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Relationships among nutrition knowledge level, healthy eating obsessions, body image, and social media usage in females: a cross-sectional study

Elif Sahin[1,2] and Nevin Sanlier[1*]

Abstract

Background This study examined the relationships among female's nutrition knowledge levels, diet practices, healthy eating obsessions, body perceptions, and social media usage.

Subjects and methods The study included 613 voluntarily participating females aged 18–60 years. Data including demographic information, anthropometric measurements, whether they follow a diet or not, and ORTO-R, Body Shape Questionnaire (BSQ-34), Bergen Social Media Addiction Scale (BSMAS), and General and Sport Nutrition Knowledge (GeSNK) Scale scores were collected.

Results The participants' mean age was 28.47 ± 9.38 years. Mean scores were 17.5 ± 5.1 for the ORTO-R scale, 89.2 ± 40.2 for the BSQ-34, 38.6 ± 12.5 for the GeSNK, and 17.3 ± 6.1 for the BSMAS. Statistically significant differences were found among the participants' total ORTO-R, BSQ-34, and GeSNK scores according to body mass index (BMI) and education level. Statistically significant relationships were also found among total ORTO-R, BSMAS, BSQ-34, and GeSNK scores. ORTO-R scores were positively correlated with BSMAS ($r = 0.475$, $p < 0.05$) and BSQ-34 ($r = 0.685$, $p < 0.05$) scores, while they were negatively correlated with GeSNK scores ($r = -0.117$, $p < 0.05$). There was a positive correlation between BMI and BSQ-34 scores ($r = 0.380$, $p < 0.001$) and between BMI and ORTO-R scores ($r = 0.130$, $p < 0.001$), while there was a negative correlation ($r = -0.176$, $p < 0.001$) between BMI and GeSNK scores.

Conclusions Social media is a fast, important, and effective tool for the sharing of information. Thus, social media may be effective in strengthening individuals' nutrition knowledge, nutrition obsessions, body perceptions. Therefore, it would be beneficial to provide training for individuals to use social media consciously and providing nutritional literacy will be effective.

Keywords Orthorexia nervosa, Healthy eating obsession, Body image disorder, Body image disfunction, Body dissatisfaction, Social media, Nutrition knowledge

Introduction

The promotion of an ideal of thin beauty in the media influences societal perceptions of beauty as thinness and thinness as beauty. Inconsistencies between one's desired and actual body lead individuals to worry about their bodies and develop body dissatisfaction over time. As distorted body perceptions cause psychological distress,

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they are effective in the development of disordered eating behaviours [1]. Although women are less likely and have a harder time achieving the media-imposed thinness, they are more likely than men to receive negative criticism about their bodies and to be discriminated against if they are overweight. Therefore, it is to be expected that women are more likely to be dissatisfied with their bodies and to be more likely to diet than men [2]. There is a relationship between the frequency with which a person compares their physical appearance to that of those they follow on social media and body dissatisfaction and the desire for thinness [3]. There are some theories that can help us better understand the impact of social media on body image and eating behaviors. The sociocultural theory emphasizes that individuals feel a strong need to conform to body ideals, and this interaction is shaped by social factors (family, peers, media). Social media, in particular, allows individuals to constantly review their body image, make comparisons, and internalize the ideal of thinness. This can lead to eating disorders and compensatory eating behaviors. Feminist theory argues that women internalize a third-person perspective on their appearance, which leads to habitual body surveillance and dissatisfaction. Social media further deepens this process, as users create idealized online personalities while experiencing a mismatch with their less perfect real bodies. This mismatch can lead to body image concerns and compensatory eating behaviors. Social identity theory posits that individuals form their identity through group memberships, and on social media, body-related norms can be reinforced through online communities such as weight loss groups. These groups can shape body image and eating behaviors. The Uses and Gratifications Theory suggests that individuals select social media content based on their inner traits and interests, and these selections can increase sensitivity to body image concerns and disordered eating behaviors [4].

A disordered eating behavior that has recently gained scientific interest is orthorexia nervosa (ON). ON is described as an obsession with healthy eating, in which health concerns lead to an extreme preoccupation with healthy food [5]. Social media posts about diet, healthy eating, and ideal bodies made by a wide range of users, including celebrities, affect the eating habits of their followers and may lead to disordered eating behaviours such as orthorexia nervosa (ON) [6]. ON was introduced to the literature by Dr. Steve Bratman in 1997 as an obsession with healthy eating [7]. ON is a new concept related to eating behavior disorders and is a pathological obsession for biologically pure foods that can lead to food restrictions, obsessive thoughts about food, and dissatisfaction [8]. Diets recommended by the media as "healthy" and the popularization of fad diets may trigger ON [9]. In attempting to follow such diets, individuals may become obsessed with 'clean', 'pure', and 'healthy' diets [10]. In Laakso's study one participant stated that he stopped consuming white foods because she believed that white foods would make her fat, another participant stated that he eliminated fruits and vegetables from her diet over time because she found a low-carbohydrate diet healthier, and another participant stated that he consumed raw or very lightly cooked vegetables, indicating that restrictive dietary patterns are a major risk factor for ON [11]. Posts shared on social media offer guidance in terms of individuals' food preferences, but this may lead to the development and progression of various health problems as a result of unhealthy nutritional behaviours. When individuals change their own nutritional behaviours to match those of people they follow on social media, a transition from healthy to unhealthy nutritional behaviour occurs over time [12–14]. With the influence of social media, irregular and unhealthy food consumption habits are more likely to emerge [15] In a blog where those diagnosed with ON shared their experiences, it was stated that the internet and social media normalize detoxing, removing or restricting a certain food from the diet [12]. In a study to evaluate the ON behaviors of bloggers, a participant who started detoxing after being offered an offer on a web page clearly demonstrates the impact of social media on ON [11].

