 1,354, 33.5%, recoded as 1), respectively, for analysis.

A logistic regression model was applied to identify the factors affecting overall happiness along with FL. Model 1 calculated the various sub-groups of the participants using the dummy variables for gender, age, education attainments, weight status, household types, monthly household income, subjective social class, food security status, and subjective health status. In Model 2, the intake of each food group was added to Model 1. The quartile values for the total FL score were added for Model 3. The Akaike Information Criterion (AIC) was calculated and presented to check the model fitness. The association between happiness scores and the sub-domains of FL, as well as the total FL scores, were examined by linear regression analysis, with an adjustment for potential confounding factors, including gender, age, education, BMI, household type, household income, subjective social class, food security, and subjective health status. This study calculated and evaluated the variance inflation factor (VIF) to check the multicollinearity of all regression models. The VIF of the developed regression models did not exceed 2. The significance of all statistical analyses was determined at $P < 0.05$. All analyses were performed using Stata/SE 17.0 (StataCorp LLC, College Station, TX, USA).

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RESULTS

Happiness scores according to the sociodemographic characteristics, weight status, food security status, and subjective health of Seoul Food Survey participants

Table 1 lists the happiness scores according to sociodemographic characteristics, obesity, food security, and subjective health status of subjects who participated in the 2021 Seoul Food Survey. There were 4,039 study participants. The mean happiness score was 6.83 points for men and 6.87 points for women. The happiness score was highest for those 30–39 years old (7.37 points) and lowest for those 70 years or older (6.09 points). In terms of education attainment, more than college entrance had the highest happiness score (7.11 points). A higher level of education tended to increase the happiness score. In terms of household types, the households with an income of KRW ≥ 7.0 million had the highest happiness score (7.51 points), and a higher household income tended to increase the happiness scores. Regarding the subjective social class, the highest class had the highest happiness score (7.35 points). A higher social class tended to show a higher happiness score. In terms of subjective health status, good subjective health showed the highest happiness score (7.07 points), and a better subjective health status tended to increase the happiness score.

Happiness score for 3 domains of FL

Table 2 lists the happiness scores after dividing the 3 domains of FL and total FL by quartiles. First, the happiness score of the nutrition and safety FL was lowest (6.50 points) in the lower first quartile group (Q1) and highest (7.32 points) in the fourth quartile group (Q4). Higher nutrition and safety FL scores tended to increase the happiness scores. Moreover, the happiness scores differed significantly between groups ($P < 0.001$). In the cultural and relational FL, the Q1 had the lowest happiness score (6.38 points), and the Q4 had the highest (7.44 points). The happiness score also tended to increase as the cultural and relational FL scores increased, and the happiness scores were also significantly different between the groups ($P < 0.001$). Similarly, the happiness score of the socio-ecological FL was also the lowest (6.53 points) in Q1 and highest in Q4 (7.33 points). Furthermore, a higher score in the socio-ecological FL tended to increase the happiness score, while the happiness score was significantly different between the groups ($P < 0.001$). In the total FL, which is the sum of 3 domains, Q1 showed the lowest happiness score (6.34 points), and Q4 showed the highest (7.40 points). **Table 2** shows that among the 3 domains of FL, the happiness score gap between quartiles was the largest in the cultural and relational FL.

Factors affecting overall happiness in life

This study built 3 logistic models to identify the factors affecting the overall happiness (**Table 3**). The first model included basic sociodemographic factors: gender, 6 age groups, 3 education attainment groups, 4 weight status groups, 4 household types, 5 monthly household income groups, 5 subjective social classes, 3 food security status groups, and 3 subjective health status groups. The odds ratios showed that the probability of responding to being happy decreased significantly as age and education attainment increased and food security decreased. Conversely, the probability of being happy increased as weight status, monthly mean household income, subjective social class, and subjective health status increased. Other factors, except weight status, showed a significant association.