Recently, social media has been recognized as an important source for obtaining nutritional information. Bany-Yasin et al. found that youth (15–24 yrs.) were more dependent on social media, with 87% using it as a primary source of nutrition knowledge, while adults (≥ 25 yrs.) demonstrated that 43% of them used social media. The results indicate that the main source of knowledge is social media, followed by mass media [16]. There is no large-scale study investigating the impact of social media on nutritional knowledge levels in Turkey.

The present study was conducted to investigate the relationships among social media usage and nutrition knowledge levels, healthy eating obsessions, and body perceptions in females. The reason why only females were included in the study is that females spend more time on social media than men [17], females are more interested in visual content on social media and have a distortion in their body image [18, 19], and females are more likely to develop an ON [20]. Also studies have reported that women have higher nutritional knowledge levels than men [16, 21].The reason for keeping the age range wide is that studies generally focus on adolescents, but adult women are also more likely to be affected by social media.

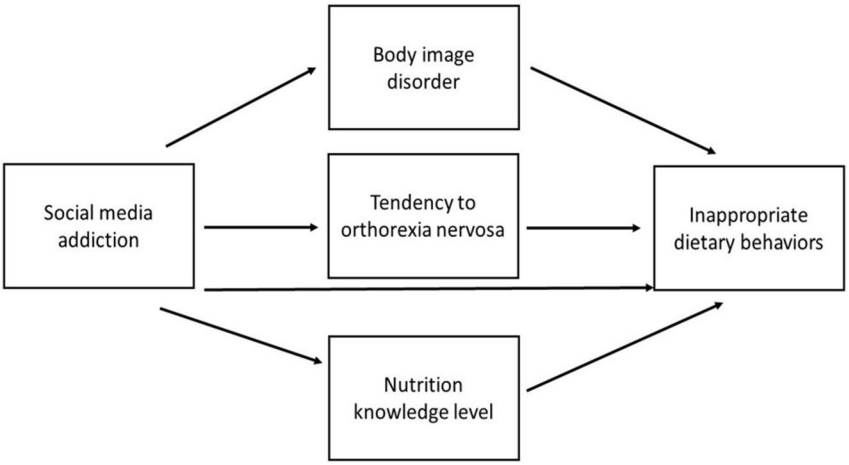

Fig. 1 General plan of the study

Subjects and methods

Study design, participants, and procedure

The sample size in the study was determined as at least 330 people using the G-POWER 3.1 package program, taking into account literature data, 90% power and α: 0.05. This study was conducted with females volunteers between the ages of 18 and 60 years. The responses of 613 volunteer women were evaluated within the scope of the study. Data were collected between December 2021 and February 2022. Individuals under the age of 18 or over the age of 60, those who were pregnant or breastfeeding, and those with mental illness were not included in the research. In order for the survey to be understandable and accurately answered by the participant, those with mental illness; pregnant women, since body weight measurements cannot be taken during pregnancy; and breastfeeding women, since current body weight measurements will not reflect overall body weight, were excluded from the study. In addition, the physiological increase in body weight of pregnant and breastfeeding women may be a possible cause of deterioration in their body perception.

The individuals participating in the study first read the Informed Consent Form located in the introductory section of the administered questionnaire. They were given brief information about the purpose of the study, its methodology, the voluntariness of participation, and assurances of anonymity and confidentiality. The voluntary consent form was then signed by the participants. A pilot study was first carried out with 30 individuals and changes were made to questions that were not comprehended fully. The finalized questionnaire forms were administered by the researchers to participants face to face in a comfortable and calm setting and were completed in approximately 20 min. Questionnaire forms were completed by the individuals participating in the study and incomplete forms were not evaluated.

General plan of the study is given in Fig. 1.

Data collection and evaluation

The questionnaire form used in this study consisted of 7 sections encompassing demographics, anthropometric measurements, and 4 scales. These sections included a form for general information (6 items), a form for anthropometric measurements (3 items), the Bergen Social Media Addiction Scale (BSMAS) (6 items), the ORTO-R Scale (6 items), the General and Sport Nutrition Knowledge Questionnaire (GeSNK) (29 items), and the Body Shape Questionnaire (BSQ- 34) (34 items).

General information

This section included questions about the participant's age, education level, occupation, presence of chronic diseases, and whether the participant followed nutrition-related information on social media or engaged in physical activity.

Measures

Bergen Social Media Addiction Scale (BSMAS)

The BSMAS [22] is an adaptation of the Bergen Facebook Addiction Scale [23] and it contains 6 items reflecting the core addiction elements of salience, conflict, mood modification, withdrawal, tolerance, and relapse [24]. Each question is answered based on experiences during the past year using a 5-point Likert-type scale, with responses ranging from 'very rarely' (1 point) to 'very often' (5 points), thus yielding total scores in the range of 6 to 30. Monacis et al. [25] showed that the Italian version of the BSMAS in the 16–40 age group fitted the model to the data excellently, thus confirming the single-factor

structure of the scale. The scale's Cronbach alpha value was found to be 0.877 in this study.

ORTO-R scale

The ORTO-R scale, developed by Rogoza and Donini [26], contains 6 items. It is a revised version of the 15-item ORTO-15 scale developed by Donini [27] because the ORTO- 15 scale showed an unstable factor structure in different populations. There is no cut-off point for this scale. Individuals are not classified as having ON according to their ORTO-R scores; thus, the scale does not report a prevalence rate. Instead, the scores obtained from the scale are used for comparisons between groups. Kaya et al. [28] showed that the Turkish version of ORTO-R is a valid and reliable tool to assess orthorexic behaviors in the adult populations in a theoretically meaningful way. We found the Cronbach alpha value is 0.766 in this study.

General and Sports Nutrition Knowledge Questionnaire (GeSNK)

In this study, the 29-item General Nutrition Knowledge section of the GeSNK was used. The scale was developed by Calella et al. [29]. The first 8 questions address the macro- and micronutrient contents of some foods and the possible responses are 'high', 'low or not present', and 'I don't know'. For 20 questions, the possible responses are 'true', 'false', and 'I don't know', while one question is a multiple-choice question. One point is assigned for correct answers, while wrong answers and responses of 'I don't know' receive 0 points. The maximum score for the General Nutrition Knowledge section is 64. Scores of less than 32 signify low nutrition knowledge and scores of more than 40 signify high nutrition knowledge [29]. We found Cronbach alpha value is 0.951 in this study.

Body Shape Questionnaire (BSQ- 34)

The BSQ- 34, developed by Cooper and Taylor [30], measures concerns about body shape among females. It comprises 34 items, which participants are asked to score on a scale of 1 to 6 (1: 'never', 2: 'rarely', 3: 'sometimes', 4: 'often', 5: 'very often', and 6: 'always'). The total score is calculated by adding the points given for each item. The lowest possible score is 34 and the highest is 204, with higher scores indicating an increase in body dissatisfaction [30]. We found Cronbach alpha value is 0.977 in this study.

Anthropometric measurements

The body weights and heights of all participants were measured by the researchers and recorded on the questionnaire form. Height was measured with a stadiometer and fat and muscle analyses were performed with a Tanita Mc 780. Body mass index (BMI) was calculated with the formula of body weight (kg)/height (m^2) and evaluated according to the BMI classification of the World Health Organization [31]. According to BMI values, participants were categorized as being underweight (BMI of < 18.5 kg/m^2), of healthy weight (18.5 ≤ BMI ≤ 24.9 kg/m^2), overweight (25.0–29.9 kg/m^2), or obese (≥ 30.0 kg/m^2) [31].

Statistical analysis

All statistical analyses were carried out using IBM SPSS Statistics 26. The conformity of the studied variables to normal distribution was examined with the Shapiro–Wilk test. For variables found to be normally distributed, the independent samples t-test was used for comparisons of two independent groups, the Pearson correlation test was used to examine the direction and intensity of relationships between two quantitative variables, and analysis of variance (ANOVA) was used for comparisons of three or more independent groups in accordance with parametric methods. Descriptive statistics including mean and standard deviation (mean ± standard deviation) values and median, minimum, and maximum (median (minimum–maximum)) values were calculated for hypothesis tests. Chi-square relationship tests were conducted as an appropriate statistical method for the comparison of groups in terms of numerical variables. In relationship tests, the expected cell value of the cross table was taken into account and the Pearson chi-square test was used in RxC tables. The margin of error was taken as 5%.

Ethical approval

Ethics committee approval was received for this study from the Ankara Medipol University Non-Interventional Clinical Research Ethics Committee Presidency (date: 16/12/2021; number: E- 81477236–604.01.01–3300). The study was carried out in accordance with the Declaration of Helsinki. Participants were informed about the purpose and procedures of the study before giving written consent. Informed consent was obtained from all the participants involved in the study.The study posed no risks to participants, and participants were free to withdraw at any time without any consequences.

Results

The demographic characteristics and health information of the participating women are presented in Table 1. From among 613 participants, 56.1% were between the ages of 18 and 25 years, 55.5% had a bachelor's degree, 51.9% worked as officers, 69.3% had no health problems, and 57.4% engaged in regular physical activity while 42.6% did not.

Table 1 Demographic characteristics and health information of the participants

Variables	n	%
Age (year)		
18–25	344	56.1
26–35	173	28.2
36–60	96	15.7
Education level		
Primary/secondary school graduate	26	4.2
High school	80	13.1
Undergraduate	340	55.5
Postgraduate	167	27.2
Occupation		
Unemployed	45	7.3
Officer	318	51.9
Student	158	25.8
Employee	93	15.0
Health status		
Yes	188	30.7
No	425	69.3
Physical activity		
Yes	352	57.4
No	261	42.6

Table 2 Female's BMI, ORTO-R, BSQ- 34, GeSNK and BSMAS scores

	X ± SD	Min–Max
Scales		
ORTO-R	17.55 ± 5.11	6–30
BSQ- 34	89.12 ± 40.71	34–204
GeSNK	38.59 ± 13.99	1–60
BSMAS	17.27 ± 6.11	6–30
Anthropometric measurements		
Body weight (kg)	60.8 ± 10.2	39–98
Height (cm)	164.4 ± 5.7	144–185
BMI (kg/m^2)	22.5 ± 3.7	15.23–38.03

The participants' anthropometric measurements and the mean values and ranges of their ORTO-R, BSQ- 34, GeSNK, and BSMAS scores are presented in Table 2.

Mean body weight was 60.8 ± 10.2 kg, mean height was 164.4 ± 5.7 cm, and mean BMI was 22.5 ± 3.7 kg/m^2. The mean ORTO-R score was 17.55 ± 5.11, mean BSQ- 34 score was 89.12 ± 40.71, mean GeSNK score was 38.59 ± 13.99, and mean BSMAS score was 17.27 ± 6.11.

The participants' levels of nutrition knowledge according to their GeSNK scores are presented in Table 3. It was determined that 49.4% of females had high, 21.5% had medium, and 29.1% had low nutrition knowledge levels.

Table 3 Nutrition knowledge scores of female according to GeSNK-Q scale

NutritionKnowledge Score	n	%
Low nutrition knowledge level (≤ 32)	178	29.1
Medium nutrition knowledge level (32–40)	132	21.5
High nutrition knowledge level (≥ 40)	303	49.4

The participants' ORTO-R, BSMAS, BSQ- 34, and GeSNK scores are presented in Table 4 as values of mean ± standard deviation according to age, education status, and BMI classification.