The second model was developed by adding the intake of each food group to Model 1. Factors that were significant in Model 1 remained significant in Model 2. The probability of being

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Table 1. Happiness scores according to the sociodemographic characteristics, weight, food security, and subjective health status

Variables	Sample	Happiness score
Total	4,039 (100.0)	6.85 ± 1.26
Gender		
Men	1,943 (48.1)	6.83 ± 1.26
Women	2,096 (51.9)	6.87 ± 1.26
Age groups (yrs)		
18–29	805 (19.9)	6.95 ± 1.23
30–39	705 (17.5)	7.37 ± 1.15
40–49	721 (17.9)	7.06 ± 1.10
50–59	726 (18.0)	6.84 ± 1.15
60–69	752 (18.6)	6.41 ± 1.26
≥ 70	329 (8.1)	6.09 ± 1.42
Education attainments		
Less than high school	403 (10.0)	5.88 ± 1.38
High school graduates	1,173 (29.0)	6.64 ± 1.24
More than college entrance	2,462 (61.0)	7.11 ± 1.14
Weight status[1)]		
Underweight	95 (2.4)	6.90 ± 1.15
Normal	2,221 (55.0)	6.97 ± 1.22
Overweight	1,169 (28.9)	6.79 ± 1.23
Obese	554 (13.7)	6.51 ± 1.41
Household types		
One person households	724 (17.9)	6.17 ± 1.40
Households with couples	967 (23.9)	6.82 ± 1.40
Households with 2 generations	2,263 (56.0)	7.08 ± 1.05
Others	85 (2.1)	6.93 ± 1.04
Occupations		
Professionals	1,416 (35.1)	7.25 ± 1.08
Service/Sales	976 (24.2)	6.82 ± 1.14
Manual workers	401 (9.9)	6.02 ± 1.54
Students	324 (8.0)	7.07 ± 1.05
Homemakers	724 (18.4)	6.70 ± 1.29
Unemployed	180 (4.5)	6.00 ± 1.22
Type of employment		
Wage workers (permanent position)	1,904 (47.1)	7.10 ± 1.14
Temporary (contract based)	397 (9.8)	6.16 ± 1.53
Business owners	450 (11.1)	6.83 ± 1.12
Others	42 (1.0)	7.14 ± 1.28
N/A (students, homemakers, unemployed)	1,246 (30.8)	-
Monthly household income (KRW)		
< 2 million	389 (9.6)	5.81 ± 1.39
2–3.5 million	932 (23.1)	6.51 ± 1.23
3.5–5 million	1,047 (25.9)	6.90 ± 1.17
5–7 million	1,117 (27.7)	7.12 ± 1.15
≥ 7 million	555 (13.7)	7.51 ± 0.94
Subjective social class		
Lowest	528 (13.1)	6.11 ± 1.66
Lower middle	739 (18.3)	6.50 ± 1.33
Middle	1,082 (26.8)	6.77 ± 1.18
Upper middle	670 (16.6)	7.20 ± 1.00
Highest	1,020 (25.3)	7.35 ± 0.86
Food security status		
Quantity and quality sufficient	3,208 (79.4)	7.02 ± 1.14
Quantity sufficient but not quality	655 (16.2)	6.09 ± 1.38
Quantity and quality insufficient	176 (4.4)	6.58 ± 1.62
Subjective health status		
Not good	140 (3.5)	5.06 ± 1.36
Moderate	422 (10.4)	5.68 ± 1.21
Good	3,477 (86.1)	7.07 ± 1.12

Values are presented as number (%) or mean ± SD.
KRW, Korean Won.
[1)]Weight status was categorized based on body mass index (kg/m^2): underweight < 18.5, normal 18.5–22.9, overweight 23–24.9, and obese ≥ 25.