BSMAS and GeSNK scores differed statistically according to age groups ($p = 0.001$ and $p = 0.000$, respectively). Statistically significant differences were also found among ORTO-R, BSMAS, BSQ- 34, and GeSNK scores according to education levels ($p = 0.002$, $p = 0.000$, $p = 0.000$, and $p = 0.000$, respectively). ORTO-R and BSMAS scores were higher among primary school and secondary school graduates compared to participants with education at the high school or equivalent, undergraduate, and postgraduate levels, while GeSNK scores of primary school and secondary school graduates were lower than those of participants with education at the undergraduate and postgraduate levels. ORTO-R, BSMAS, BSQ- 34, and GeSNK scores were also statistically significantly different according to BMI classifications ($p = 0.008$, $p = 0.089$, $p = 0.000$, and $p = 0.000$, respectively). The ORTO-R and BSQ- 34 scores of underweight females were lower than those of normal-weight and slightly overweight/obese females, while the GeSNK scores of slightly overweight/obese females were lower than those of underweight and normal-weight females.

Among the females who stated that they were not dieting, 54.5% were 18–25 years old and 45.5% were ≥ 26 years old ($p < 0.001$). While 64.2% of those on a diet had a healthy body weight, 30.6% were slightly overweight/obese and 5.1% were underweight. A significant relationship was also found among dieting status, BMI, and following nutrition-related accounts on social media ($p < 0.001$).

The distribution of female's dieting status according to age, BMI and nutrition-themed social media following is resented in Table 5.

ORTO-R, BSMAS, BSQ-34, and GeSNK scores according to the participants' satisfaction with their body weight and dieting status are presented in Table 6. The differences in ORTO-R, BSMAS, BSQ- 34, and GeSNK scores were found to be statistically significant between those

Table 4 Classification of female's ORTO-R, BSMAS, BSQ- 34 and GeSNK scores according to age, education level and BMI

Variables	ORTO-R X ± SD	BSMAS X ± SD	BSQ- 34 X ± SD	GeSNK X ± SD
Age (year)				
18–25	17.72 ± 4.88	18.63 ± 5.59	89.10 ± 41.68	40.79 ± 14.34
26–35	17.73 ± 5.09	16.77 ± 5.84	86.91 ± 40.30	35.36 ± 13.85
36–60	16.64 ± 5.87	13.35 ± 6.56	93.17 ± 37.98	36.54 ± 11.43
F	– 0.022	3.465	0.569	4.156
p	0.982	**0.001****	0.570	**0.000****
Education level				
Primary school-secondary school graduate	13.27 ± 6.08	9.50 ± 5.67	80.19 ± 34.48	28.88 ± 10.15
High school and equivalent graduate	17.95 ± 5.37	16.68 ± 6.40	102.40 ± 40.40	35.15 ± 12.44
Undergraduate	17.50 ± 4.70	17.58 ± 5.90	84.83 ± 40.19	41.73 ± 13.21
Postgraduate	18.11 ± 5.35	18.10 ± 5.60	92.87 ± 41.31	35.36 ± 14.99
F	14.391	37.686	16.473	49.303
p	**0.002***	**0.000****	**0.001****	**0.000****
BMI (kg/m^2)				
Underweight	15.62 ± 5.66	17.22 ± 6.40	65.69 ± 37.99	40.67 ± 13.42
Normal	17.65 ± 4.80	17.63 ± 5.82	85.15 ± 38.58	39.86 ± 13.98
Slightly overweight/obese	18.03 ± 5.58	16.34 ± 6.67	109.20 ± 39.57	34.31 ± 13.45
F	4.931	2.429	32.583	9.487
p	**0.008***	0.089	**0.000****	**0.000****

[F] One-Way Anova

t-test

*$p < 0.05$

**$p \leq 0.001$

Table 5 Distribution of dieting status of female by age, BMI and nutrition themed social media follow-up status

Dieting Status							
	Did not follow		**Follow**		**Total**		**χ2/p**
	n	**%**	**n**	**%**	**n**	**%**	
Age (year)							
18–25	133	54.5	211	57.2	344	56.1	54.896 **0.000***
26–35	74	30.3	99	26.8	173	28.2	
36–60	37	15.2	59	16.0	96	15.7	
BMI (kg/m^2)							
Underweight	39	16.0	19	5.1	58	9.5	126.340 **0.000***
Normal	170	69.7	237	64.2	407	66.4	
Overweight/obese	35	14.3	113	30.6	148	24.1	
Following nutrition-related accounts on social media							
Follows	165	68.0	314	85.0	479	78.1	26.249 **0.000***
Does not follow	79	32.0	55	15.0	134	21.9	

[X2] Chi-square test of independence

*$p < 0.001$

who were satisfied with their body weight, those who were not satisfied with their body weight and wanted to lose weight, and those who were not satisfied with their body weight and wanted to gain weight ($p = 0.000$, $p = 0.028$, $p = 0.000$, and $p = 0.000$, respectively). The mean ORTO-R, BSMAS, and BSQ- 34 scores of females on diets (19.24 ± 4.84, 18.27 ± 5.86, and 101.30 ± 40.92, respectively) were higher than those of females who were

Table 6 ORTO-R, BSMAS, BSQ- 34 and GeSNK scores of female according to their satisfaction with their body weight and dieting status

	ORTO-R X ± SD	BSMAS X ± SD	BSQ- 34 X ± SD	GeSNK X ± SD
Satisfaction with body weight				
Satisfied with body weight	15.87 ± 4.86	16.49 ± 5.97	66.88 ± 29.53	41.50 ± 13.45
Want to lose body weight	18.96 ± 4.82	17.79 ± 6.05	108.43 ± 38.54	36.54 ± 14.04
Want to gain body weight	16.61 ± 5.75	18.11 ± 7.07	70.50 ± 40.04	36.78 ± 14.16
F	29.138	3.610	104.171	9.477
p	**0.000****	**0.028***	**0.000****	**0.000****
Diet application status				
Followed	19.24 ± 4.84	18.27 ± 5.86	101.30 ± 40.92	38.54 ± 14.11
Didn't follow	15.00 ± 4.43	15.78 ± 6.18	70.70 ± 32.77	38.68 ± 13.84
t	− 11.002	− 4.982	− 10.231	0.116
p	**0.000****	**0.000****	**0.000****	0.908