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Table 2. Happiness scores according to the quartile by the 3 domains of FL

Variables	FL quartile	Happiness score	*P*-value
Nutrition and safety FL	Q1	6.50 ± 1.25	< 0.001
	Q2	6.82 ± 1.17	
	Q3	7.03 ± 1.18	
	Q4	7.32 ± 1.16	
Cultural and relational FL	Q1	6.38 ± 1.35	< 0.001
	Q2	6.80 ± 1.11	
	Q3	7.17 ± 1.15	
	Q4	7.44 ± 1.15	
Socio-ecological FL	Q1	6.53 ± 1.21	< 0.001
	Q2	6.65 ± 1.34	
	Q3	7.10 ± 1.12	
	Q4	7.33 ± 1.18	
Total FL	Q1	6.34 ± 1.29	< 0.001
	Q2	6.72 ± 1.26	
	Q3	7.01 ± 1.09	
	Q4	7.40 ± 1.12	

Values are presented as mean ± SD.
FL, food literacy.

happy was 1.38 times higher when the protein foods group satisfied the recommended intake frequency better. The probability of being happy was 1.80 times higher when the fast food group satisfied the recommended intake frequency better. Both cases showed a significant association. On the other hand, the probability of being happy was significantly lower when the sugar-sweetened beverages group and the instant noodles group satisfied the recommended intake frequency better.

The final model (Model 3) included the total FL score. When the total FL was added, gender, age, education attainment, monthly household income, subjective social class, food security status, subjective health status, protein foods group, fruits group, sugar-sweetened beverages group, and instant noodles group were associated with happiness. The noteworthy result of this model was that a higher total FL score increased the probability of being happy even after controlling for all other factors. The Q2, Q3, and Q4 groups showed a 2.29, 2.74, and 7.32 times higher probability, respectively, than Q1, with the lowest total FL score, and all groups revealed a significant relationship. Model 3 showed the lowest AIC value, indicating optimal fit.

Association between overall happiness in life and FL

Table 4 lists the results of analyzing whether the overall happiness in life is related to the 3 FL domains and total FL. Even after controlling for all sociodemographic factors, 3 FL domains and total FL showed significant association with overall happiness. First, the overall happiness in life of the nutrition and safety FL increased by 0.142, 0.388, and 0.485 points for Q2, Q3, and Q4, respectively, compared to Q1 (*P* for trend < 0.001). In the cultural and relational FL, the overall happiness in life increased by 0.282, 0.608, and 0.755 points for Q2, Q3, and Q4, respectively, compared to Q1 (*P* for trend < 0.001). In the socio-ecological FL, compared to Q1, the overall happiness in life increased linearly by 0.133, 0.434, and 0.592 points for Q2, Q3, and Q4, respectively (*P* for trend < 0.001). Lastly, as the score of the total FL increased, the overall happiness in life for Q2, Q3, and Q4 was 0.313, 0.493, and 0.811 points higher, respectively, than Q1 (*P* for trend < 0.001).

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Table 3. Factors affecting overall happiness using logistic regression analysis