[F] One-Way Anova

[t] Bağımsız örneklem t-testi

*$p < 0.05$

**$p \leq 0.001$

Table 7 Correlation between ORTO-R, BSMAS, BSQ- 34 and GeSNK scores of female

	BSMAS	BSQ- 34	GeSNK
ORTO-R	**0.475***	**0.685***	**− 0.117***
BSMAS	1	**0.354***	0.010
BSQ- 34		1	-**0.213***
GeSNK			1

(r: 0–0,30) low level relationship, (r:0,30–0,70) moderate level relationship, (r: 0,70–1,00) high level relationship, (r:1,00) very high level relationship [32]

Table 8 Multiple linear regression analysis of ORTO-R, BSQ- 34, BSMAS and GeSNK scores

Scales	Beta	SH	t	p	Adj R^2
ORTO-R					
Constant	6.984	0.639	10.938	**0.000****	0.529
BSMAS	0.222	0.025	8.909	**0.000****	
BSQ- 34	0.074	0.004	19.465	**0.000****	
GeSNK	0.002	0.010	0.226	0.821	
BSMAS					
Constant	5.922	1.041	5.691	**0.000****	0.229
BSQ- 34	0.011	0.007	1.449	0.148	
GeSNK	0.033	0.016	2.096	**0.037***	
ORTO-R	0.519	0.058	8.909	**0.000****	
BSQ- 34					
Constant	8.696	5.795	1.501	0.134	0.487
GeSNK	− 0.400	0.085	− 4.703	**0.000****	
ORTO-R	5.148	0.264	19.465	**0.000****	
BSMAS	0.319	0.220	1.449	0.148	
GeSNK					
Constant	42.057	2.116	19.878	**0.000****	0.049
ORTO-R	0.036	0.158	0.226	0.821	
BSMAS	0.215	0.103	2.096	**0.037***	
BSQ- 34	− 0.088	0.019	− 4.703	**0.000****	

[t] Independent samples t-test *$p < 0.05$, **$p < 0.001$, Beta: Coefficient, SE: Standard error, Adj R2: Adjusted coefficient of determination

not on diets (15.00 ± 4.43, 15.78 ± 6.18, and 70.70 ± 32.77, respectively). Differences between ORTO-R, BSMAS, and BSQ- 34 scores according to participants' status of dieting or not dieting were determined to be statistically significant ($p = 0.000$ for all).

Correlations among the participants' ORTO-R, BSMAS, BSQ-34, and GeSNK scores are presented in Table 7. Positive moderate correlations were found between ORTO-R and BSMAS scores ($r = 0.475$, $p < 0.05$) and between ORTO-R and BSQ-34 scores ($r = 0.685$, $p < 0.05$), while a negative low correlation was found between ORTO-R and GeSNK scores ($r = -0.117$, $p < 0.05$). In addition, a positive moderate correlation ($r = 0.354$, $p < 0.05$) was found between BSMAS and BSQ-34 scores, and a negative low correlation ($r = -0.213$, $p < 0.05$) was found between BSQ-34 and GeSNK scores.

Multiple linear regression analysis results for the participants' ORTO-R, BSQ-34, BSMAS, and GeSNK scores are presented in Table 8. Increases in social media addiction ($\beta = 0.222$, $p = 0.000$, partial $\eta^2 = 0.529$) and body image disturbance ($\beta = 0.074$, $p = 0.000$, partial $\eta^2 = 0.529$) were associated with an increased tendency towards ON. Increases in nutrition knowledge ($\beta = 0.033$, $p = 0.037$, partial $\eta^2 = 0.229$) and tendency towards ON ($\beta = 0.519$, $p = 0.000$, partial $\eta^2 = 0.229$) were associated

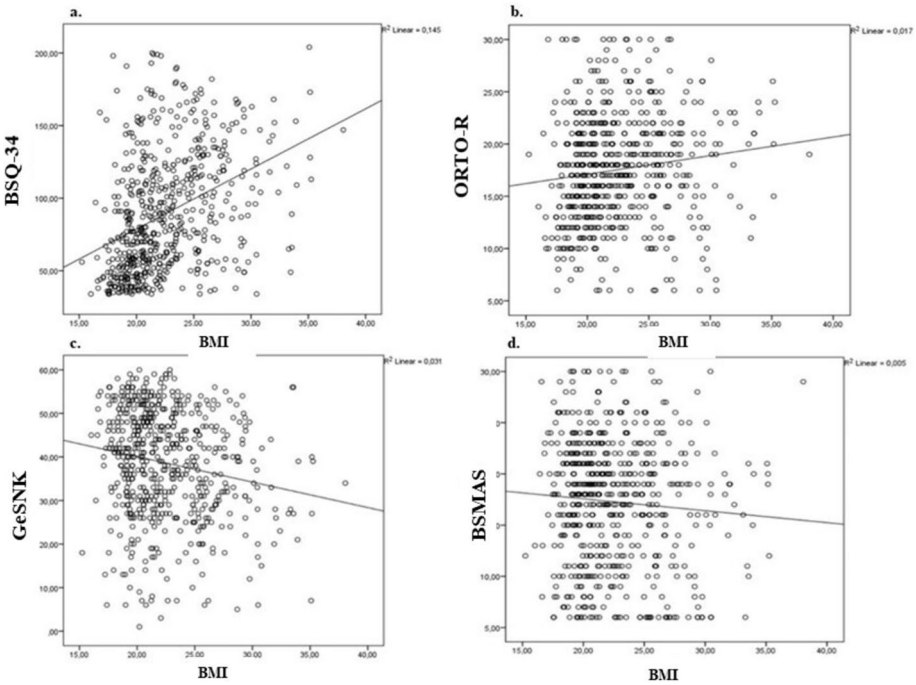

Fig. 2 Correlation between women's BMI values and BSQ- 34, ORTO-R, GeSNK and BSMAS total scores (r). (r: 0–0.30) low level relationship, (r:0.30–0.70) moderate level relationship, (r: 0.70–1.00) high level relationship, (r:1.00) very high level relationship [32]

with increased social media addiction. Decreased general nutrition knowledge (β = − 0.400, p = 0.000, partial η^2 = 0.487) and increased tendency towards ON (β = 5.148, p = 0.000, partial η^2 = 0.487) were associated with increased body image disturbance. Finally, increased social media addiction (β = 0.215, p = 0.037, partial η^2 = 0.049) and decreased body image disturbance (β = − 0.088, p = 0.000, partial η^2 = 0.049) were associated with increased general nutrition knowledge.

Correlations among BMI classifications and BSQ-34, ORTO-R, GeSNK, and BSMAS scores are shown in Fig. 2.

There was a positive moderate correlation between BMI and BSQ- 34 scores (r = 0.380, p < 0.001), positive low correlation between BMI and ORTO-R scores (r = 0.130, p < 0.001), while there was a negative low correlation (r = − 0.176, p < 0.001) between BMI and GeSNK scores.

Discussion

There is growing concern about how social media usage may influence the development of eating disorders [33, 34]. Compared to traditional media, social media may have a strong impact on an individual's body objectification due to contents and tools that influence eating behaviours [35].

Turnwald et al. [36] demonstrated how food-focused posts from the social media accounts of well-known celebrities who use social media effectively have negative consequences. Idealized body images on social media are causing increasing body dissatisfaction among young females [37]. Females report more concerns about their bodies, eating, and body weight than men [38], and female's media exposure may drive them to spend more money and time to change their appearances, be more prone to eating disorders due to the distortion of their perceptions of their bodies, and think more about food [39]. Body satisfaction is often problematic in females due to social pressures on females to be thin. Furthermore, negative body talk within the family was shown to be positively associated with emotional eating, and body dissatisfaction significantly mediated this relationship [40]. It was found that higher levels of body dissatisfaction were significantly associated with more restricted eating, particularly in females, and were significantly associated with more ON tendencies and behaviours in females [41]. Valente et al. (2022) [42] found that people who share ON-related content on Instagram are primarily young women. The focus on the physical appearance of females, the fact that female's physical appearance is emphasized as a component of social success, and the societal belief that slender females are attractive and successful lead females to be more engaged in behaviours

such as maintaining body weight and dieting compared to men.In a study conducted by Vaccari et al. [43], the mean ORTO-R score in females was 16.6 ± 4.6, and in a study by Gkiouras et al. [44], the mean ORTO-R score was 15. In the present study, the mean ORTO-R score was 17.5 ± 5.1. The higher mean ORTO-R score of this study compared to previous research may be attributed to the fact that the present sample consisted of only females and the mean age was relatively low. The incidence of ON is higher among obese individuals compared to thin individuals and it was found that ON is related to BMI [44–46]. However, in the study conducted by Yılmaz and Dündar, no statistically significant difference was found in terms of ON between overweight/obese participants and participants with normal BMI values [47]. In the present study, a statistically significant difference was found among ORTO-R scores according to the participants' BMI classifications ($p < 0.05$). The ORTO-R scores of underweight and normal-weight participants were significantly lower than those of slightly overweight/obese participants. Although it is understood that healthy eating has positive effects on health, an obsession with healthy food behaviours may cause ON, which negatively affects the individual's health and quality of life. Individuals with ON experience intense anxiety about 'bad' foods, focus excessively on food and eating, and have repetitive thoughts about food and health [48]. In one study, eating disorder psychopathology was associated with visits to weight loss websites [49]. Another study of females with tendencies towards ON found a significant negative relationship between internet usage and positive emotions associated with healthy eating habits [50].

Education is an important factor in the development of ON [51]. In a study carried out by Bağcı Bosi et al. [52], it was determined that people who received more education on healthy nutrition tended to have greater success in pursuing healthy nutrition. In the present study, a significant difference was found between ORTO-R scores according to the participants' education levels ($p < 0.05$). The ORTO-R scores of females who had completed only primary or secondary school were significantly lower than those of females who had completed high school or an equivalent, as well as those who had obtained undergraduate or postgraduate degrees (Table 4). This may be due to the social environments that females experience. Another important factor is that social media addiction increases as the level of education increases, and exposure to social media posts on healthy nutrition may cause an increase in ON tendencies in females.

Tendencies towards ON were found to increase with age [53]. In another study, although the difference did not reach the level of statistical significance, it was found that tendencies towards ON decreased with increasing age [47]. In the present study, no significant difference was found between age groups in terms of ON tendencies ($p = 0.982$) (Table 4). However, the ORTO-R scores of females aged 18–35 were higher than those of females aged 36–60 (Table 4). Although anxiety due to health problems that occur with age may be a cause of ON, the association of healthy eating with beauty may cause obsessions with healthy eating more frequently among young people.

A previous study revealed the existence of a significant relationship between BMI and nutrition knowledge [54]. Similarly, Elsahoryi et al. [55] reported that as BMI increased, the score obtained from a nutrition knowledge questionnaire decreased. In agreement with the literature, a significant relationship was found between BMI and nutrition knowledge level scores ($p < 0.05$) in the present study. As BMI increased, nutrition knowledge levels decreased. It can be said that there is a relationship between individuals' nutrition knowledge and food choices, and that relationship affects food preferences. Furthermore, in this study, nutrition knowledge levels differed significantly according to age ($p < 0.05$). The highest GeSNK scores were obtained by females between the ages of 18 and 25 (Table 4). This may be due to the education level of that age group. Some studies have shown a positive relationship between education level and nutrition knowledge level [56–59], but Tabrizi [60]did not find a relationship between education and nutrition knowledge levels. In the present study, the GeSNK scores of females with undergraduate degrees were significantly higher compared to graduates of primary school, secondary school, and high school ($p < 0.05$) (Table 4). In the study of Bany-Yasin et al. [16] and in the study of Koch et al. [21], a relationship was found between nutritional knowledge and education level. As their levels of education increase, individuals' opportunities to access correct information also increase. This may explain the effect of education level on nutrition knowledge level. This finding highlights the importance of conducting nutrition awareness campaigns in schools and universities [16]. A study conducted in India found that nutrition knowledge among females was at an average level [59]. A study conducted in Lahor found that many participants (65.3%) had high nutrition-related basic knowledge, and 34.7% had low knowledge [61]. In this study, female's nutrition knowledge levels were found to be high according to the mean GeSNK score. Socioeconomic levels and geographical conditions may explain the differences between studies. In addition, the fact that there were many participants with undergraduate or postgraduate degrees in the present study may be an important reason for the high level of nutrition knowledge.