Variables	Variable categories	Model 1		Model 2		Model 3	
		ORs[1] (95% CI)	*P*-value	ORs[1] (95% CI)	*P*-value	ORs[1] (95% CI)	*P*-value
Gender	Men (Ref.)	1.00		1.00		1.00	
	Women	1.12 (0.96–1.30)	0.157	1.16 (0.98–1.37)	0.094	0.76 (0.63–0.92)	0.004
Age groups (yrs)	18–29 (Ref.)	1.00		1.00		1.00	
	30–39	1.48 (1.11–1.98)	0.008	1.48 (1.10–1.98)	0.009	1.10 (0.81–1.50)	0.543
	40–49	1.21 (0.90–1.62)	0.199	1.21 (0.90–1.62)	0.215	0.85 (0.62–1.16)	0.308
	50–59	0.74 (0.54–1.00)	0.050	0.76 (0.56–1.04)	0.091	0.60 (0.43–0.84)	0.003
	60–69	0.61 (0.43–0.86)	0.004	0.64 (0.45–0.92)	0.015	0.54 (0.37–0.79)	0.001
	≥ 70	0.46 (0.28–0.75)	0.002	0.50 (0.30–0.82)	0.007	0.45 (0.27–0.75)	0.002
Education attainments	Less than high school (Ref.)	1.00		1.00		1.00	
	High school graduates	0.51 (0.35–0.76)	0.001	0.50 (0.33–0.74)	0.001	0.60 (0.40–0.91)	0.016
	More than college entrance	0.43 (0.28–0.65)	< 0.001	0.43 (0.28–0.66)	< 0.001	0.57 (0.36–0.89)	0.014
Weight status[2]	Underweight	0.55 (0.31–0.97)	0.040	0.56 (0.32–0.99)	0.046	0.63 (0.35–1.12)	0.114
	Normal (Ref.)	1.00		1.00		1.00	
	Overweight	0.91 (0.77–1.08)	0.280	0.88 (0.74–1.05)	0.157	0.87 (0.73–1.05)	0.139
	Obese	1.13 (0.91–1.41)	0.259	1.05 (0.84–1.31)	0.678	1.18 (0.93–1.49)	0.175
Type of household	One-person households (Ref.)	1.00		1.00		1.00	
	Households with couples	1.32 (0.92–1.90)	0.128	1.39 (0.96–2.00)	0.080	1.44 (0.99–2.10)	0.056
	Households with 2 generations	0.92 (0.64–1.33)	0.666	0.97 (0.67–1.40)	0.851	1.02 (0.70–1.50)	0.900
	Others	1.05 (0.55–1.98)	0.891	0.98 (0.51–1.86)	0.946	1.36 (0.70–2.63)	0.362
Monthly household income (KRW)	< 2 million (Ref.)	1.00		1.00		1.00	
	2–3.5 million	0.88 (0.56–1.38)	0.585	0.88 (0.56–1.39)	0.584	0.87 (0.54–1.38)	0.548
	3.5–5 million	1.13 (0.71–1.81)	0.605	1.09 (0.68–1.75)	0.721	0.97 (0.60–1.58)	0.909
	5–7 million	1.39 (0.87–2.24)	0.169	1.35 (0.84–2.17)	0.222	1.14 (0.69–1.86)	0.614
	≥ 7 million	2.39 (1.45–3.93)	0.001	2.44 (1.47–4.04)	0.001	2.26 (1.34–3.82)	0.002
Subjective social class	Lowest (Ref.)	1.00		1.00		1.00	
	Lower middle	0.78 (0.57–1.08)	0.130	0.79 (0.57–1.09)	0.145	0.74 (0.53–1.03)	0.071
	Middle	1.19 (0.89–1.58)	0.232	1.24 (0.93–1.66)	0.142	1.05 (0.78–1.42)	0.753
	Upper middle	1.63 (1.21–2.20)	0.001	1.60 (1.18–2.17)	0.002	1.41 (1.03–1.93)	0.033
	Highest	1.91 (1.43–2.56)	< 0.001	2.07 (1.53–2.79)	< 0.001	1.92 (1.41–2.61)	< 0.001
Food security status	Quantity and quality sufficient (Ref.)	1.00		1.00		1.00	
	Quantity sufficient but not quality	0.42 (0.32–0.55)	< 0.001	0.44 (0.33–0.57)	< 0.001	0.52 (0.39–0.69)	< 0.001
	Quantity and quality insufficient	0.97 (0.64–1.45)	0.867	1.00 (0.66–1.50)	0.982	1.49 (0.98–2.27)	0.062
Subjective health status	Not good (Ref.)	1.00		1.00		1.00	
	Moderate	1.47 (0.50–4.32)	0.487	1.52 (0.52–4.50)	0.447	1.26 (0.42–3.78)	0.677
	Good	9.50 (3.41–26.47)	< 0.001	10.19 (3.64–28.51)	< 0.001	6.70 (2.36–18.98)	< 0.001
Major food groups intake frequency[3]	Whole grains			0.88 (0.75–1.04)	0.130	0.84 (0.71–1.00)	0.048
	Protein foods group			1.38 (1.08–1.76)	0.010	1.51 (1.17–1.94)	0.001
	Total vegetables			0.94 (0.74–1.19)	0.624	0.86 (0.67–1.10)	0.226
	Vegetables, excluding kimchi and pickles			1.19 (0.95–1.51)	0.137	1.18 (0.93–1.50)	0.183
	Fruit			0.81 (0.65–1.01)	0.058	0.71 (0.57–0.89)	0.003
	Sugar-sweetened beverages			0.76 (0.66–0.89)	< 0.001	0.81 (0.69–0.95)	0.011
	Instant noodles			0.61 (0.46–0.81)	0.001	0.66 (0.49–0.89)	0.006
	Fast food			1.80 (1.15–2.80)	0.010	1.55 (0.98–2.44)	0.061
Total FL	Q1 (Ref.)					1.00	
	Q2					2.29 (1.81–2.91)	< 0.001
	Q3					2.74 (2.15–3.49)	< 0.001
	Q4					7.32 (5.69–9.42)	< 0.001
AIC		4,584.50		4,553.50		4,280.60	