It has been shown that BSQ-34 scores increase as BMI increases in females [62], and obesity and higher body weight are also associated with worse body shape trajectories [63]. Similar to the literature, a positive correlation was found in this study between BMI values and BSQ-34 scores, with BSQ-34 scores increasing significantly as BMI increased ($p < 0.05$) (Table 4). In a previous study, younger age was associated with body dissatisfaction [64]. In the present study, the highest rate of body dissatisfaction was seen among females aged 36–60, but the difference between age groups was not statistically significant ($p = 0.570$) (Table 4).

In this study, a statistically significant difference was found between ORTO-R scores according to body weight satisfaction ($p < 0.005$). The ORTO-R scores of participants who wanted to lose body weight were found to be higher than those of participants who were satisfied with their body weight and those who wanted to gain body weight. Pauze et al. [65] showed that individuals who are more successful in following a healthy diet want to lose more body fat. It has also been reported that those who have been on at least one diet in their lives have more severe orthorexic behaviours [66] and that dieters have higher ON scores than those who have not been on a diet [67]. Furthermore, 77% of individuals who followed popular diets were found to be at risk of orthorexic behaviour at some point in their lives, and individuals who previously followed a diet exhibited significantly more orthorexic behaviours than individuals who had never followed a diet [6]. In the present study, the ORTO-R scores of females who had been on a diet at some point in their lives were significantly higher than those of females who had not been on a diet ($p = 0.000$) (Table 6). Females who are prone to ON may have higher expectations of thinness, and as expectations of thinness increase, tendencies towards ON and eating disorders will also increase. In parallel with the increase in the prevalence of obesity, individuals are exposed to messages about dieting and posts that popularize unrealistically thin appearances on social media, emphasizing society's expectations of thinness in females.

A study conducted by Mohsenpour et al. [68] demonstrated that body image concerns were significantly associated with disturbed eating behaviour in terms of emotional eating, external stimuli, and restricted eating. In the present study, the mean BSQ- 34 score of females who had been on a diet at some point in their lives was higher than that of females who had not been on a diet (Table 6). Studies have also shown that individuals with higher levels of body dissatisfaction are more likely to engage in disordered eating behaviours such as excessive dieting, unhealthy eating, and weight control practices [69, 70], and social media usage was found to be associated with higher body dissatisfaction and dieting practices [71]. On Instagram, users who follow accounts that focus heavily on appearance (e.g. models and fitness bloggers) may be more preoccupied with their own appearance than users who follow accounts that are appearance-neutral (e.g. travel) [72]. In the study of Kleemans et al. [73] the results indicated that exposure to altered Instagram photos directly resulted in a decrease in body image. This effect was particularly pronounced in girls with higher tendencies for social comparison, who were more negatively impacted by the manipulated images. Concerns about body image may lead females to compare themselves with the appearances of others [74], and Gann [75] reported a correlation between social media usage and body anxiety. Engeln et al. (2020) [76] reported that Instagram users reported significantly more appearance comparisons than Facebook users. Those who used Instagram but not Facebook showed decreased body satisfaction. Differences may also occur depending on the country. In South Korea, Instagram use appears to have an overall positive effect on adolescents' body-related concepts: Instagram use was uniquely associated with lower levels of self-objectification and higher levels of positive body image [77]. A study reported that the negative effects of being exposed to the ideal image on social media in young women decreased with social media literacy [78]. In the present study, a positive moderate correlation was found between BSQ- 34 and BSMAS scores ($r = 0.354$, $p < 0.05$), with BSMAS and BSQ- 34 scores increasing in parallel (Table 7). Turner and Lefevre [79] investigated the relationship between social media and ON symptoms, and they concluded that Instagram use was strongly associated with tendencies towards ON but Facebook, Pinterest, Google +, and Tumblr use was unrelated to ON. In the study by Kumala et al. [80], a positive correlation was found between Instagram usage intensity and ON. In the study conducted by Awad et al. [81], social media use disorder was found to be associated with higher levels of ON symptomatology, while Minadeo et al. [82] found that posts on nutrition, body weight, and weight loss encouragement were popular on social media. Another study found that as social media addiction increased, ON tendencies also increased [83]. In the study conducted by Yurtdaş-Depboylu et al. [84], social media addiction was found to be associated with a higher risk of eating behaviour disorders, ON tendencies, and poorer body image. The Social Media Addiction Scale scores of participants at risk of ON were found to be statistically significantly higher than those of participants who were not at risk of ON [85]. People who self-identified as having ON were significantly more likely to post about ON, to search for #orthorexia and to follow ON-related accounts in instagram [42]. Asil et al.

[86] found that participants who followed webpages with healthy nutrition and sport-exercise recommendations had an increased ON risk when compared to those who did not follow those pages. In this study, a positive moderate correlation ($r = 0.475$, $p < 0.05$) was found between BSMAS and ORTO-R scores (Table 7). Taken together, these results suggest that social media usage may lead to disordered eating behaviours and body dissatisfaction.