The outcome variable was the overall happiness in life, categorized into 2 groups: less than 8 points were not happy (0), and 8 points or more were happy (1).
OR, odds ratio; CI, confidence interval; KRW, Korean Won; FL, food literacy; AIC: Akaike Information Criterion.
[1]ORs were obtained by logistic regression.
[2]Weight status was categorized based on the body mass index (kg/m^2): underweight < 18.5, normal 18.5–22.9, overweight 23–24.9, and obese ≥ 25.
[3]Major food groups intake frequency: whole grains, protein foods group, total vegetables, vegetables excluding kimchi and pickles, fruit: intake above recommended intake frequency standard (1), intake below recommended intake frequency standard (0), and sugar-sweetened beverages, instant noodles, fast food: less than 3 times a week (1), and more than 3 times a week (0).

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Table 4. Association between the overall happiness in life and FL

Variables	FL quartile	Coefficient	SE	*P*-value	*P* for trend[1)]
Nutrition and safety FL	Q1 (Ref.)	-			< 0.001
	Q2	0.142	0.048	0.003	
	Q3	0.388	0.047	< 0.001	
	Q4	0.485	0.052	< 0.001	
Cultural and relational FL	Q1 (Ref.)	-			< 0.001
	Q2	0.282	0.041	< 0.001	
	Q3	0.608	0.049	< 0.001	
	Q4	0.755	0.052	< 0.001	
Socio-ecological FL	Q1 (Ref.)	-			< 0.001
	Q2	0.133	0.044	0.002	
	Q3	0.434	0.046	< 0.001	
	Q4	0.592	0.051	< 0.001	
Total FL	Q1 (Ref.)	-			< 0.001
	Q2	0.313	0.046	< 0.001	
	Q3	0.493	0.048	< 0.001	
	Q4	0.811	0.051	< 0.001	

All models were further adjusted for sex, age, education attainments, body mass index, household type, monthly household income, subjective social class, food security status, and subjective health status for any potential confounding effect.
FL, food literacy.
[1)]Test for linearity.

DISCUSSION

This study examined the level of happiness among citizens of Seoul and the association between FL while adjusting for covariates using the 2021 Seoul Food Survey data. Various sociodemographic factors positively or negatively influenced happiness among representative samples of the citizens of Seoul. Moreover, even after adjusting for other variables, the group with the highest total FL score was 7.32 times more likely to be happy than the group with the lowest FL score. These results suggested that FL was an important factor for happiness.

Many studies have reported that women, education level, income level, subjective social class, obesity, and perceived health status are factors affecting happiness [8,25,26]. Similarly, the results of this study also showed that women, obesity, and those with higher income levels, subjective social classes, and subjective health status had higher happiness scores. In particular, the probability of being happy was 6.70 times higher when the subject was perceived to have better health subjectively. Weech-Maldonado *et al.* [8] showed that the perceived health status mediated the relationship between sufficient income and happiness. They reported that people with sufficient income were likelier to have a better perceived-health status and a higher possibility of happiness [8]. Godoy-Izquierdo *et al.* [26] also reported that overweight or obese people with higher body satisfaction and positivity were likelier to be happy. This study confirmed various factors influencing happiness. On the other hand, it was difficult to determine if these factors were mediated by each other and affect happiness. Therefore, additional studies will be needed to understand how various sociodemographic factors are mediated and affect happiness, as shown by previous studies.

Many studies suggested that the relationship between happiness and age would show a U-shaped curve, where happiness decreases from the teenage years and increases again between 40 and 50 years old [27,28]. Unlike previous studies, the present results showed that the level of happiness was highest in the 30s, which decreased from the 40s, which agreed with the results reported by Kye and Park [5] conducted in South Korea. Chang [29] reported

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that anxiety about aging, economic status, and family support influenced the happiness of middle-aged Koreans. As life expectancy increases, promoting the happiness of middle-aged people is important for old age. Identifying the factors that affect their happiness and developing strategies to enhance the present and future happiness of middle-aged people while considering these factors are essential.

No study analyzed the relationship between FL and happiness. In this study, various sociodemographic factors affected happiness, such as monthly household income, subjective social class, and subjective health status. These factors influenced FL in previous studies [30,31]. On the other hand, even after controlling for other sociodemographic factors, the level of happiness increased significantly when the 3 FL domains and total FL scores were higher. In particular, the group with the highest total FL score was 7.32 times more likely to be happy than those with the lowest total FL score.

The cultural and relational domains of the FL index were strongly associated with happiness. These domains were composed of the following items: finding cooking pleasurable, concentrating while eating, savoring different senses while eating, feeling grateful while eating, enjoying sharing food with others, talking about food with others, being interested in foods from different cultures, and thinking that traditional foods are important for diet and culture [22]. During the development of FL questionnaires, the focus was on the relational and cultural aspects of food rather than the overall life satisfaction or happiness related to food. Hence, the current study investigated the relationship between FL and actual happiness experienced by people and explored differences in this relationship across the sub-domains of the index. Furthermore, this study aimed to determine if FL is still related to happiness after controlling for other variables. The statistically significant results suggest that FL may be a surrogate variable for happiness. Therefore, future research should explore whether building positive relationships with food and other individuals through food can enhance happiness.

Relational factors are important because they greatly influence happiness [32], and eating together is also closely related to the quality of life, such as depression, anxiety, and happiness [33]. Previous studies reported that the stress, anxiety, and depression of the subjects increased, and their happiness decreased because the relational factors have deteriorated since the coronavirus disease 2019 pandemic [34,35]. The cultural and relational domain is important because many countries and cities, in addition to Seoul, focus on happiness as the ultimate goal of food policy [36-38]. As a result, the cultural and relational domain must be considered for a happy diet and life, and it is necessary to develop an FL program to promote this domain.

This study had some limitations. First, happiness, the key variable of this study, was surveyed using only one item (how happy a person perceived their life to be). The limitation of the data is that only a few items of the 2021 Seoul Food Survey were approximately psychological variables related to happiness. Hence, the results should be interpreted with caution. Nevertheless, Abdel-Khalek [21], who measured with a single item, showed that, similar to the present study, measuring happiness with a single item is a reliable and valid result compared to other questionnaires with more items. Second, although this study found that FL and happiness were related, it could not conclude that these 2 factors were causal. Nevertheless, the present results may indicate the need for policies and programs to improve FL to promote the happiness index. Lastly, food intake was not measured using a validated questionnaire that can accurately estimate the exact amount of food consumption. Therefore, the relationship between FL and

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food intake should be interpreted cautiously. Despite these limitations, this study is meaningful because it shows that FL is a very important factor for explaining happiness in life, in addition to the many other factors influencing happiness reported elsewhere.

Based on the findings of this study, suggestions for future strategies to improve FL and happiness can be made. First, the study found that the happiness score of individuals living alone was the lowest and that the cultural and relational sub-domain of FL had the greatest association with happiness. While the cross-sectional nature of the data makes causality unclear, developing FL improvement programs targeting individuals living alone could help build FL and relationships within the community. Community kitchens could educate people about key components of FL while enhancing social bonds and community members' happiness. Second, well-designed interventions for FL should be developed to understand how they can affect food intake, subjective health status, and happiness. This study found a close relationship between happiness and FL after adjusting for other vital covariates. Therefore, it is important to understand how these factors influence each other. Such interventions may help find effective ways to improve people's diet and overall happiness through FL.