Some researchers suggest that ON is different from other eating disorders, with disturbed body perceptions being less obvious in cases of ON. Nonetheless, the perfectionism generally seen in ON can disrupt the individual's body perceptions [87]. Perfectionism scores of individuals with high tendencies towards ON were higher compared to individuals with low ON tendencies [66]. Furthermore, Messer et al. [88] found that higher scores for overevaluation, dissatisfaction, preoccupation, body control, and body image avoidance were associated with increases in ON symptoms. In the study conducted by He et al. [89], however, ON was found to be associated with positive body image. In the present study, a positive moderate correlation ($r = 0.685$, $p < 0.05$) was found between ORTO-R and BSQ- 34 scores (Table 7). Previous findings in the literature support this result. For example, one study found that orthorexic behaviours were less common among students who had more knowledge about nutrition [90]. In another study, greater ON intensity was found to correlate with higher levels of nutrition knowledge [91]. In the study conducted by Plichta and Jezewska-Zychowicz [92], however, no significant difference was found in orthorexic behaviours according to nutrition knowledge levels. In this study, a negative correlation ($r = -0.117$, $p < 0.05$) was observed between GeSNK and ORTO-R scores (Table 7). Dissen et al. [93] found that nutrition knowledge level was not associated with body satisfaction, while Schwartz et al. [94] studied females university students and concluded that females with more nutrition knowledge may be more prone to developing concerns about body shape/weight and eating disorder pathologies. In a systematic review, it was observed that with increased nutrition knowledge as a result of nutrition education, body image satisfaction and general satisfaction with physical appearance increased [95]. In the present study, a negative correlation ($r = -0.213$, $p < 0.05$) was found between BSQ-34 and GeSNK scores (Table 7).

Strengths and limitations

This study was conducted only with females between the ages of 18 and 60 years in Istanbul, which has the highest population density in Turkey. Due to the sample size and the demographic characteristics of the participants, the results cannot be generalized to the country as a whole. Furthermore, the fact that the administered questionnaire was based on self-reporting may have introduced some bias. There are many arguments about the beneficial use of social media, but it is difficult to ensure that social media has positive effects in certain areas because the contents of social media posts vary dramatically in terms of their accuracy. Negative effects of social media may arise from that lack of quality control, particularly in the context of unhealthy nutritional approaches and diets. Accordingly, it is extremely important that future studies incorporate research on educators and social media content producers. In addition the effects of different social media platforms were not evaluated in this study. This is one of the limitations of this study because exposure to visual content on social media platforms varies. In the literature to date, insufficient studies have explored the relationships among types of diets, obsessions with healthy eating, social media addiction, body perceptions, and nutrition knowledge levels. The present study has aimed to address that gap in the literature, which constitutes the study's main strength. Further research in this field is warranted, particularly considering the impact of nutrition knowledge on diet quality. This study is also important in terms of raising awareness of the need for more comprehensive experimental, field-based, and epidemiological studies in the future, incorporating broader age groups and both genders. Most research on social media's impact on body dissatisfaction focuses on participants younger age. However, adult women, who also use social media, may be similarly affected by the messages they encounter online. Therefore, using a wide age range in this study was also beneficial in examining older women.

Conclusion

Extensive usage of social media leads individuals to be more heavily exposed to images that may disrupt body perception. Social media addiction and increased time spent on social media have negative effects on body image. Subsequently, as a result of deteriorated body image, individuals may resort to unhealthy diets in an attempt to achieve idealized thinner bodies. Posts shared on social media may also cause individuals to develop an obsession with healthy eating and mentally categorize foods as 'good' and 'bad'. Obsessions about healthy nutrition can reach dangerous levels, triggering strong tendencies towards ON. It is important to provide nutrition education to individuals, especially at younger ages, and to promote increased media and social media literacy. Improving the level of nutrition knowledge within society may have significant effects as individuals learn to be more questioning before applying the health- or weight-related information they see

on social media. And also planning nutrition education programs from an early age will be beneficial for individuals to be more conscious and to question the information they see on social media about nutrition. Social media literacy, nutrition education programs and body positivity programs could be carefully developed. We urge researchers to further examine whether current policies are achieving their intended effects and to collaborate with governments and other organizations to design and implement policies that effectively prevent body dissatisfaction and disordered eating. Organizing training in primary and secondary schools in the areas of social media literacy, nutrition education and body image development would be an important policy for raising awareness among children and adolescents. It is particularly crucial that nutrition knowledge, healthy nutrition obsessions, social media usage, and body image be evaluated together. Deterioration in one of these factors can easily cause deterioration in the others. We believe that future studies investigating how different social media platforms affect body perception in different age groups will provide more detailed information. This study examined the overall impact of social media, but did not address differences across social media platforms. Additionally, children and preadolescents were not included in this study. Considering the prevalence of visual social media platforms use in these age groups, studying this age group in future research may provide more long-term and comprehensive insights.

Abbreviations

BMI	Body Mass Index
ON	Orthorexia nervosa
BSMAS	Bergen Social Media Addiction Scale
BSQ- 34	Body Shape Questionnaire
GeSNK	General and Sport Nurtiriton Knowledge Questionnaire

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Authors' contributions
"E.S. wrote conceptualization of the topic and content, gatherited data and resources, prepared and writing the article. N.S. was done final revision and editing. All authors contributed to the final version of the main draft as a result of revisions."

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Data availability
Since we promised the participants that their information would not be shared and that the data would only be used for scientific purposes while conducting the current study, it is not publicly available. Therefore, the data obtained for this study will not be shared due to "personal data protection". Collective consent of the participants is required for sharing. However, all data generated or analyzed during this study are already included in article.

Declarations

Ethics approval and consent to participate
Ethics committee approval was received for this study from the Ankara Medipol University Non-Interventional Clinical Research Ethics Committee Presidency (date: 16/12/2021; number: E- 81477236–604.01.01–3300). The study was carried out in accordance with the Declaration of Helsinki. Participants were informed about the purpose and procedures of the study before giving written consent. Informed consent was obtained from all the participants involved in the study.The study posed no risks to participants, and participants were free to withdraw at any time without any consequences.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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