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REFERENCES

1. Jyväkorpi SK, Urtamo A, Pitkälä KH, Strandberg TE. Happiness of the oldest-old men is associated with fruit and vegetable intakes. Eur Geriatr Med 2018;9:687-90. PUBMED | CROSSREF
2. Veenhoven R. Healthy happiness: effects of happiness on physical health and the consequences for preventive health care. J Happiness Stud 2008;9:449-69. CROSSREF
3. Chen W. How education enhances happiness: comparison of mediating factors in four East Asian countries. Soc Indic Res 2012;106:117-31. CROSSREF
4. Sasaki Y, Shobugawa Y, Nozaki I, Takagi D, Nagamine Y, Funato M, Chihara Y, Shirakura Y, Lwin KT, Zin PE, et al. Association between happiness and economic status among older adults in two Myanmar regions. Int J Environ Res Public Health 2022;19:3216. PUBMED | CROSSREF
5. Kye SY, Park K. Health-related determinants of happiness in Korean adults. Int J Public Health 2014;59:731-8. PUBMED | CROSSREF
6. Frongillo EA, Nguyen HT, Smith MD, Coleman-Jensen A. Food insecurity is more strongly associated with poor subjective well-being in more-developed countries than in less-developed countries. J Nutr 2019;149:330-5. PUBMED | CROSSREF
7. Gu Y, Wei HL. Significant indicators and determinants of happiness: evidence from a UK survey and revealed by a data-driven systems modelling approach. Soc Sci 2018;7:53. CROSSREF
8. Weech-Maldonado R, Miller MJ, Lord JC. The relationships among socio-demographics, perceived health, and happiness. Appl Res Qual Life 2017;12:289-302. PUBMED | CROSSREF
9. Angner E, Miller MJ, Ray MN, Saag KG, Allison JJ. Health literacy and happiness: a community-based study. Soc Indic Res 2010;95:325-38. CROSSREF
10. Ministry of Health and Welfare (KR); Korea Health Promotion Institute. The 5th Health Plan (2021–2030). Seoul: Ministry of Health and Welfare; 2020.
11. LeBlanc J, Ward S, LeBlanc CP. The association between adolescents' food literacy, vegetable and fruit consumption, and other eating behaviors. Health Educ Behav 2022;49:603-12. PUBMED | CROSSREF
12. Vidgen HA, Gallegos D. Defining food literacy and its components. Appetite 2014;76:50-9. PUBMED | CROSSREF

13. Palumbo R, Adinolfi P, Annarumma C, Catinello G, Tonelli M, Troiano E, Vezzosi S, Manna R. Unravelling the food literacy puzzle: evidence from Italy. Food Policy 2019;83:104-15. CROSSREF
14. Begley A, Paynter E, Butcher LM, Dhaliwal SS. Examining the association between food literacy and food insecurity. Nutrients 2019;11:445. PUBMED | CROSSREF
15. Khorramrouz F, Doustmohammadian A, Eslami O, Khadem-Rezaiyan M, Pourmohammadi P, Amini M, Khosravi M. Relationship between household food insecurity and food and nutrition literacy among children of 9-12 years of age: a cross-sectional study in a city of Iran. BMC Res Notes 2020;13:433. PUBMED | CROSSREF
16. Lesani A, Mohammadpoorasl A, Javadi M, Esfeh JM, Fakhari A. Eating breakfast, fruit and vegetable intake and their relation with happiness in college students. Eat Weight Disord 2016;21:645-51. PUBMED | CROSSREF
17. Peltzer K, Pengpid S. Dietary consumption and happiness and depression among university students: a cross-national survey. J Psychol Afr 2017;27:372-7. CROSSREF
18. Głąbska D, Guzek D, Groele B, Gutkowska K. Fruit and vegetable intake and mental health in adults: a systematic review. Nutrients 2020;12:115. PUBMED | CROSSREF
19. Palumbo R. Sustainability of well-being through literacy. The effects of food literacy on sustainability of well-being. Agricu Agric Sci Procedia 2016;8:99-106. CROSSREF
20. World Health Organization. Obesity: Preventing and Managing the Global Epidemic. Geneva: World Health Organization; 2000.
21. Abdel-Khalek AM. Measuring happiness with a single-item scale. Soc Behav Personal 2006;34:139-50. CROSSREF
22. Yoo H, Jo E, Lee H, Park S. Development of a food literacy assessment tool for healthy, joyful, and sustainable diet in South Korea. Nutrients 2022;14:1507. PUBMED | CROSSREF
23. Ministry of Health and Welfare (KR); The Korean Nutrition Society. The Application of 2020 Dietary Reference Intakes for Koreans. Sejong: Ministry of Health and Welfare; 2022.
24. Yook SM, Park S, Moon HK, Kim KR, Shim JE, Hwang J. Development of Korean healthy eating index for adults using the Korea National Health and Nutrition Examination Survey data. J Nutr Health 2015;48:419-28. CROSSREF
25. Azizi M, Mohamadian F, Ghajarieah M, Direkvand-Moghadam A. The effect of individual factors, socioeconomic and social participation on individual happiness: a cross-sectional study. J Clin Diagn Res 2017;11:VC01-04. PUBMED | CROSSREF
26. Godoy-Izquierdo D, González-Hernández J, Rodríguez-Tadeo A, Lara R, Ogallar A, Navarrón E, Ramírez MJ, López-Mora C, Arbinaga F. Body satisfaction, weight stigma, positivity, and happiness among Spanish adults with overweight and obesity. Int J Environ Res Public Health 2020;17:4186. PUBMED | CROSSREF
27. Laaksonen S. A research note: happiness by age is more complex than U-shaped. J Happiness Stud 2018;19:471-82.
28. Beja EL Jr. The U-shaped relationship between happiness and age: evidence using world values survey data. Qual Quant 2018;52:1817-29. CROSSREF
29. Chang HK. The health status, aging anxiety, social networking, generativity, and happiness of late middle-aged adults. J Korean Acad Soc Nurs Educ 2021;27:392-401. CROSSREF
30. Begley A, Butcher LM, Bobongie V, Dhaliwal SS. Identifying participants who would benefit the most from an adult food-literacy program. Int J Environ Res Public Health 2019;16:1272. PUBMED | CROSSREF
31. Skeaff S, Ware L, Davis N, Power D, Russell K, Cameron C, Skeaff M. The association between socio-demographic and anthropometric variables and food literacy scores in elementary school children. FASEB J 2018;31:432.6. CROSSREF
32. Lakey B. Perceived social support and happiness: the role of personality and relational processes. In: Boniwell I, David SA, Ayers AC, editors. Oxford Handbook of Happiness. Oxford: Oxford University Press; 2013. p. 847-59.
33. Choi MJ, Park YG, Kim YH, Cho KH, Nam GE. Eating together and health-related quality of life among Korean adults. J Nutr Educ Behav 2020;52:758-65. PUBMED | CROSSREF
34. Greyling T, Rossouw S, Adhikari T. The good, the bad and the ugly of lockdowns during COVID-19. PLoS One 2021;16:e0245546. PUBMED | CROSSREF
35. Choi I, Kim JH, Kim N, Choi E, Choi J, Suk HW, Na J. How COVID-19 affected mental well-being: an 11-week trajectories of daily well-being of Koreans amidst COVID-19 by age, gender and region. PLoS One 2021;16:e0250252. PUBMED | CROSSREF

36. Greater London Authority. The London Food Strategy: Healthy and Sustainable Food for London. London: Greater London Authority; 2018.
37. Food Policy Team of the Seoul Metropolitan Government. 2021 Seoul Food Survey (SFS). Seoul: Food Policy Team of the Seoul Metropolitan Government; 2022.
38. Brighton and Hove Food Partnership. Brighton and Hove Food Strategy Action Plan 2018-2023. Brighton, Hove: Brighton and Hove Food Partnership; 2018.